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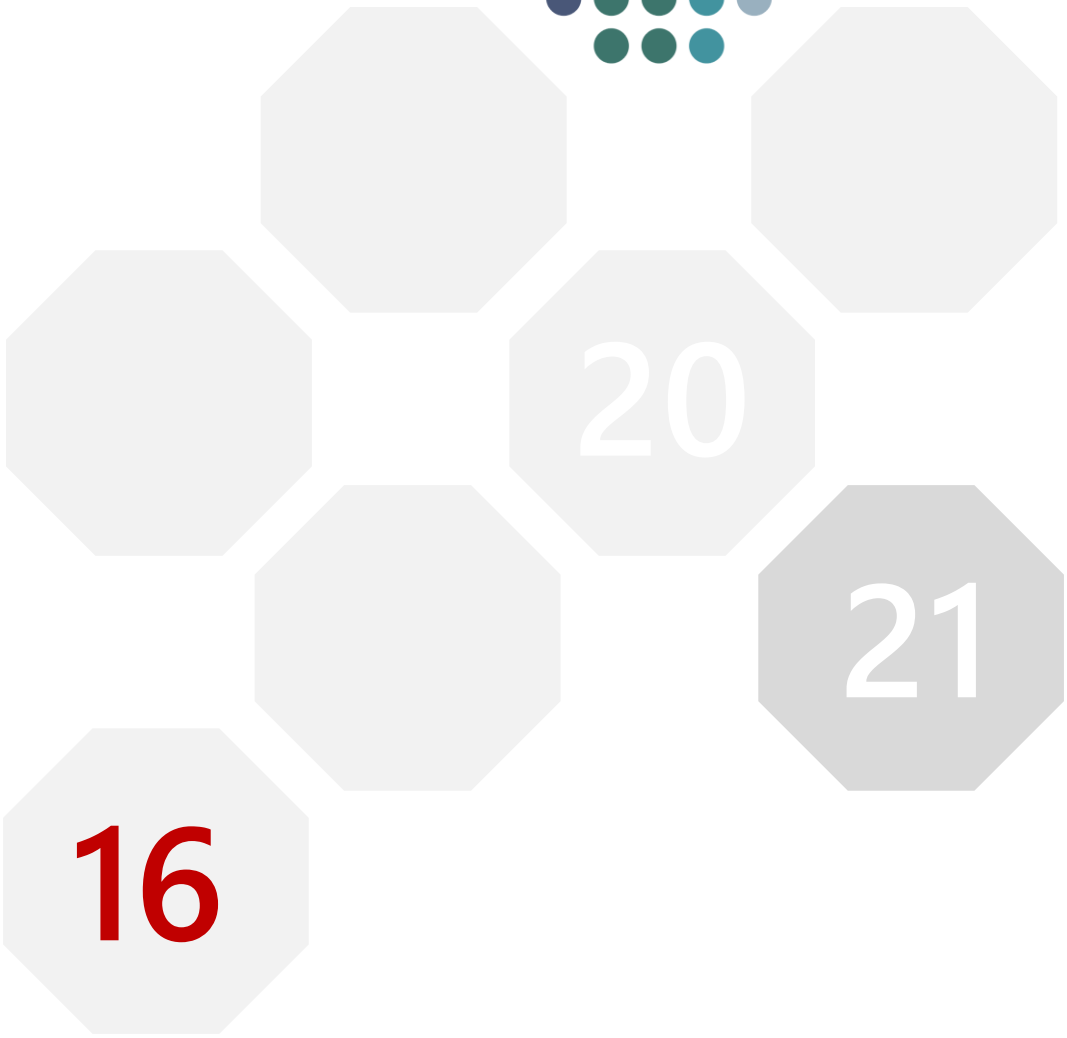

DisCo 2021: Active Learning in Digital Era

How Digital Tools promote a Conscious, Open-minded, Creative and Social-Oriented Thinking

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Content

Dear Readers,

We are delighted to present to you the proceedings of the 16th International Online Conference, DisCo 2021, focusing on "***Active Learning in Digital Era: How Digital Tools Foster Conscious, Open-minded, Creative, and Socially-Oriented Thinking***." The backdrop of DisCo 2021 was profoundly shaped by the ongoing pandemic, which prompted us to adapt our traditional approach.

Unfortunately, our customary conference venue, located at the Microsoft Prague headquarters, had to remain closed due to public health concerns. Additionally, travel restrictions prevented numerous potential participants from joining us in Prague. Consequently, we made the decision to reschedule our traditional June conference dates to September, allowing for a more favourable environment.

In response to these challenges, DisCo 2021 was held under a hybrid model, blending virtual and in-person participation. Remarkably, many attendees expressed their delight at the opportunity to gather physically after nearly two years of virtual interactions. For some, this marked their first in-person event since the onset of the pandemic.

The 16th International Conference, DisCo 2021, centered around the theme "***Active Learning in Digital Era: How Digital Tools Foster Conscious, Open-minded, Creative, and Socially-Oriented Thinking,***" took place at the esteemed Hotel Krystal in Prague from September 6th to 7th, 2021.

Although opening keynote of Nadia Sansone dropped out at the last minute, due to health conditions, the rest of the conference went very well according to the reactions of the participants. It was the first time we organized the conference in really hybrid mode. Most of the lectures were also recorded and there were nice interactions between present and distance participants thanks to support of IT specialist from the hotel Krystal. The selected presentation will be published on DisCo Youtube channel in coming weeks. **Helaine W. Marshall**, Professor of Education and Director of Language Education Programs at LIU Hudson, NY, USA firstly presented The Synchronous Online Flipped Learning Approach (SOFLA) together with Tereza Havránková and remotely connected Jeffrey Skolnick from Australia. This presentation was a good starter before her excellent afternoon keynote speech. The participants had also opportunity to experience Virtual Reality for purpose of language learning during the afternoon workshop. The first day of the conference finished with networking event on the sail on Moldau.

The day two start with a bombastic presentation of professor **Vilmos Vass** from Budapest Metropolitan University about Coherence between Competencies for Online Learning and Digital Mindset. He nicely explained the important and not easy role of teachers framed by motto of Pasi Sahlberg and Timothy W. Walker in “Teachers we trust”. After his presentation Vilmos Vass discussed the challenges of online learning in small languages during Covid-19 pandemic together with Helaine W. Marshall and Sara Gabrielsson, Swedish teacher working in Belgium and Ivana Batarelo Kokic. Short message from this discussion is that we should support learning small languages as a development of rich humanity. The covid-19 crisis accelerated the using e-tools in education and even there will be tendency turn to so-called old normal at least some elements of e-learning will be applied in the most form of education. After this panel discussion participants could visit workshop of the professor Christine Preston, De Monfort University, United Kingdom. The Established Theories that Scaffold Teaching, Learning and Mentoring Online. The afternoon program opened online keynote speech of Dr. Sanna Brauer, Oulu University of Applied Sciences, Finland. about 360 Degree View on Digital Open Badge-Driven Learning.

DisCo audience and program committee reward two awards to Hana Tulínská and Michal Černý online course Information Literacy Online Course for High Schools.

Also, thanks to CEI about over 100 participants from 16 countries could deepen their knowledge about digital learning and teaching and exchange their experience and contacts.

We divided the proceeding to three parts. The first one is focused on reflection of the Covid-19 pandemic. The second part is dedicated to using advanced technologies in the education. The last part reflects different aspects of digitalization in education.

Finally, we would like to express gratitude to our partners for their sponsorship and support. First, we thank The Central European Initiative, our general partner, especially for their flexibility and shifting its travel support to next year. Our thanks go to AAEI (Association of Adult Education Institutions) the Czech Republic, Navreme Boheme s.r.o, Prague Development Center, Veriod, Czech for Association of Distance Teaching Univeristies (ČADUV) and media partners: Edumenu; Andragogika v praxi, Aula, RicercAzione, Firemní vzdělávání and Ikaros. Finally, we really appreciate the enthusiasm and work of the Programme and Organizational Committees as well as our volunteers. Without their great effort and help, the organization of such an event would not be possible.

Jan Beseda, Centre for Higher Education Studies

Articles

COVID reflections

REFLECTION OF STUDENTS' NEEDS IN COVID EMERGENCY HEALTH CARE EDUCATION

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Abstract

The COVID-19 pandemic has raised new questions regarding the quality, format, and structure of education. Teaching has shifted to online environments, where all educational activities have been structured. A study conducted among 76 teachers and 294 students in non-medical healthcare fields in the Czech Republic reveals a shared agreement on the importance of participating in quality education. However, there is no common consensus on what constitutes this quality. The research is based on an analysis of open-ended questions conducted at the turn of 2020/2021 and is qualitatively oriented. Its objective is to provide both target groups with an understanding of what constitutes quality online education and to establish a shared conceptual foundation for potential positive changes.

Keywords

E-learning. Students. Perception. Health Care Education. Questionnaire.

INTRODUCTION

The COVID-19 pandemic has brought to the forefront important considerations regarding the structure, forms, and quality of education. This article specifically focuses on the reflections of health professional students, namely general nurses (Quinn, 2000; Freshwater, 1999ab; Jack et al., 2017) and paramedics (Xue-man, 2006; De Luca et al., 2017). Drawing upon the experiences of healthcare education students from the Czech Republic, the authors aim to address a crucial question: What kind of support do students require during emergency online education? To answer this question, a qualitative analysis of open-ended survey questions was conducted among 294 bachelor students. Additionally, the insights gained from focus groups involving seven students who participated in the survey were considered.

HEALTH CARE AND DIGITAL EDUCATION

Education in health care is continuously evolving and various teaching methods are increasingly used in education. Current education should be adapted to current trends in the provision of health services (Pottle, 2019). Transformation of education and implementation of new possibilities in the educational process is also important in view of the rapid development of information technologies (Chen et al., 2020). Digital technologies are increasingly used in connection with the development of a variety of technologies. This brings about individual changes in teaching practices and has implications for the teaching and learning process (Loureiro, et al., 2021). Digital education is a very important part of the

educational process in this context. As part of the educational process, competence and satisfaction should be improved not only for health professionals but also for students (WHO, 2020). In many European countries, including the Czech Republic, the student portfolio is being gradually adjusted. First of all, it is the implementation of digital competences in teaching (National Institute of Education, 2018). It is an act of teaching and a process of education using a variety of modern digital technologies (Haowen et al., 2021). According to the World Health Organization, digital education can be divided into the possibility of education according to goals and modalities (includes mobile phones, online digital education, virtual reality, gaming and gamification), further divided according to the method of realisation (fully digital and mixed), according to the methods of teaching (direct teaching and simulation), according to the pedagogy of teaching (problem-based digital learning or digital team learning). It can also be divided according to the study population (focus on general nurses, doctors, other health professionals) and according to the subject or discipline or health status of the focus of teaching (antibiotic therapy, domestic violence, care of the elderly, etc.). The World Health Organization also states that digital education is important also in view of the possible existence of limitations on equal access to digital education (WHO, 2020). Digital technologies implemented in education require new pedagogical skills, with some studies mentioning that digital competencies of teachers are at a basic to intermediate level. Digital education represents a wide range of individual didactic interventions. They include technological content, goals, learning outcomes, measurement tools, approaches to learning and setting the effectiveness of digital education (Cabero-Almenara et al., 2021).

Digital education includes online digital education, offline digital education, online courses, online modules, teaching management systems, mobile digital education (mobile learning or m-learning), serious games and gamification, video feedback, etc. (Posadzki et al., 2019). E-learning (Haowen et al., 2021) is also an option for digital education. Another option is virtual reality, which is included in the field of simulation teaching methods. The essence of virtual reality is software that creates an immersive simulated environment (Pottle, 2019). It is therefore a technology that allows the user to explore and manipulate a computer-generated or artificially created three-dimensional (3D) multimedia sensory environment in real time (Haowen et al., 2021).

There is currently a growth in digital technologies, which have a societal impact and provide new opportunities to meet individual needs and challenges. Digital technologies and their development are part of the strategic needs of higher education. An important area is also the aspect of the use of digital education in lifelong learning. The issue of digital education is also increasingly used in the education of nurses and other health professionals (Meum et al., 2021). Based on some research, it has been shown that the use of digital technologies knowledge, skills, and competences of nursing students. However, an important part is also the role of the teacher in pedagogical strategies and the use of appropriate tools (Männistö et al., 2019; Meum et al., 2021). Digital education technology platforms also have a significant impact for full-time or combined learning. The recent pandemic has highlighted the need for the use of digital technologies, which also provide added value for interactivity and enhancing knowledge enhancement (Loureiro, et al., 2021).

In the Czech Republic, the implementation of digital education is increasingly being implemented in mainstream education. According to an OECD report, approximately 62% of the population had at least basic digital skills in 2019. Compared to the EU average, 58% had basic digital skills. However, only 26% of people had above-basic digital skills, with the EU average being 33%. In 2020, the Council of the European Union proposed various country-specific recommendations. An example is that digital skills as well as access to digital learning should be promoted in the Czech Republic. This is a very important aspect for making the

implementation of digital education more effective. Based on previous strategies, three key objectives were set, namely the introduction of new approaches to education using digital technologies. Further, it was about improving students' digital competences as well as developing students' knowledge in information technology. Ensuring equal access to digital infrastructure is also an essential part of this, including promoting innovation in education (OECD, 2020).

Digital literacy skills can be taught through a range of methods, including didactic, experience and peer-learning approaches (Posadzki et al., 2019). Virtual reality, virtual patients and M-learning, serious games, etc. are effective, compared to other digital ways of teaching. They improve the focus on improving and deepening professional skills in the clinical aspects of healthcare provision. They are also an option for improving and deepening professional skills in individual health professions. Based on relevant sources, including the World Health Organization, further research, optimal evaluation, investments, and mutual cooperation are needed in this area (WHO, 2020).

METHODOLOGY

The article tries to answer the research question: What kind of support students need during the (emergency) online education? The answer is based on the qualitative analysis of open questions from a quantitative survey and a focus group discussion.

The quantitative survey was conducted at the turn of 2020/21. The questionnaires contained a mix of open and closed questions, and it was filled by 294 bachelor nurse and paramedic students from the Czech Republic. Forms was used to collect data and was distributed to all nurse and paramedic students online. Our research focuses solely on open-ended responses, but their interpretation is made in light of the previous analysis of the quantitative approach (Beseda et al., 2021).

The authors used analysis, selective and theoretical coding. (Holton, 2010). The Taguette tool was used for coding, into which the students' open-ended responses were imported. Responses were then read repeatedly, and codes were generated and merged into higher categories. Five of these are presented in the structure of the results and discussion: lack of information, communication issues, a social dimension and psychological and psychological support, the psychological and temporal aspects, and learning materials. The choice of codes was driven by the research question while relying on the theoretical background.

A limitation of the research is a specific selectivity of the answers, which may not be fully representative and cover all the interests and needs of the students of the mentioned disciplines. The research also does not allow for generalisations as individual responses are firmly embedded in the local conditions of individual courses, teachers and institutions. Nevertheless, by working with all Czech schools, the research gives significant insight into the sentiment that students experience in online learning.

RESULTS

We analysed the question "What kind of support do you most need from your teacher when you are distance learning?" and how students answer it. Their answers can be divided into five groups, where it is remarkable that they hardly reflect the quality of teaching itself but its broader aspects. Students in online teaching lack information. Information creates a particular fixed structure, a certainty that students can count on. If it is absent or poorly available (which

is closely related to problematic communication), this adversely affects the perceived quality of teaching.

Students staid:

'*Clearly specified topics needed for credit/exam and the required requirements, correctly filled out the syllabus, lecture presentations, exam and credit dates announced on time',*

'Announce as soon as possible how the course will be completed at this time and do not change it anymore and announce exam dates as soon as possible"

'I do not like the passive attitude when they send us an e-mail with recommended literature, and then an exam date announced not far enough in advance. Also, it's hard to keep adapting and keeping track of sudden changes."

"*Clear and precise enough information regarding what they want from me.*"

It is clear from the statements that relevant information is a prerequisite for meaningful learning. If students are to be educated independently, they need to know what areas and by what date. Ensuring a good information service is thus the primary task of each teacher. At the same time, this is an area that can also be monitored by university management. From the students' statements, this is one of the parameters that can significantly affect the quality of teaching and is not difficult to manage.

The second area that is closely related to awareness is the **issue of communication**. Students understand it in three dimensions: a question of feedback, answering e-mails and consultation. These three communication pillars are fundamental to their perception of the communication scheme. The data shows that this is a phenomenon that some teachers manage well, but many teachers have significant problems. In contrast to simple awareness, the possible intervention of faculty management here is much more complex and complicated.

Students comment on this: 'the possibility of consultation, lecturing on given topics by the teacher, individual approach assignments, tests, interesting things... feedback", "sufficient information and communication - at least via e-mail. Answers.", "to be in regular contact (preferably the video above conferences). Opportunity for consultation.", "More effort to communicate and spend more time online learning regular video conferencing and active help with any questions" and "Answer questions asked".

It is clear from these responses that just as information is a kind of building block associated with certainty, communication allows for refining of that information and points to the social nature of education. Learning can be a matter of self-study, but at the same time, it always has a **social dimension.** Students want to learn by getting feedback and by being able to ask teachers questions. This position points to the first reason why students study at university and not just MOOC courses. The second is the **issue of the psychological and psychological support** they expect from their teachers. Even though teachers have communication and information problems, they do not lose relevance in providing psychological support, a part of the teaching profession that is very personal to the point of intimacy.

Students mention this dimension, for example, with the statements "I expect Understanding and patience", "Forbearance", "Moral support", and "Thoughtfulness in exams." Thus, there are pretty high personality demands on the personality of the teacher, which can then be manifested in specific dimensions: "showing interest in the student", "I expect psychological help", "I expect to know that we are not alone", "encouragement to activity", "Understanding".

The fourth area is **the psychological and temporal aspects** related to the students. The students perceive online learning as challenging and would like to see this challenge reflected somehow. Students comment on this by saying, "I support the fact that when we are on call in hospitals, we do twelve-hour shifts because we have complied with the wards, so we don't have much time for self-study. It's hard in the hospital.", "Emphasize the most important topics for self-study (a lot of us are busy and can't manage to learn such a quantum of the material discussed) materials", or "Use the lecturers' discretion and judgment as to whether their courses are relevant to the job I'm preparing for and adjust the difficulty of taking them accordingly."

The aim should not necessarily be to reduce the complexity, but it is clear from the responses that good communication, good information and psychological support would provide a good service. To these should be added the last area that students talked about, namely study materials. Some students perceive their online studies as challenging, undifferentiated and with little support. Some of the problems are related to the study itself, but at the same time, the online nature of learning cannot be neglected. As one student says, "it supports me when the teacher has at least a camera on because I can focus better, and it's not like an audiobook." It is necessary to perceive the psychological and technological difficulties of new forms of education and to look for ways (at the level of individual teachers, but again also of whole faculties) to make learning bearable for students.

The last, already mentioned area is **learning materials**, which represent the fundamental prerequisite for self-study, on which online learning, as conceived by the departments involved in our research, is based. Students are more likely to emphasize their need for study materials than to comment on their forms. Neither the preferred form of distribution of materials nor their quality or form can be estimated from the statements. Students said:

"I want him to send us the promised materials", "I expect Sharing of study materials", "[Teacher] will send us his materials of the given curriculum.", "Textbooks!!! These are not kept in our course, and I don't understand why. It is quite common to look up information on medical school websites, but one does not know what to learn from it." In terms of form or quality, we find, for example, the following mentions: "materials that are good to learn from", "teaching materials stored, e.g. e-learning", and "Well-constructed teaching on a level - nicely prepared (clear) presentations and materials in files".

RESULTS

Mokmin et al. (2021) argue that the absence of the presence of communication is a serious educational barrier and leads to dropout. Berger et al. (2019) even suggest creating stand-alone learning objects (chatbots) that would provide a purely information-based learning experience to reduce uncertainty, stress and academic failure. Lim et al. (2007) offer a management perspective that argues that better communication interaction from managers leads to higher work efficiency and reduces employee uncertainty and ill-feeling. These aspects can also be seen in the case of education. This fact is also perceived as crucial by Lowman et al. (2020), who points out that the availability of information is a crucial factor in learning. Students in higher years could cope better with online learning as they had their own information channels and were not limited to those provided by specific institutions. Poor communication was also perceived as a significant problem in our research - students strive for high-quality information more than high quality. Park et al. (2022) mentions the issue of the quality of teacher communication even within the video recordings of lectures and states that reading the slides of the presentation without further explanation and the interaction of teachers with students reduces the concentration and motivation of students. The relevance of this need is also quite

evident in similar literature (Lowman et al., 2020; Lim et al., 2007) and is consistent with the more general notion of information available as supporting any human activity (Horgan et al., 2010; Magnusson et al., 2004). Therefore, the availability and quality of information used to regulate learning plays a crucial role and needs to be addressed at all levels of the educational process.

Lowman et al. (2020) state, "Nearly 35% reported they were not able to communicate effectively to advise students, 22% reported that students were not adequately available or responsive remotely, and 43% believed students were struggling with learning remotely." Their research focused on American colleges during the lockdown shows similar problems identified by our students. Poor communication or barriers make it impossible to understand education as a social process and lead to negative impacts on learning. According to Kunaviktikul et al. (2022), the quality of communication and education itself is greatly influenced by technical problems during online teaching, which affect the course of teaching and reduce the motivation of students to engage in education. The use of the appropriate digital technology, knowledge of working with the technology and the positive attitude of teachers to the use of these technologies are thus proving to be one of the fundamental factors of quality teaching. According to Park et al. (2022), students are also faced with inadequate digital communication technologies, equipment, and devices for virtual learning during online teaching. The result is then a higher number of assigned homework by teachers, as an alternative to the course of teaching and thus again a reduction in the quality of interactive communication and education itself. According to Aguilera-Hermida (2020), students prefer face-to-face interaction with professors (concerning communicative acts). Some of our respondents also identify with this statement. Chakraborty et al. (2020) emphasise that communication is a psycho-social process that cannot be fully realised online. Even improved digital competencies do not compensate for the health and psychological problems that students must face. Bojović et al. (2020) argue that many teachers lack confidence in online assessment techniques. It seems that learning is a highly complex problem that is not easy to manage administratively so that there are no communication problems. Nevertheless, it can be said that the commitment of institutions and individuals to good communication is a prerequisite for quality online education. According to Kunaviktikul et al. (2022), motivation and concentration decreases during online learning and students feel lonely and socially isolated during distance learning. Students state that school is also important for them in terms of socialisation. Lack of two-way interaction, feedback and communication only further reduces motivation to actively engage students in education (Kunaviktikul et al., 2022). Not only for these reasons, high-quality online communication of teachers with students proves to be an important factor for high-quality education.

Studying online during COVID-19 is challenging for students in terms of psychological determinants is well known (Dhar et al., 2021; Usher et al., 2021; Alomyan et al., 2021). Online learning is challenging and exhausting for students. Meanwhile, these negative factors depend on many determinants (Rodriguez-Besteiro et al., 2021). The students in our research felt the psychological burden and perceived the teacher as a kind of support, which is especially typical for lower levels of education (Zhou, 2020; Ye et al., 2022). It can be said that the psychological aspects of online learning are quite crucial (Hasan et al., 2020; Zhou, 2020). Students in our research strongly emphasize the psychological hardship and the positive influence of their teachers. They play the role of authentic representatives of helping professions working in the online environment in our research (Rockinson-Szapkiw et al., 2010; Walters et al., 2018). Even according to Park et al. (2022), motivation to learn, the quality of teaching itself and especially professional support from teachers are crucial factors for effective education of students in the framework of online teaching.

There have been many studies on study materials and their structure, particularly concerning teaching in the COVID-19 era (El-Ariss et al., 2021; Kumar et al., 2021; Mitra et al., 2021), and some authors have considered the pandemic a significant motivating factor (Soni, 2020; Amarneh et al., 2021). In order to provide effective online teaching by teachers, it is essential to provide appropriate support to students in the form of study materials (Park et al., 2022). However, digital learning also brings with it the need to digitise study materials and work in an e-learning environment. However, the preparation and digitisation of study materials, as well as the adoption to online learning, can become a very problematic area in a very short time (Alkhowailed et al., 2020). Our students show a strong emphasis on the very existence of study materials. They do not perceive any specific structuring or emphasize unique methods of promoting learning autonomy but emphasize their simple presence. The latter is, to some extent, linked to the need for information discussed above. Through materials, ideally coherent and cover the requirements of the learning outcomes, learners gain some sense of direction and certainty. It seems that it is not the design of the environment or its quality that is crucial, but it is simple existence.

CONCLUSIONS

Two important conclusions emerge from these statements. Firstly, learning materials are not always available, and students have a lot to learn from. This is again a topic closely linked to the issue of information. Secondly, students want materials that they will be comfortable learning from. That "good to learn" is the crucial parameter that students work with. They do not need a challenging solution but something that will prepare them well to pass the exams even in light of the previous statements. Students do not view quality as an abstract value but as a means to an end, passing the exam.

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PERCEPTION OF E-LEARNING BY STUDENTS OF PRACTICAL TRAINING AND VOCATIONAL SUBJECTS DURING THE COVID-19 PANDEMIC

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Abstract

The text addresses the issue of e-learning in the study of university students during the COVID-19 pandemic. The specific goal of the authors is to capture, describe and interpret how and to what extent students perceive the course of teaching mediated by e-learning. Specifically, the authors present in the study the results of their research focused on issues related to student activities during e-learning or evaluation of the positives and negatives of e-learning in comparison to "traditional" teaching. They also addressed student satisfaction with various tools for e-learning, such as MS Teams or LMS Moodle etc. The research survey is based on a quantitative approach. The authors used a self-designed questionnaire as a data collection tool. The questionnaire survey was carried out electronically in the period from November 2020 to March 2021. The respondents were students of all years of full-time and part-time bachelor study programmes Teaching of Vocational Subjects and Practical Training and Vocational Subjects Teaching provided by the Institute of Lifelong Learning of Mendel University, Brno. In total, the authors analyzed data from 302 questionnaires received. After evaluating the primary descriptive results based on absolute and relative frequencies or measures of the central tendency, the statistical significance of the relationships between the selected variables was determined, using adequate parametric and non-parametric tests. In general, the results show that the transition from "traditional" teaching to e-learning was a completely new experience for most students, which included both a positive perception of, for example, the availability of study materials, as well as several difficulties. In this regard, the difficulties included both those of a technical nature and those related to the actual implementation of teaching using e-learning.

Keywords

E-learning. Students. Perception. Vocational education. Questionnaire. COVID-19.

INTRODUCTION

The global COVID-19 pandemic is undoubtedly a principal public health challenge today. However, the measures taken by the governments of the individual countries to prevent the spread of this disease have significantly affected many other areas of society. The field of education is no exception in this regard. Closing schools at all levels, which in many countries lasted for several months, introduced entirely new requirements for the implementation of classes and on teachers, pupils, students, their parents, etc. At the same time, however, it showed certain unpreparedness of schools and their staff for the whole situation (see, e.g., Pokhrel and Chhetri, 2021).

From another point of view, the described situation can be understood as an opportunity for change. It is the opportunity to fulfil the ideas of implementing digital technologies in education that have been emerging since the middle of the last century. At first, mainly as a minor topic in the professional journals of several "enthusiasts", later as a relevant topic with

overlaps in the political agendas of many states (see, e.g., Conlon, 2000; Cuban, 1986; Watson and Tinsley, 1995; Watson, 2001; Williams et al., 2000 etc.). As an important milestone, in this regard, we can understand mainly the turn of the 20th and 21st centuries. On the one hand, several publications that have popularized the digital technology implementation issue have been published and literally become bestsellers overnight (e.g. Prensky, 2001; Makimoto and Manners, 1997; Tapscott, 1999), on the other hand, this issue is becoming an important political topic. Evidence can be found, for example, in the European Union (EU), of which the Czech Republic has been a member since 2004.

In the mid-1990s, the EU adopted the first of the fundamental strategic documents focused on that issue called Learning in the Information Society. This document sets out for the first time the main lines of implementation of digital technologies in the field of public education (in the EU countries). Almost 30 years ago, some of the main issues included equipping schools with the necessary hardware and software, providing training for teachers, as well as connecting regional and national school networks, setting up training centres and funding and networking individual EU schools (EU Commission, 1996). The points set, gradually implemented through the so-called action plans and other strategic documents in the individual EU countries[1], are, to varying degrees, basically fulfilled to this day. That is due to the development of digital technologies. Therefore, schools must constantly change, "update", e.g., used hardware and software and at the same time further train their teachers for their use, etc.

In this context, the unexpected arrival of the COVID-19 pandemic has become a catalyst for this implementation development. We can say that it has significantly accelerated this implementation, regardless of existing plans and strategies, both at the national and the European (world) level. That, of course, brought along several problems that had to be solved in a limited time. The "old" topics related to the implementation of education via digital technologies or e-learning became topical again, such as equipping teachers, pupils and students with the necessary technology for online teaching, the abilities of teachers, and pupils and students they teach, to master these technologies, adaptation of the curriculum and evaluation to new conditions, etc. (see, e.g., Williamson, Eynon, and Potter, 2020).

One of the principal issues that individual school directors had to solve was the decision which software for providing education in the form of e-learning choose that would facilitate the education, communication in general between teachers and their pupils, students, or parents of students. At the same time, it would have to eliminate as much as possible several negative consequences of the transition from full-time to distance education via e-learning. In this light, the selection of suitable software for the successful implementation of e-learning classes, moreover, in a situation where a decision had to be made in a very brief time, proves to be very critical given the unexpected consequences and impacts in many areas of education. It is, therefore, rather interesting to look at some of the consequences related to this choice and implementation of education in the form of e-learning.

In our study, we focused on the university level. Specifically, our goal was to find out and interpret the way and level of perception of the process of teaching mediated by e-learning amongst selected university students. Therefore, the main research question for us was how and to what extent university students perceived the teaching process mediated by e-learning. We focused on issues related to student activities during e-learning or evaluation of the

[1] In this regard, it is, for example, a series of documents called eEurope, but also, for example, i2010. In the Czech environment, for example, in addition to the strategic plans of eEurope, also eČesko, respectively the action plan School for the 21st Century – School[21] from 2009 (Hausner et al., 2009), or the Strategy of Digital Education until 2020 from 2014 (MEYS, 2014).

positives and negatives of e-learning compared to "traditional" teaching. Also, for example, we explored student satisfaction with the use of various e-learning tools for teaching such as MS Teams or LMS Moodle etc.

The results of our research not only partially describe the situation of the researched issue prevailing in the Czech university environment, but they can also contribute to a professional discussion on this or a similar topic. There exist already several other quantitatively oriented studies in this area. One of them is, for example, a study by Polish authors Bączek et al. (2021), who deal with the same issue, but with a focus on medical students. There is also research by Gillis and Krull (2020), which mapped students' attitudes to remote learning during the first wave of COVID-19 (Spring 2020) in the USA. A similar topic is also addressed, for example, in the text of Pal and Vanijja (2020), who conducted their research in India and by many others.

METHODS

The research was based on a quantitative approach. We chose a self-designed questionnaire as a data collection tool. The questionnaire contained items focused on several areas of perception of the teaching process by university students via e-learning. In this study, and due to its scope, we present only selected results of our survey, namely the results focused on the issues described above.

The questionnaire survey was carried out electronically in the period from November 2020 to March 2021. It was the time when all universities in the Czech Republic were closed due to the COVID-19 pandemic, and the classes had to shift to e-learning.

We conducted the research among students of all years of full-time and combined forms of bachelor study programmes of Teaching of Vocational Subjects and Practical Training[2] and Vocational Subjects Teaching[3], provided by the Institute of Lifelong Learning at Mendel University in Brno (ILL) in the Czech Republic. During the lockdown, students of these study programmes mainly used Microsoft Teams (MS Teams) and the learning management system Moodle (LMS Moodle)[4], which complemented teaching via MS Teams by providing electronic structured study support with basic and extended study materials, interactive links, videos or spoken word and feedback in the form of questions and tests (see Figure 1).[5]

[2] Graduates of this study programme can work as teachers of practical training and vocational training at secondary technical schools (ISCED 353 and 354).

[3] Graduates of this study programme can work as teachers of specialized subjects at secondary technical schools (ISCED 353 and 354).

[4] MS Teams is centrally supported at Mendel University in Brno. It was, therefore, one of the main tools used by the vast majority of academics and university students during the period under review as the primary tool for the realization of education. At ILL, where the research was carried out, however, teachers and students, in addition to MS Teams, also used LMS Moodle, which is not supported by the university. It is used on ILL only due to the initiative of ILL management.

[5] For more details on the issue of LMS Moodle and its use in education, see, e.g., Beatty and Ulasewicz (2006).

Figure 1: Example of the structure of study support in LMS Moodle of ILL.

(Source: Own)

In total, we analyzed data from 302 received questionnaires. After evaluating the basic descriptive results based on absolute and relative frequencies or measures of the central tendency, the statistical significance of the relationships between the selected variables was determined using adequate parametric and non-parametric tests. The primary statistical features used for measuring the results for individual questions included gender, age, form of study, year of study and field of study. However, no statistically significant relationship between the variables was identified.

RESULTS

The detailed structure of the respondents is provided in the table below. The average age of the respondent was 28.5 years of age; the median was 25, and the modus 23. Among the respondents, women and, at the same time, students of the combined form of study predominated.

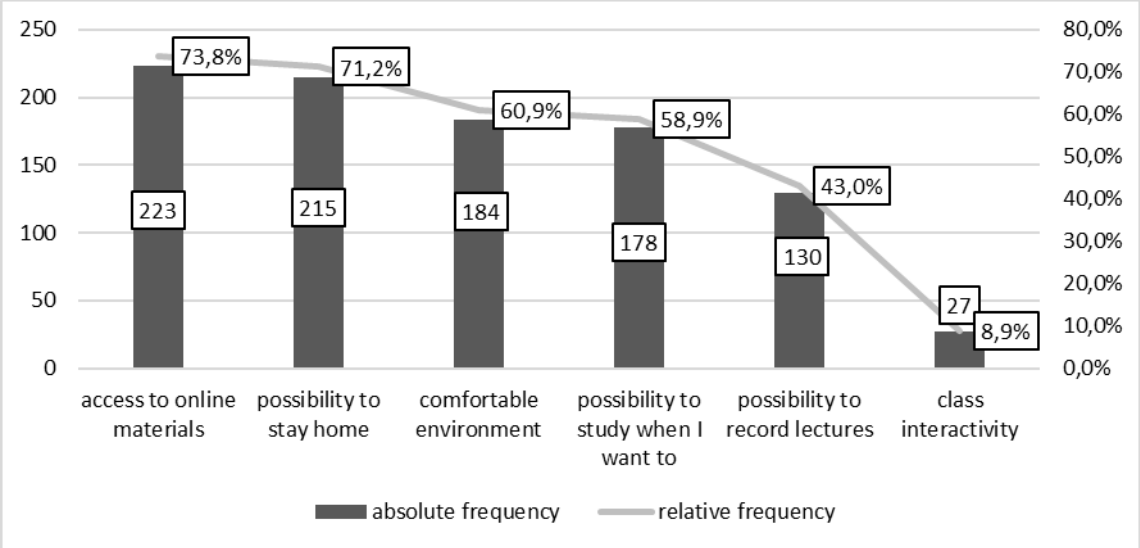
Table 1: The structure of respondents.

The structure of respondents		N	%
Form of study	full-time	100	33,1
	combined	202	66,9
Gender	male	67	22,2
	female	235	77,8
Age	up to 25	160	53,0
	26-35	76	25,2
	36-45	50	16,6
	46 and more	16	5,3
Field of study	TVSPT	174	57,6
	VST	128	42,4
Total		302	100

(Source: Own)

As part of the question focused on the most significant benefits of e-learning in the pandemic period, almost ¾ respondents (73.8%) expressed the opinion that the greatest advantage was access to online materials or the possibility to stay at home during the classes (71.2%). Respondents could choose more than one option; therefore, the sum of individual relative frequencies is higher than 100%.

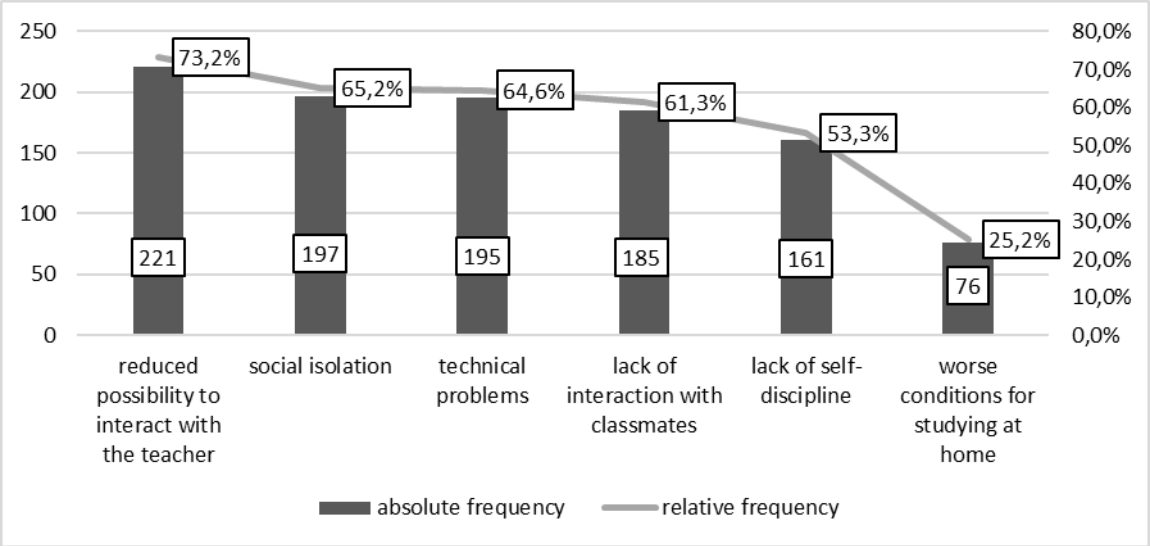
Figure 2: What do you think are the most significant benefits of e-learning?



(Source: Own)

At the same time, respondents in the survey were asked about the disadvantages of e-learning. The most significant disadvantage in this regard was the reduced possibility of interaction with teachers, mentioned by almost three-quarters of respondents (73.2%); then about two thirds (65.2%) felt socially isolated, or e-learning caused them technical problems. An interesting finding was that the respondents, as in the previous question, de facto acknowledged the opportunity to learn from home with gratitude.

Figure 3: What do you think are the most significant disadvantages of e-learning?



(Source: Own)

Among other things, the subject of our survey was a comparison of satisfaction with the use of MS Teams and LMS Moodle. Satisfaction was measured on a scale from 1 - dissatisfied to 5 - satisfied. For interpretation purposes, responses 1 and 2 have been merged into the category "dissatisfied", response 3 indicates "neither satisfied nor dissatisfied", and answers 4 and 5 have been merged into the category "satisfied". The results are provided in Table 2 below, and it is clear from them that MS Teams was much more popular among the respondents at the time of the pandemic.

Table 2: Satisfaction with MS Teams and LMS Moodle

Level of satisfaction with MS Teams and LMS Moodle	Dissatisfied		Neither satisfied nor dissatisfied		Satisfied		Average
	N	%	N	%	N	%	
Level of satisfaction with MS Teams	19	6,3	42	13,9	241	79,8	4,01
Level of satisfaction with LMS Moodle	45	14,9	108	35,8	149	49,3	3,42

(Source: Own)

Respondents also could express their satisfaction or dissatisfaction with the study aids provided for them in LMS Moodle. It is gratifying that more than 2/5 of the respondents considered them very useful, and a half (50.7%) considered them useful. Only 8.3% described them as "completely unnecessary".

In the survey, we also found out to what extent the respondents were active during the pandemic during the classes, which took place via e-learning. At the same time, we were interested in comparing the degree of similar activity in classes, which take place in the traditional way. Both were again measured on a scale from 1 to 5, where 1 means "inactive" and 5 "active". The results, which were interpreted and categorized by analogy for interpretative reasons (see above), are presented below in Table 3. From the results, it is clear that the respondents admit a greater degree of activity in classes, which take place in the traditional way, not online.

Table 3: Activity in e-learning classes.

Level of activity in classes	Inactive		Neither active nor inactive		Active		Average
	N	%	N	%	N	%	
Level of activity in e-learning classes	98	32,5	140	46,4	64	21,2	2,86
Level of activity in traditional classes	33	10,9	121	40,1	148	49,0	3,40

(Source: Own)

DISCUSSION AND CONCLUSION

The results of our survey show relatively interesting, but to some extent not so surprising, findings. For example, it is not very unexpected that the main benefit that students in the study programmes Teaching of Vocational Subjects and Practical Training and Vocational Subjects Teaching at ILL perceived during the period of teaching via e-learning is access to online materials. Naturally, similar conclusions can be found in the studies of Bączek et al. (2021), Gillis and Krull (2020) or Pal and Vanijja (2020). In this respect, there is also a view of students' satisfaction with LMS Moodle or the study aids provided in this environment, which students can use at ILL. In both cases, a positive assessment prevails. That corresponds, for example, with the findings of Martín-Blas and Serrano-Fernández (2009, p. 43), who came to the same conclusion as a part of their research among Physics students. According to them, students simply welcome the opportunity to use LMS Moodle also because this environment is generally convenient for them and through it, in a relatively simple form, they can obtain a large number of resources, which usually teachers, due to lack of time, cannot show them during classes. It is necessary to mention here that it is a question of how the investigation in this issue would turn out if we carried it out in a group of students who do not have access to LMS Moodle and whose classes took place only through MS Teams, and vice versa. Each software offers slightly different options. The combination of both seems to be efficient concerning this issue based on our findings.

However, concerning other issues, the situation no longer looks so peaceful. In our research sample, an absence of classroom interaction proved to be a relatively fundamental problem in e-learning classes. Not only between students and teachers but also among students themselves. Another problem was a lack of self-discipline. Even these findings seem to copy the results of other pieces of research. In general, it is typical for all of them, as it is in our case, that in e-learning students very negatively perceive especially poor interaction with teachers and classmates, lack of personal contacts (face-to-face), but also, for example, the longer time it takes to get answers to questions sent to teachers, poorer communication in general, lack of motivation leading to procrastination, etc. (see Bączek et al., 2021; Erichsen et al., 2014; Pal and Vanijja, 2020, etc.). The question in this regard is to what extent the responses to these questions were affected by the fact that during the COVID-19 pandemic, the students could not meet with each other or in private due to the measures taken. In other words, whether the results would not be different if the classes took place only in the form of e-learning, but students would be free to meet both with each other and with teachers. The results of items focused on the "possibility to stay at home" or "the opportunity to learn when I want", which are perceived by students as one of the main advantages of e-learning, can be a certain guide in this context. There are some ideas in this regard from Prensky (2001), Tapscott (1999), or Makimato and Manners (1997), who, twenty years ago, described the

arrival of a new generation for whom digital technologies will be a completely natural part of their daily lives, not excluding education. The idea of online studying "when I want" and "where I want" is, in this context, in principle, a certain example of the digital nomad in the field of education.

The COVID-19 pandemic has generally become a major challenge for education. The implementation of digital technologies based on long-term strategies and action plans has been significantly disrupted by this global event. The goal was no longer to meet the economic goals of society, as has been the case since the 1990s when technology (including education) was to contribute to significant economic growth (in the case of the EU, cf. Rodrigues, 2003), but a simple effort to solve the unexpected crisis. It is a question of how much experience will be reflected in future development, but in any case, the successful introduction of e-learning in the curriculum of study programmes will always require a well-thought-out strategy and active approach both by teachers and other participants.

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REFLECTION OF DISTANCE EDUCATION FROM THE PERSPECTIVE OF TEACHERS AND STUDENTS OF PRIVATE HIGHER EDUCATION INSTITUTION

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Abstract

Until recently, the Czech higher education environment was relatively resistant to online education and was developing slowly. With the advent of the pandemic crisis, the education system was disrupted, and the importance of online education increased rapidly. It can be assumed that even in the so-called "new normal", online space will remain an essential part of formal education. This is also related to the fact that Generation Z, currently studying full-time, is accustomed to instant communication through online tools and collaboration, which should also be reflected in collaborative learning. In universities, students' expectations of this study, its forms and methods, the competencies of teachers and graduates, etc., are changing. At some higher education institutions in the Czech Republic, the reflection of these changes is still gradual. For example, outdated digital content to support study or weaker digital competencies of educators may be a threat in the future. The paper aims at analysing the experiences, problems and challenges that teachers and students of private higher education institutions faced within the annual duration of distance learning due to the COVID-19 pandemic. The research was carried out through a questionnaire survey of teachers and students and a focus group with students of a particular private university. It is obvious that the current knowledge about the use of new technologies in higher education requires further and new deepening, verification and refinement. Thus, knowledge concerning changes in students' expectations from this study, its form and method, and the competence of teachers needs to be constantly expanded and updated. The case study also brings recommendations for improvement of current state of art.

Keywords

Covid-19 pandemic. Distance learning. Online education. Emergency Remote Teaching.

INTRODUCTION

The paper focuses on the perception of Covid-19 Distance Education at the private University of Jan Amos Komensky from the perspective of higher education teachers and students. University of Jan Amos Komensky (UJAK), is one of three Czech private universities. Compared to other Czech higher education institutions, it is a smaller institution with about 1200 enrolled students. On the other hand, in comparison with other Czech private HEIs it belongs to larger institutions. UJAK offers Bachelor and Master's study programs in the field of social sciences and humanities, such are special pedagogy, andragogy, media studies, law, security studies etc. It also provides doctoral studies in andragogy. UJAK has most students in the "combined" study form, which means that students attend the lectures during weekends, and they are older than traditional students. However, the UJAK still needs to develop a Learning Management System, even though in the past some version of Moodle had been installed. However, in the days before the pandemic, this LMS Moodle version was not used anymore.

Until recently, the Czech higher education environment was relatively resistant to online education and was developing slowly. The outbreak of a covid-19 at the beginning of the spring semester of the year 2020 pandemic caught the university unprepared for this situation. However,

it was not an exceptional case. The closure of higher education sector and all institutions and other schools was a shock. A similar situation was at many other Czech HEIs and worldwide. UNESCO (2020) reported that there have been 1, 576, 021, 818 affected learners out of 91.3% of total enrolled learners in 188 countries in all levels of learning. For instance, numerous HEIs, both state and private, in the Philippines, were not prepared to teach online (Toquero, 2020). A similar situation was in Ukraine (Stukalo and Simakhova, 2020). Also, small Romanian universities were unprepared (Edelhauser and Lupu-Dima, 2020).

However, the case of teachers at Princess Nourah Bint Abdulrahman University in Saudi Arabia shows that if teachers had been trained in using online platforms (such as learning management system Blackboard), their preparedness for emergency remote teaching was moderate or high in the most cases. (Alqabbani et al., 2020).

In this article, we would like to investigate how teachers and students of UJAK reflect emergency remote education (ERT). We understand ERT as the digital, fully remote delivery of teaching that would otherwise take place on campus as a response to COVID-19. (Palacios-Hidalgo and Huertas-Abril, 2021).

METHODOLOGY

The key research question was how students and teachers of UJAK reflected the ERT during the pandemic.

The research used mixed methods research (Creswell et al., 2003), i.e. a mix of quantitative and qualitative research. Firstly, the quantitative research was done in April and May 2021, followed by focus groups with students in June. We prepared two questionnaires. The first one was focused on students' reflection of online teaching and learning and the second questionnaire on the teachers' reflections. Students' questionnaire contains 5 demographic questions, 10 questions focused on ERT and 10 questions about traditional teaching and learning. Teacher questionnaires were composed of 4 demographic questions, 12 questions focused on ERT and 10 questions about classic learning. The questionnaires contain a mix of closed, semi-open and open questions. As a questionnaire tool we used Google Forms and distributed the questionnaire over schools' emails to all students (n =1212) and to all teachers. We used one reminder and collected 326 filled questionnaires from students (response rate 26,9 %) and 17 teachers.

We used for the analysis of quantitative results descriptive statistics (Satake, 2015). The answers from focus groups and semi-open and open questions were analysed using selective and theoretical coding (Holton, 2010) in the program Atlas.ti.

RESULTS

Of 324 students' respondents were 87,3% women, which nearly copies real distribution by gender, where women are 80,9% of students (980 students from 1212). The biggest group of students were in the age between 41 to 50 years (29,9%), the second biggest group (26,9%) was in the age between 31 to 40 years, the third biggest group (21,6%) were students between 21 and 25 years, and 11,1% were students from 26 to 30 years. We split these two groups because traditional students in Czechia are younger than 26. Most students were from study programs focused on special pedagogy (55%), and the second biggest groups (34,6%) were students from study programs in andragogy. 44,4% of students were in the second year of their study, 39,5% in the first year and 16% in the third year.

The teacher sample consists of 58,8% men and 41,2% women. The largest groups of respondents (41,2%) were in the age group from 41 to 50 years. 28,6% of respondents were older than 61 years and 23,5% of respondents were in the age between 51-60 years, one respondent was

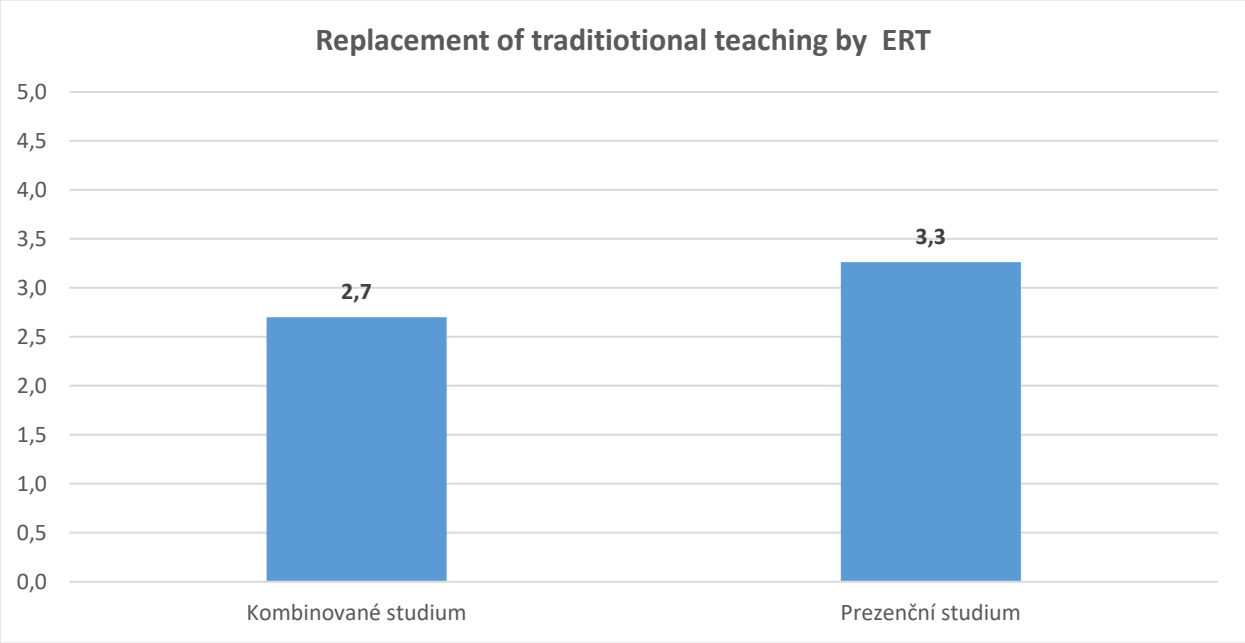
younger than 41 years. More than half of respondents have taught for more than 20 years, and 35,3% between 11 and 20 years. The most of teachers teach at the department of special pedagogy (47,1%). 41,2% teach at the department of andragogy. 17,6% of the respondents teach at the department of economy or international relations and diplomacy. There were also respondents with experience from the department of media studies, law and foreign languages.

STUDENTS

According to students of both forms of study, the quality of online teaching, which replaced full-time teaching in the past semester, is good. Students of the combined form of study evaluate it slightly better than full-time students. A likely explanation could be that the combined students were used to be in less contact with teachers than full-time students (See Figure 1).

From the dates, we can assume that a slight optimism prevails. On the one hand, we can see that 38,6% of students evaluate online teaching as a good substitute for face-to-face teaching, but the opposite opinion is held by 22,6% of respondents. The remaining 39,5% hold a neutral opinion. That are the opposite results of the survey among students of the health care professions in Czechia. In this research, only 21,7% of respondents had a positive opinion about this issue, 27,1% had neutral opinion and 51,1% negative. (Beseda, Černý and Pekara, 2021). An explanation could be that health care students are more practically oriented, and it is harder to replace face-to-face teaching in this area than in humanities and social sciences.

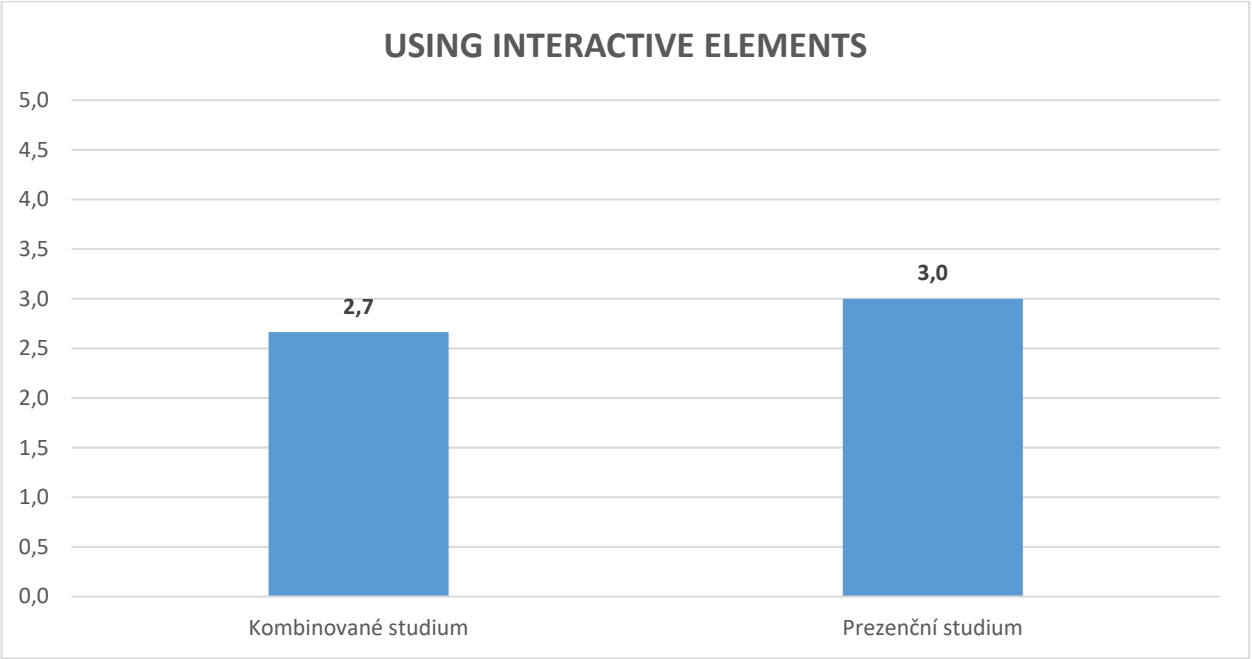
Figure 1. Replacement of traditional teaching by ERT. Question: In your opinion, to what extent did online teaching in the past semester replace traditional teaching with its quality? Average (the best mark is 1)



(Source: Own)

The following questions are focused on the activity of the students during online lessons. Students of both forms of study also evaluate the efforts of teachers to include interactive elements for activating students in synchronous online teaching equally well. Students of the combined form of study evaluate the efforts of teachers a little better than students of full-time study (See Figure 2). 41,7% of students evaluated the effort of teachers positively, 34,3% as neutral and 24% negative. The results are better than those in the survey of students of the health care professions (34% positive, 28,6% neutral, 37,4% negative) (Beseda, Černý and Pekara, 2021).

Figure 2. Using interactive elements during online lessons (Average, the best mark is 1)



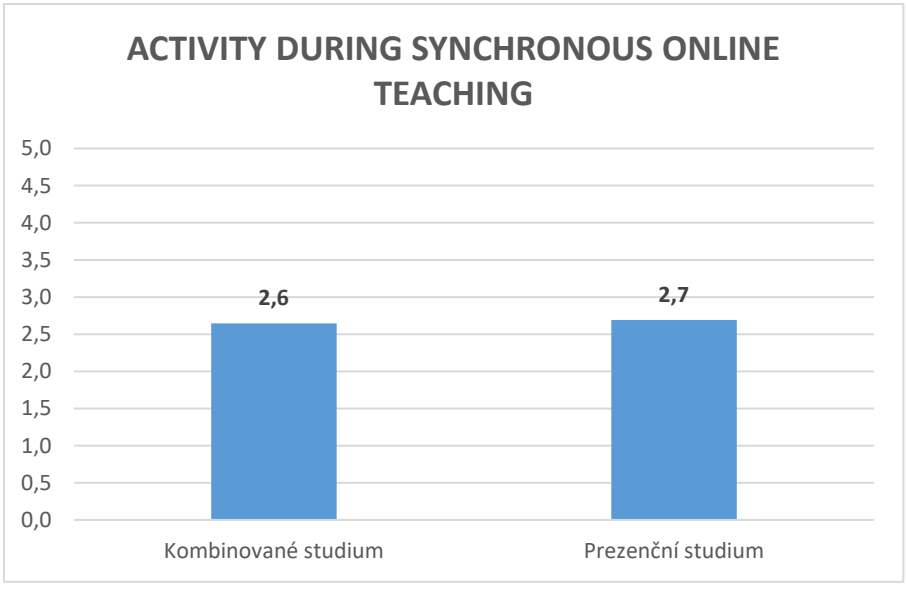
(Source: Own)

We also asked students if they perceived themselves as active during synchronous online lessons. We can observe (compare Figures 2 and 3) that students see themselves as more active than they see the effort of teachers to encourage thei(Source: Own)

r activity. The less-self-critical are full-time students. The difference between perception of their activity and the effort of activation of teachers is 0,3-mark point (3,0 versus 2,7).

If we compare the activity of students during regular teaching and online teaching, we see that students see them more active during regular lessons. The average mark is 2,33 versus 2,65 during emergency remote teaching. The results are opposite to the survey of students of the health care profession, who saw themselves as more active during emergency remote teaching than during regular teaching (Beseda, Černý and Pekara, 2021).

Figure 3. Reflection of students on their activity during online learning (Average, the best mark is 1)



(Source: Own)

Interesting data can be seen in student evaluations of teaching methods. Students evaluated a lecture with the highest score, there were 92,3% positive answers. The second most suitable method was a discussion (83,95%), followed by a tutorial (66,3%), demonstration (57,7%) and self-study (54%). The last scored simulation with only 48,8% positive answers. The results are different compared to answers of the students of health care professions, where the most popular was tutorial (87% of positive answers), followed by simulation (83,3%), demonstration (73,1%), lecture (72,1%) and discussion (67,7%). The least popular was self-study 39,5%. (Beseda, Černý and Pekara, 2021). Even the self-study is not a very popular method, we can see from the Czech graduate survey that this method is evaluated as the most useful for the employment on the job market (Zelenka et al., 2019.)

Based on the analysis of the qualitative answers, we can observe that according to the students, the quality of teaching would be improved mainly by a better organization of teaching, setting rules and better communication between students, teachers, and the faculty. Students also missed the ongoing feedback from teachers. Feedback is not obtained by teachers retrospectively, even though students repeatedly call for it. There were also cases when the teachers were not interactive at all.

TEACHERS

We would like also to mention that results from teachers' questionnaires are limited to a relatively small sample of teachers. However, our research brings some interesting findings. Nearly two thirds of teachers (64.7%) thought that ERT replaced traditional teaching well. Teachers' views are in general more optimistic compared to students (38%).

From the teachers' perspective 53% of them answered that they try to include active elements in their online teaching, only 17.7% of teachers answered negatively. The research of Beseda, Černý and Pekara (2021) shows similar results. However, teachers included fewer active elements during the ERT than in traditional teaching, 70.6% of teachers answered positively. Students are less favourable in the evaluation of their activization during ERT. Only 41.7% answered positively regarding this issue.

53% of teachers positively evaluated the activity of their students during the online lessons, only 17.7% of teachers reacted in a negative way. However, the activity of students during the traditional teaching was rated by the teachers as higher (64.7% answered positively). On the other hand, only 35.55% of students evaluated teachers' activity during the traditional teaching positively. 41.35% of them answered that s/he was active during traditional teaching.

In our case, teachers reflect the activity of students more positively than students, who are more critical of teachers but also of themselves than their teachers.

Teachers believe that their students are most comfortable with tutorials with 82.35% positive answers followed by discussions 76.5% and lectures 70.6%. 47.7% of the teachers considered self-study to be less convenient. The lecture and discussion were also highly positively evaluated by students.

Most teachers used Microsoft Teams for distance teaching, and some of them used Zoom. Some teachers also had certain experience with Moodle. Other tools like Google Classrooms, Google meet, or Kahoot were mentioned a couple of times. However, the level of experience was low.

Based on teachers' open answers, we can say that teachers called for better technical support and better equipment. Also, the better information flow about the organisational issues was mentioned several times. They would also prefer teaching smaller groups.

DISCUSSION AND CONCLUSION

We can say that the study field of the involved students plays an important role. The students of humanities and social sciences evaluated online teaching more positively in comparison with the students of health care specialists (Beseda, Černý and Pekara, 2021). From our results, we can conclude that students and teachers evaluated the online form of teaching relatively positively. Teachers were more optimistic which correlated with results obtained by Beseda, Černý and Pekara (2021).

From the literature (e.g. Anderson, 2003 and Abrami et al., 2011) we know that the activity of students during online teaching is the cornerstone of the quality and satisfaction of students. Moreover, the results reveal that teachers try to add interactive elements to their teaching and students try to be active. Teachers were more optimistic about themselves and about the activity of their students, and students were more critical. However, from the responses, we can see that both students and teachers are more active during traditional teaching and there is a space for improvement.

The forms of teaching are also important topic discussed in the literature (see e.g. Hussain et al., 2011; Mangram at al., 2015). There is also a quest if the lecture is to be considered an old fashioned format or still a functional one (DiPiro, 2009). However, for students, no method of teaching that has been tested in a questionnaire with a clearly negative reception. We can say that students perceive a variety of educational forms as functional, which is an important finding for the future development of education.

The problem was a need for organization of teaching according to students and teachers. Unclear and insufficient communication with the teachers / university and the lack of information about the course of the semester were mentioned many times. Insufficient organisation of teaching during the covid-19 pandemic is also mentioned in literature (e.g. Lin, Qin and Zhu, 2020; Karatas and Tuncer, 2020; Mäkelä et al., 2020). Students wanted better organisation of teaching, transparent communication with the university and teachers and study materials available in an electronic form.The problem was also ongoing feedback, which some teachers do not give to students even though that students repeatedly call for it, which can be also confirmed by Bodzin and Park's (2000) thesis feedback from students and teachers who get derailed in many cases in the online mode. As also Agarwal and Devan (2020) noted that regular feedback was key to student satisfaction and well-being during the lockdown.

Finally, we can say that the biggest problem mentioned by student and teacher perspective was a poor or unstable internet connection. Also, Hasan (2020) writes that it was the most disliked feature of online education mentioned by students. From the students' perspective it was a big problem. Similar issues were faced also by the students at other Czech universities (Vondrák, 2021).

We can recommend other universities to develop online forms for education; these could be included as parts of combined study programs. Universities should also prepare emergency education strategy/plan, develop availability of electronic study materials, and strengthen their support and internet connectivity, accompanied by an update of their IT equipment and development of digital teaching competencies of their teachers.

ACKNOWLEDGEMENT

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IMPLEMENTATION OF DISTANCE LEARNING TECHNOLOGIES IN HIGHER EDUCATION INSTITUTIONS UNDER COVID-19 PANDEMIC (CASE OF UKRAINIAN UNIVERSITIES)

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Abstract

The COVID-19 has affected many people all around the world in different areas, including education sector. Nowadays, one of the main challenges for universities is to shift an education process to the distance learning due to lockdowns and social distancing. The authors used generalized scientific methods for theoretical and empirical research. Therefore, the paper analyses how universities in the world respond to COVID-19 challenges and debates about the advantages and disadvantages of distance learning. This paper employs a theoretical framework which is based on the literature about distance learning and an empirical framework which includes possible responses from universities to modify their learning process with a focus on the Ukrainian example of the Taras Shevchenko National University of Kyiv. The good example of "KNU Online" is proposed as a "best practice" for all Ukrainian universities and abroad.

Keywords

Distance learning. Higher education sector. Digital tools. Universities. COVID-19. LMS

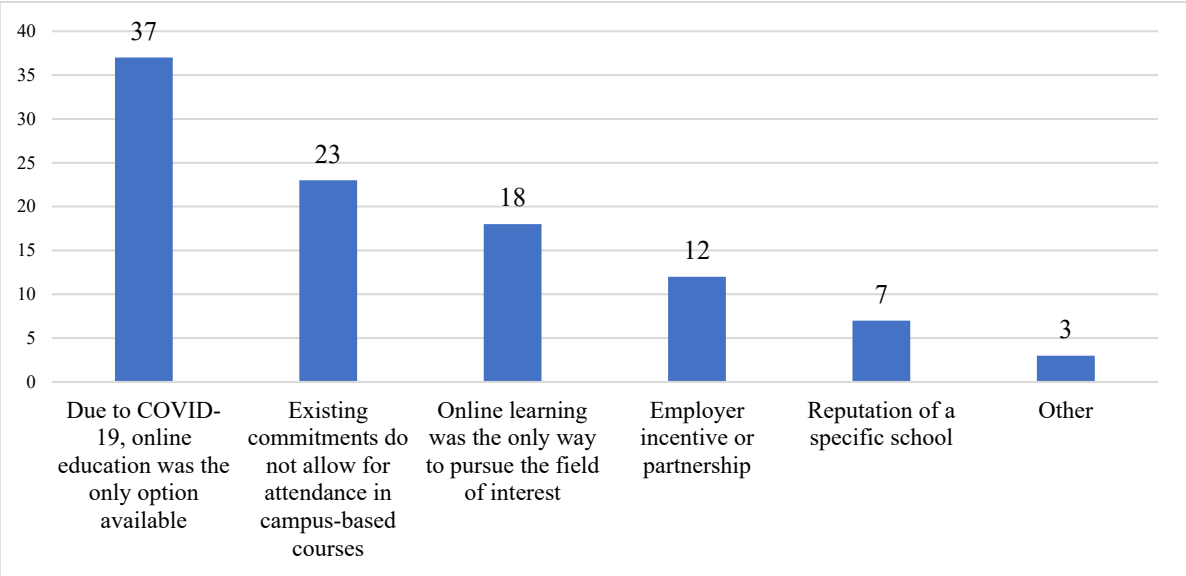
INTRODUCTION

Nowadays, distance learning is at the stage of introduction and implementation in the educational process of higher education institutions (HEIs) in Ukraine. Distance learning systems are unlikely to substitute the conventional higher education systems, but rather to complement them and, at the same time, have a considerable impact on the evolution of education both in Ukraine and globally. Many education strategists describe distance learning as the educational system of the 21st century. Relevance of distance learning lies in the fact that the results of the social process, which were primarily concentrated in the field of technology, are now oriented on the information sphere. Assuming that professional knowledge ages very quickly, it is necessary to constantly improve it.

According to Article 49 "Forms of education in higher education institutions" of the Law of Ukraine "On Higher Education" (2014), the distance form of learning is "an individualized process of learning that occurs mainly through the mediated interaction of remote participants of the educational process in a specialised environment, functioning based on modern psychological and pedagogical, information and communication technologies" (On Higher Education, 2014).

This topic is currently receiving a lot of attention due to the emergence of COVID-19. It is worth noting that the pandemic has had a tremendous impact on the education of students all around the world and has made several adjustments to the learning process. According to UNESCO (Education: from disruption to recovery, 2021), more than 155 million students have been affected by the pandemic, equal to 8.9% of total enrolment. The world has seen more than 19 country-wide closures. A large number of students had to adapt to external factors, namely the pandemic, and choose alternative ways of gaining knowledge. In 2021, about 37% of all students who chose online degree programs in the United States said they did so because COVID-19 made it the only option available to them (Best Colleges, 2021). A further 23 % of students said they chose online degree programs because existing commitments did not allow for in person attendance (Figure 1).

Figure 1. U.S. online learning choice reasons according to students 2021



(Source: Best Colleges, 2021)

METHODS

To achieve the goals set in this paper, general scientific methods were used, namely: scientific abstraction – when clarifying the categorical apparatus and disclosing the essential characteristics of distance learning; historical and logical – for a comprehensive study and identification of patterns in the development of distance learning; logical generalisation – to identify trends in the use of distance learning; comparison – to identify common and distinctive features in platforms that provide an opportunity to introduce and implement distance learning in Ukraine; analysis and synthesis – for the analysis of theoretical and practical knowledge about distance learning.

LITERATURE REVIEW

Recently, a problem of distance learning has received much attention in the scientific literature. Distance learning systems are in the focus of scientific circles, and current trends indicate a further intensification of research in this area. In particular, theoretical and methodological problems of distance learning have been studied by scientists (Johnson, Veletsianos, Seaman, 2020; Majowicz, 2020; Gaebel, Zhang, 2018; Zatonatska, Wołowiec, Anisimova, 2020; Xu, Xu, 2020; Polianovskyi, Zatonatska, Liutyi, 2019; Polianovskyi, Zatonatska, Dluhopolskyi, Liutyi, 2021; Boyko, Turko, Dluhopolskyi, Henceruk, 2021).

The problems of implementing distance learning technologies, developing of online courses using information systems and investigating areas of using of electronic learning environment Moodle in the educational process are covered in the publications of contemporary scholars (Casany, Alier, Galanis, Mayol, Piguillem, 2012; Klapkiv, Dluhopolska, 2020; Stukalo, Dluhopolskyi, 2020; Tryus, Herasymenko, Franchuk, 2012; Kuznyak, 2017).

Several articles (Airinei, Homocianu, 2010; Jaggars, 2014; Bettinger, Fox, Loeb, Taylor, 2017) are devoted to the problem of forming digital competencies of students and teachers in computer science.

RESULTS

Distance learning emerged as a full-fledged concept when education without a physical presence in the classroom became widespread. First and foremost, distance learning has emerged and expanded due to standardised means of communication. For instance, the first shorthand course founded by the English professor Isaac Pittman in the 1840s became famous not only because of the venerable professor's talents, but also because of the only nationwide collection and appearance of postcards which Pittman used to send assignments to students and gave feedback.

Modern distance learning takes advantage of all channels of information transfer, including correspondence learning through ordinary mail, educational TV and radio programmes. However, undoubtedly, the greatest opportunities are offered by the Internet: text files, audio, video, and real-time image creation. Consequently, the first and main principle of distance learning is the availability of information channels and their common standard.

Distance learning was given a new impetus in England during Queen Victoria's reign, when there was a demand for knowledge that was free from religious overtones. Virtually all universities were supported by various churches and there was fierce competition between religions for the congregation, but more and more students simply demanded knowledge. That

is why University of London (formerly University College London and King's College London) was one of the most democratic educational institutions. It was the first that gave everyone who wanted to get higher education regardless of gender, social origin, nationality, religious or political beliefs. In 1858, University of London opened the External Programme of distance learning which was hailed personally by Queen Victoria. The Queen defended the university against attacks from competitors who called it "godless". In the 19th century, the trend began to spread, and the example of the University of London was followed by other universities (Distance learning, 2018).

The second important principle of distance learning is a democracy. Even at the launch of the first distance learning program there was a heated discussion about the recognition of examinations, so it was decided to create independent examination commissions to confirm knowledge and assign grades. The exams required students to be personally present in order to be awarded a bachelor's or master's degree, and it did not matter at which university knowledge was acquired. This tradition is still in place in the UK (Distance learning, 2018). Thus, external independent testing (EIT), introduced in Ukraine relatively recently, dates to the 19th century.

Each successful distance learning course has a transparent and comprehensive system of testing both for self-checking during studies and for the final determination of results. The third crucial element of distance learning is independent testing. No matter how perfect educational materials are (video lectures, comprehensible charts, engaging quizzes), without regular work of students themselves, all this is no more than an information flow. Self-organization, commitment to achieve short-term and long-term goals, curiosity about the topic and searching for additional materials other than those offered by teacher are crucial elements to success in both conventional and distance learning.

The fourth vital pillar of distance learning is that a student works independently with the course materials. With the access to the internet, distance learning allows students to acquire knowledge from the best experts in a specific field, regardless of where you reside. The audience of online education courses is growing daily and soon this trend will be the leading one in the world (Distance learning, 2018). For instance, the global online learning market size is estimated to rise USD 370 billion by 2026, from USD 226 billion in 2020, at a CAGR of 8.56% during 2021-2026 (Best Colleges, 2021).

Distance learning is often interpreted as being synonymous with such concepts as Learning Management System (LMS) – software application for the administration, documentation, tracking, reporting, automation and delivery of educational courses, and E-learning – the use of electronic technologies in organising a learning process (Study management system, 2018).

LMSs have a significant impact on the students' learning processes since they change the pattern of knowledge transfer and teaching methods. Numerous HEIs have been introducing distance learning systems to provide greater access to learning information and to efficiently monitor progress of their students. The application of LMS in the learning process may improve the quality of learning, allow for the creation of new means of influence, more effective interaction between teachers and students, and ensure increased mobility. Hence, the analysis of the results of the use of LMS in distance learning in HEIs allows us to draw certain conclusions and generalizations: distance learning is constantly being improved and directed to support student-centred learning. Optimization of this type of learning promotes student mobility, enhanced student-centricity, increased number of students involved in this type of learning, broader opportunities for interaction between a teacher and a student in a virtual environment, expanded a student autonomy through independent work with a large number of databases that are offered online, personalized learning, widespread access to mobile devices that provide blended learning.

Distance learning is a new, specific form of learning, somewhat different from the traditional forms of full-time or part-time learning. It provides other means, methods, organizational forms of learning, a different form of interaction between teachers and students, and students with each other. However, like any form of education, distance learning has a complex structure, including determined goals set by the social order for all forms of education; content provided by the current programs for a particular type of educational institution; methods, organisational forms, means of education, etc. Distance learning is determined by the specifics of the technological framework (e.g., computer telecommunications only, combined with printed media, CD-ROMs, the so-called case technology, etc.).

Distance and part-time learning should not be equated. Their main difference is that distance learning provides systematic and effective interactivity, while part-time learning does not. Distance learning is considered as a new form of learning and, accordingly, distance education (both as a process and a result) as a new form of education, although it cannot be regarded as a completely autonomous one. Distance learning is built according to the same goals and content as full-time education, but the forms of presentation of material and forms of interaction between the subjects of the learning process differ significantly. Didactic principles of distance learning organization (principles of science, consistency and systematicity, activity, principles of developmental learning, visualization, differentiation and individualization of learning) are similar to full-time education, but their implementation is specific.

A notable feature of modern distance learning in foreign countries is that it significantly influences development and cooperation of universities. An example of this is a joint project of the Massachusetts Institute of Technology and Harvard University, which have created their own distance learning platform and since 2012 began to place distance learning courses on it.

In Ukraine, National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”, Taras Shevchenko National University of Kyiv, National Technical University “Kharkiv Polytechnic Institute”, Sumy State University, Kharkiv National University of Radio Electronics, Khmelnytskyi National University and Kherson State University were the first on the path to distance learning. In 2005, in order to intensify the development of distance learning in Ukraine, this topic was discussed by the Collegium of the Ministry of Education of Ukraine (Bykov, Kukharenko, Bohachkov, 2008).

The development of a distance learning system is a crucial process, as it can significantly expand opportunities and increase the competitiveness of the domestic market for educational services, increase access for various social groups and categories of the population, create prerequisites for accelerating the development of all strategically important areas of sustainable development of society and facilitate Ukraine’s full-scale entry into the world information space, while preserving the quality of human capital (Kuznyak, 2017).

Table 1 lists the actions and time spent by the coordinator before and after the implementation of the appropriate system.

Table 1: Teacher hours before and after implementation of the system.

Actions of the training coordinator	Time before	Time after
Stage 1: Preparatory phase (time required per student)		
Introduction the safety rules for students. Formation of group list / Registration of students on the educational platform	15 min.	5 min.
Stage 2: Updating the background knowledge (time commitment per group)		
Forming test assignments for students (printed/unprinted).	60 min.	30 min.
The initial course check-up in the form of a written assignment/computer-based test	20 min.	30 min.
Stage 3: First session (time commitment per group)		
Conducting a lecture session / Laying out theoretical material using the multimedia resources of the educational platform	120 min.	80 min.
Stage 4: Independent work (cost per trainee)		
Conducting a seminar session / Student processing of educational materials using a web-based learning platform	120 min.	40 min.
Step 5: Generating statistics/information		
Forming printable tests for students / Forming electronic tests in the educational platform	120 min.	60 min.
Checking tests / Automated calculation of test results	120 min.	2 min.
Calculation of the results	20 min.	-
Formation of a statement	10 min.	10 min.

(Source: own)

A comparison of these parameters shows that the teacher's time commitment is almost halved. This has simplified the educational process and reduced the teacher's workload.

When analysing the results of utilising Opigno LMS, it is worth noting that the use of videos for learning purposes is one of the most effective ways of presenting educational information, especially when it comes to learning a particular software product. After all, most students acknowledge the fact that they do not have the habit of taking notes, regardless of the teaching method (Airinei, Homocianu, 2010).

During the period of distance learning implementation, researchers have found a trend of increasing visits to web-based learning systems from mobile devices – smartphones and tablets. While visits from mobile devices were only 3.6% with an average time spent of up to two minutes for the period 2012-2013. Currently these figures have reached 13.9% with an average time spent of up to 20 minutes. The leap in the number of visits from mobile devices is, of course, closely linked to the global mobile penetration of the population, especially students. Accordingly, the researchers attribute the qualitative positive shifts in average student website activity from mobile devices to the emergence of adaptive design technologies for web resources. A simple and at the same time full-featured template, compared to the version for personal computers allowed for a doubling of students' time spent, which is a positive result. It is worth mentioning that the course content did not change when the templates were modified. This was also confirmed by the results obtained in the paper of Spanish scientists "Analyzing Moodle / LMS Logsto Measure Mobile Access" (Casany et al, 2012).

The operating systems from which the learning platform is most frequently accessed have also been analysed. The top three were Microsoft products – Windows 7, 8 and 10, respectively. The next place was taken by Android operating system of different versions, and after its Apple Mac OS. Another research vector showed that more than 80% of students use Google Chrome browser, in fact, according to Stat Counter Global Stats in Ukraine this figure is 58.12% (Stat Counter Global Stats, 2020).

Since one of the strategic directions of reforming the educational system of Ukraine is the active use of information and communication technologies for the development of distance learning it is necessary to focus on the study of distance learning platforms application, without which it is impossible to organize distance learning. The choice of distance learning platforms is a vital step. Therefore, it is crucial to clarify what a distance learning platform is. A distance learning platform is a software to support distance learning, the purpose of which is to create and manage pedagogical content and individualized learning online. It includes the tools necessary for three main users – teachers, students, and administrators.

CMS Drupal 8 was chosen for analysis since it is a platform for building a web-based learning system. Drupal is a popular free and open-source modular Content Management System (CMS) written in PHP programming language and distributed under international license – General Public License (GPL). Drupal is used as a back-end framework for a variety of websites, from personal blogs to corporate and government sites. Drupal is also used as LMS and for business collaboration. The structure and powerful base of Drupal modules allows to create powerful interactive web resources relatively quickly. The basic package system, apart from the modules for creating static pages (pages with a permanent address) and new articles, includes modules for organizing blogs (electronic journals), forums (places for online discussions), "books" (information collections, work on which is carried out jointly), syndication (import news from other sites), module management information blocks on the pages, which facilitate the control of their appearance, and menu management module. Drupal supports a variety of design themes and allows to create unique design themes. Community of Drupal developers created a lot of additional modules, among which are internationalization modules (creating multilingual sites), file management modules, which allow to put on website audio and video files, content categorization modules, modules that organise users into groups, etc. Standard set of modules includes functions such as news feed, blogs, forums, download files, news collector, voting, search, and so on. The design of the website is also changed with the help of specific modules – "design themes" (Drupal, 2018).

CMS Drupal 8 is a suitable platform for higher education websites. It has a great set of features for building an e-learning system. Drupal offers its pre-configured Drupal 8 distribution called Opigno LMS, which is designed specifically to meet the basic needs of universities and colleges.

The main benefits of Drupal for university websites include (Why Drupal, 2018):

1. User roles and access to content. Teachers, students, administrators, regular visitors, and other users need to have different level of access to create and edit content depending on their roles. This can be easily addressed with the help of Drupal. Different access rights can be given to different groups of users rather than specific users.

2. Performance. It is challenging to cope with a web-based learning system with millions of pages and not to decrease its performance. However, CMS Drupal can manage this issue and is powerful enough to cope with data size and website productivity. Built-in caching and scalable databases are just some of its features, responsible for high performance of complex web applications.

3. Expansion and growth are integral characteristics of sufficient learning system, as the amount of learning material is constantly increasing. This is easily achieved through scalability, one of Drupal's most attractive features. There is no need to reconfigure the entire system, and no amount of additional material will be a limitation for Drupal.

4. Simple content management. Uploading to or from the website, creating, updating, editing, and distributing different types of content are daily processes on university websites.

Drupal has a user-friendly interface for this, so teachers, students and administrators do not need to be a programmer to do all these things quickly and successfully.

5. Security. University web resources contain a lot of sensitive, valuable, and confidential information, so the issue of security comes to the fore. Drupal web developers work daily to find security gaps and bugs, so that security updates can be made in time. Therefore, Drupal is justifiably considered one of the most secure platforms for building websites and other Internet resources.

Opigno LMS is a complete learning management system and a web resource for administration, documentation, tracking, reporting and delivery of educational courses or curricula. Opigno LMS is one of the most advanced LMS on the market in Europe and provides implementation and execution of various educational processes, such as creation of educational materials and providing unlimited access to them, knowledge delivery, quick modification of content in online classes, interaction between students and teachers through online video conferencing, forums and chat rooms, and centralised tracking of students' progress. Opigno LMS is an easy-to-use system, which requires a browser and internet access (Distance learning, 2018).

Consequently, Opigno is a system for constructing online learning environment, focused primarily on providing interactive communication between the participants of educational process. It is applied to organize both part-time and distance learning, and to support full-time education. The technical capabilities of the Opigno learning system allow it to be used for effective education of students. The variety of forms of presentation and student accessibility, as well as the wide range of courses and content management options, make Opigno a convenient tool for distance learning.

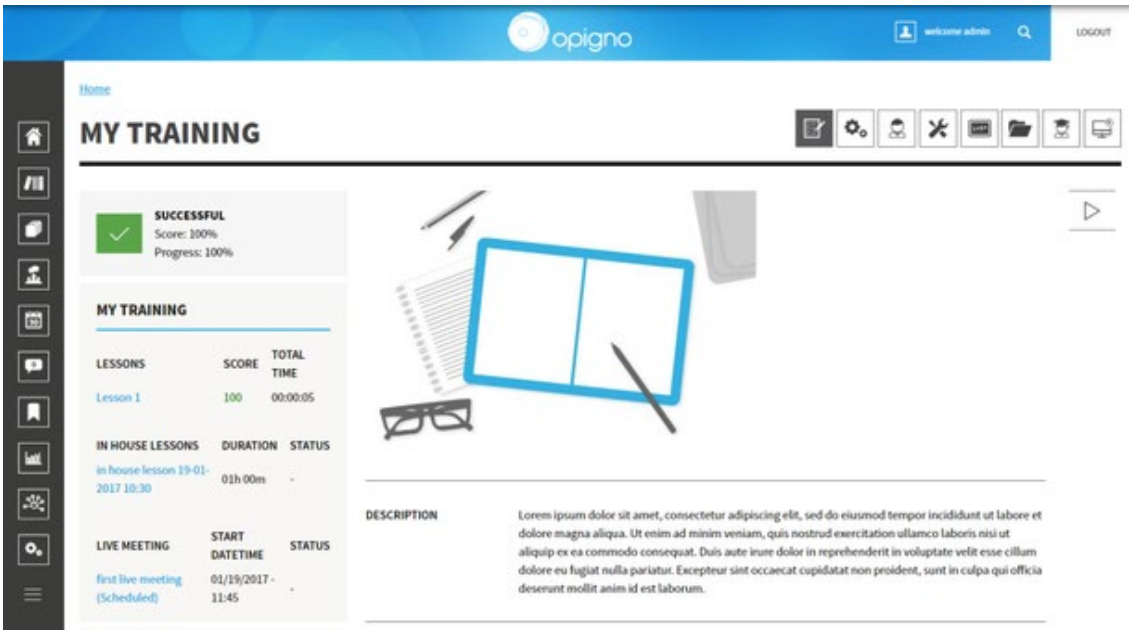
Opigno LMS is a platform for building web-based distance learning resources. In today's information era, Opigno is becoming more and more widespread. Currently, the platform is used not only in higher education institutions, but also in schools, non-profit organizations, private companies, individual teachers, and even parents who teach their children independently. This can be explained by the fact that the platform is not only suitable for the use in a wide area network scenario but can also be easily adapted as a self-sufficient platform to create local, single-user offline learning resources and resources that can function fully within local networks. The Opigno learning platform is distributed under an international license - General Public License v3 (GPL), which allows free use, modification, and additions. The main developer of the system is the Swiss company Connect-i.

Opigno has a wide range of functionality, which is common to e-learning platforms, course management systems (CMS), LMS or virtual learning environments (VLE). Opigno LMS enables teachers to create effective online learning websites. The software is easy to install, configure and maintain for system administrators, and teachers can create, transfer, and run their own online courses with relative ease. Moreover, since the system is modular, meaning that it consists of individual functional units - modules - it is opened to upgrading and extending functionality.

Opigno enables the structuring of learning content within classes and courses. A course is the main object containing many tools enabling the distribution of knowledge and the assessment of students. In the case of an interdisciplinary programme it is possible to group two or more courses in a class. This ensures that users can be managed in a holistic way at class level (add users, inform them).

The learning and navigation interface consists of a personal user account. It includes information and navigation panels that display information about available classes and courses (Figure 2).

Figure 2: User interface of the personal profile.



(Source: Opingo webpage)

In the upper corner there is a toolbar with many buttons (Figure 3) that is linked to all the tools available for this course (documents, video gallery, forum, live conference).

Figure 3: Opigno LMS toolbar.

(Source: Opingo webpage)

The left-hand side of the screen displays the general training structure with a list of online lessons, a list of homework lessons (if applied) and a list of live conference meetings (if applied). For each one, a duration (or time spent in online lessons), and score or status received are displayed.

The main part of the screen displays the learning content (slides, videos, quizzes).

On the right-hand side of the course/class homepage, the “Start” button allows to start the training session from the first lesson or to resume the last lesson the user attended. To complete lesson, the user needs to click on the “Next” button and pass all tasks. When the lesson has finished, the “Next lesson” button is displayed and allows to proceed to the next lesson.

Once the learning system is installed, the following user roles are available by default:

- administrator: this role provides the ability to manage the general settings of the platform, review the achievements of students and modify the content of courses and study sessions;

- student manager: this role enables access to some tools that are useful for student management. It is to be given to users with the role of “teacher” and “instructor” so that they can carry out their teaching activities;
- forum administrator: this role grants permission to moderate forums and can be useful if extra assistance is needed to edit forums and deal with organisational issues. This role does not authorise any other permission that is related to users or the management of classes and courses;
- forum moderator: this role can be assigned to both sections: classes and courses. A course moderator can only change forums within that course. A moderator defined within a class is responsible for all courses that comprise a class;
- instructor: this role is related to the class. If a user is added to a class, you can give him the role of “instructor”. This role becomes effective only for selected class. Within courses that comprise this class, the instructor is able to send messages to students, receive a list of students, view test results, but unable to modify course content (theoretical content and quizzes);
- tutor: this role is related to courses. When a user is added to a course, he/she can be granted the role of “teacher”. This role is to be only effective for certain courses. This means that the user can be the teacher of certain course and the student for other courses. Within a selected course the teacher can manage the course settings, create activities, etc. But he/she cannot manage the users' settings during the course;
- manager: has the same rights as a teacher but can also manage users' settings during the course. This role can be assigned at a class level or at a course level. If it is assigned at a class level, the manager is granted permission for all the courses that comprise the class;
- student: has access (by default) only to work with learning materials for which it has been assigned; to complete tasks, take tests, quizzes; to monitor its own performance.

To add a new user to the platform, you have to obtain an administrator rights. The user needs to navigate to the “Administration” menu, and then in the “User Management” section, click “Administration”. Then, at the top of the page there is a link “Add user”, where the user can enter the list of other users who are to be added to the platform. If there is a list of users to import from an Excel file, this is also possible. To do this, go to the “Import” tab in the upper right corner and click on “New Import”.

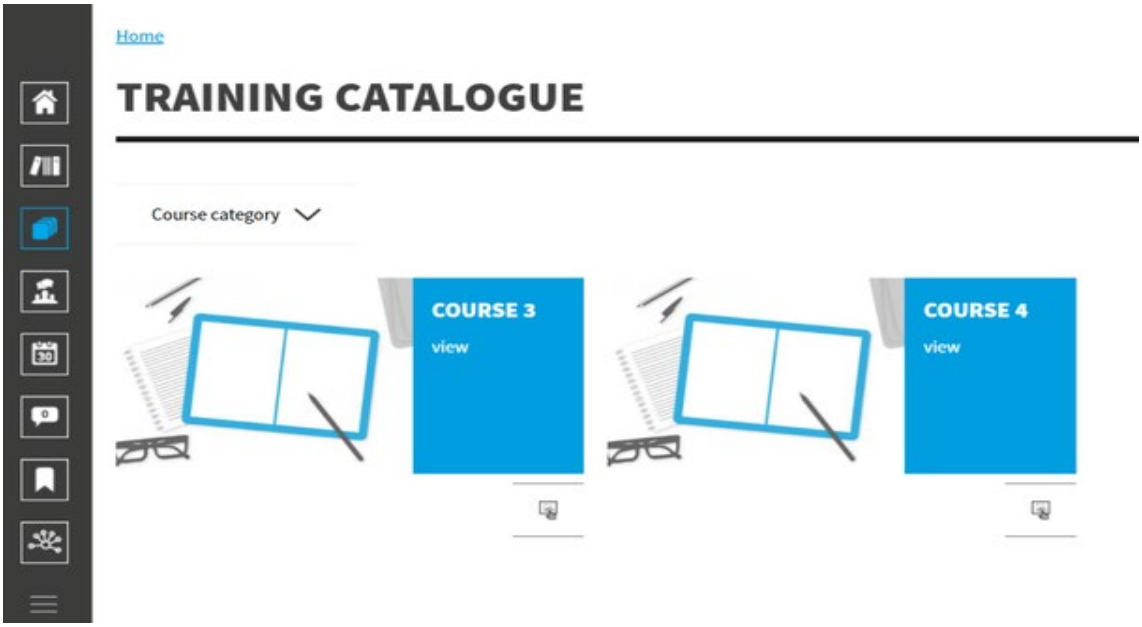
The Opigno main menu has the following items:

- homepage: the homepage of the Opigno platform is an information panel containing widgets individually adapted by each user. Widgets allow the user to see the latest data from his/her courses;
- my trainings: this section provides the user with an overview of all courses he/she has access to;
- training catalogue: shows the user all courses (grouped by class if they are applicable) that he/she can subscribe to;
- forum: the forum page shows the user all forums to which he/she has access to. This means a general forum (platform level available to all users regardless of the course they have access to) and one forum of course the user has access to (if the forum tool has been activated for the course);
- calendar: it consolidates all the events applicable to the user, i.e., general events and events for each of the courses the user has access to. In this way, the user has an overview of all events related to the training activity;

- messaging: Opigno offers an internal messaging system which allows users to communicate depending on certain permissions. The basic settings only allow managers, teachers, and instructors to communicate with students. Then students can send and reply to messages to other participants (students, teachers) in their class or course;
- achievements: this section provides students with a summary of all their results for classes and courses. It also uploads their certificates, if they have passed the test with the minimum score defined in the class/course settings. The user can also review the results to see details on courses, lessons, questions;
- statistics: this section contains graphical dashboards of platform usage statistics, course statistics and statistics for each user;
- collaborative workspaces: this section is only displayed once the required module has been enabled. This allows the user to access all of its collaborative workspaces. Collaborative workspaces enable users to communicate together, share files, share lists and discuss in live meetings;
- administration: this section is not displayed for students. Teachers, instructors and platform administrators have access to this section. Some parts are hidden depending on their profiles. Teachers and instructors can find links to manage users, whereas a platform administrator can also find some interfaces to set the general parameters of the platform.

A list of all study materials is displayed in the section "Study catalogue" (Figure 4). All trainings and courses are available in this section. Training materials are divided into categories so that users can filter them. To manage the available categories, users can proceed (as administrator) to the administration section and click on the link "Course category". To add a category, the user needs to click on the link "Add category".

Figure 4: Interface of the Training Catalogue.



(Source: Opingo webpage)

The course content can be edited in a flexible way by the author of the course. Various learning elements can simply be uploaded to the e-learning course: lectures, tasks, forums, glossary, chats, video conferences, etc. For each e-learning course, there is a useful webpage to view the most recent changes to the course. The Opigno system provides the instructor with the tools to present course tutorials, conduct theoretical and practical sessions, and organize both individual and group learning activities for students.

An essential feature of Opigno is that the system creates and stores each student's portfolio: all the work a student has done, grades, teacher's comments, forum postings, etc. The platform allows students to access learning material both directly on the course webpage and to download course files to their computers. The functionality of the platform permits students to freely use many learning resources and materials, as well as facilitating communication between participants in the learning process, both synchronously via chat (participants in the learning process need to have access to the network at the same time) and asynchronously via email forum, workbook, etc. (simultaneous access to the network is not required). The system supports file exchange in all formats – both between teacher and student as well as between students themselves.

The Opigno LMS platform is fully compliant with the European Sharable Content Object Reference Model (SCORM) standards.

SCORM is a set of standards and specifications developed for distance learning systems. The standard specifies the requirements for the organization of the learning material and the whole e-learning system. SCORM allows for component compatibility and reusability: learning materials are organized into discrete, small units that may be incorporated into a course and used by a distance learning system regardless of who created them, where they are created, or by what medium (Sharable Content Object Reference Model, 2018). Since testing is the main form of knowledge control in distance learning, Opigno has a powerful toolkit for creating tests and conducting tutorial and quizzes. Several types of test types are supported (multiple choice, matching, yes/no, short answer, essay).

Opigno provides the user with many functions to facilitate the processing of test results. When a teacher creates test tasks, the training system enables the setting of a grading scale, and there is also a mechanism for semi-automated enumeration of results. The system supports advanced tools for statistical analysis of test results. All test results are stored in a database, allowing a teacher to review them at any time. For such purposes, the 'statistics' module is used, which contains all tools to perform a differentiated analysis of the results of the tests performed.

As a result, the Opigno system can be used not only to provide distance learning in HEIs, but also to support the traditional higher education learning process with a blended (combined) model.

Apart from Opingo system, the implementation of distance learning for students can also take place through the functioning and support of Moodle e-learning platform. This software tool is built in accordance with the standards of educational information systems, providing access to many of learning materials a student needs for learning.

Due to its functionality Moodle is becoming more widespread in the international educational space (the system is used not only in private companies, but is gradually being introduced for use in universities, secondary schools). With Moodle it is possible to create e-learning courses, to conduct both classroom training and distance learning.

“Moodle is a learning platform designed to bring together participants in the educational process into one system in order to create a personalised learning environment. Moodle is free and can be freely downloaded, installed, modified etc.; it belongs to Open Source systems, enabling many developers to create additional, useful extensions or modules” (Casany, Alier, Galanis, Mayol, Piguillem, 2012).

Moodle is suitable for all levels of e-learning – from personal distance learning to a broad application at the institutional level. Many Ukrainian HEIs use Moodle in their operations. Overall, “Moodle does an excellent job in distance learning. Its main advantages are: free of charge installation, ready for implementation stage, creation of quality courses for distance learning, wide possibilities of course management, powerful testing tools, variety of learning elements, use of educational strategies (programming, modular, individual, social learning),

availability of settings for managing user access to the course (recording only by teacher, by code word, moderation) and tracking of students' progress.

"The use of the Moodle learning management system in student training allows: increase the intensity of the educational process; development of abilities, skills, and other competencies of students; using the full e-learning functionality available in Moodle; implementing modular organization of the educational process with the requirements of the Bologna Declaration" (Salykhova, 2015).

The disadvantages of Moodle platform are as follows:

1. Although the platform is free of charge, it needs somewhere to be installed (server or hosting, domain name, etc.); all of which can be an overwhelming and costly task for the university.
2. Moodle is highly server-demanding (free hosting allows installing only older versions of this LMS).
3. Moodle is a resource-consuming platform.
4. Moodle is too complex - many of its tools are not applicable at the university level.
5. Finally, it requires serious introduction training.

The Moodle LMS has many positive attributes that define it as one of the most efficient and easy to use for both teachers and students. It offers a well-developed communication system; the ability to work with files of different formats, to create quality e-learning courses, to motivate students, and to facilitate teachers' work.

"Considering distance learning as an activity mediated by computer technology, it should be noted that, compared to traditional forms of learning, it is characterized by certain psychological features. The use of computer technologies in distance learning allows students to improve their cognitive processes. Thus, the introduction of distance learning fundamentally changes the "teacher-student" relationship. In the traditional form of learning, the teacher acts as an interpreter of knowledge. With the expansion of educational space, the function of knowledge interpretation is assigned to the student, and the teacher is the coordinator of this knowledge: advises students, directs the work of their cognitive processes, i.e. takes on the function of supporting the student's professional development" (Mazur, Pantsyreva, Prokopchuk, 2021).

In addition, one interesting example of distance learning is the "KNU Online" system, which is used at Taras Shevchenko National University of Kyiv. In mid-2020, when the coronavirus spread to all parts of the world, the university presented a new educational platform for distance learning "KNU online". This platform consists of several modules, including both teacher and student offices, a module for international students, a digital library, a digital presentation module, a testing module and interactive timetables. Due to its comprehensive structure and technical capabilities, the platform can be accessed from any region without any barriers (KNU Education Online, 2021).

Notably, the e-student cabinet provides access in one place to all the tools required for distance learning, such as: interactive timetable, access to lecture materials, access to digital libraries, analysis of results, automatic check for plagiarism, etc. The combination of multiple functions united in one platform opens new opportunities for the EdTech market.

KNU Online educational platform is currently being tested in several faculties, particularly economics and law. The platform includes a mobile application compatible with Android and iOS, both versions of the application are currently available in test mode.

To summarise, Taras Shevchenko National University of Kyiv has introduced a comprehensive distance learning platform that provides an online learning experience that responds to external factors, namely the pandemic.

When analyzing the results of the use of Opigno LMS, Moodle LMS, and "KNU Online" in distance learning in HEIs, positive aspects of such use are observed: creation and development of online courses; increased motivation to study disciplines in a blended learning format for students; increased awareness of teachers and students about the possibilities of LMS; improved skills of both teachers and students in working with LMS; possibility of automated testing.

CONCLUSION

Despite the rather extensive list of positive features of distance education, as in any other form of education, several disadvantages can be identified. Firstly, sometimes it is complicated to process the identification of all students who applied to the course. However, HEIs designed an in-live identification processes to identify the actual person. In doing so, it is obligatory to provide proof of identity. Also, quite a significant problem might be the low Internet connection to the network during a learning or exam. Students from remote cities of Ukraine suffer from this the most.

Among the important disadvantages of distance education in Ukraine is also the lack of direct contact between a teacher and a student due to the heavy professional workload of domestic educators. Foreign distance education students can receive answers to their emails within several hours, as the number of teachers in the developed countries is much greater than the number of students. Unfortunately, in Ukraine there is the opposite situation – we have a lot of e-learning courses, but few experienced teachers who are familiar with the latest technologies of distance learning.

Analysis of implementing and using Opigno LMS, Moodle LMS and "KNU Online" in the educational process has shown that these platforms of distance learning can promote the development of Ukrainian higher education sector in line with the framework of European education.

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PRAGMATIC ELEMENTS IN EDUCATIONAL COMMUNICATION AT UNIVERSITY DURING THE COVID-19 PANDEMIC

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Abstract

The situation with the COVID-19 pandemic in 2020 and 2021 has changed our way of communication. This phenomenon has also been radically reflected in the education and communication processes at universities. This paper deals with communication between students and academics at the Faculty of Education, University of West Bohemia during this time. The objective of the research was to confirm the hypothesis that certain conversational components are not being realized in the online educational process. The research was also based on the fact that especially pragmatic elements of communication are often directly associated with nonverbal aspect of language; however, due to its nature, this feature is frequently missing in online education. The main goal of this research is to investigate the effects of online education in this area of communication and describe the problem as perceived by academics and students. The results of the research show first of all that pragmatic elements of communication were indeed absent; secondly, they indicate the importance of nonverbal components in educational processes, which is likewise in accordance with the hypothesis. The interconnection between this issue and the chosen teaching and learning method (e. g. specific digital tools) seems clear.

To sum up, this study demonstrates the complications of online education regarding missing elements of (not only) nonverbal communication. Thus, the importance of selecting the appropriate digital tool for education is evident.

Keywords

Online communication. Linguistics. Pragmatics. Education. University. Nonverbal communication.

COMMUNICATION IN ONLINE EDUCATION

In 2020 many people struggled to balance work, family, school etc., and overcome serious complications caused by the COVID-19 pandemic. Given such circumstances, the Internet was widely considered a very good option for keeping in touch with relatives, peers, colleagues and other people generally. But is this really the case? Can this type of communication be considered equivalent to standard personal contact?

This situation at schools and universities was highly challenging. For many universities worldwide, online education became the only viable option; therefore, these institutions had to support new communication strategies, based predominantly on such IT tools as LMS Moodle, MS Teams or Google Classroom. These tools, typical of distance education (e.g. at online universities), have become an everyday instrument in seminars or workshops at many universities. In short, the given circumstances changed the form of communication at universities when personal contact and face-to-face

communication, which form a fundamental part of tertiary education, suddenly became impossible. A considerable amount of information conveyed by this form of communication was potentially lost due to the absence of signals traditionally present in "normal" personal conversation.

Personal communication involves numerous paraverbal and nonverbal cues (e.g. eye contact, physical distance between participants, intonation) which convey much information about the speaker (Ambady, Bernieri & Richeson, 2000). The same cues also support an appropriate interpretation of the conversational contribution: paraverbal features (intonation, accent, and so on) and nonverbal elements do not stand in opposition to explicit components of verbal communication; rather, they might be described as a complement of it. Interplay between the verbal and nonverbal/paraverbal components of communication is characteristic of a natural communication process, one which helps accomplish the effective transfer of information between the people involved. On the other hand, a lack of cue systems could result in miscommunication.

Paraverbal and nonverbal elements of language correlate with pragmatic factors of communication in the specific context. Crystal (2017, 124) states: "Pragmatic factors always influence our selection of sounds, grammatical constructions, and vocabulary from the resources of the language (…) In many languages, pragmatic distinctions of formality, politeness, and intimacy are spread throughout the grammatical, lexical, and phonological systems, ultimately reflecting matters of social class, status, and role." Crystal's description of pragmatic factors may be complemented by an example of prosody as a presupposition trigger in Mihalicek and Wilson (2011). An adequate decoding of the presupposition relates to the prosodic structure of the utterance. The example cited is based on the various usages of pitch accent in the utterance.

However, these paraverbal and nonverbal cues do not belong primarily to computer-mediated communication (CMC) often used in online education. In a synchronous type of education in the form of online conversation, we can observe many nonverbal cues, such as intonation, gesture or gaze. Nevertheless, asynchronous lessons are mostly text-based, which might suggest various communicative shortcomings: "A specific characteristic of computer-mediated communication (CMC) is that it is largely text-based, which automatically implicates that there is a lack of nonverbal cues" (Derks, Bos & von Grumbkow, 2008). Here the authors are working only with text-based CMC, which is an example of the rapid development in this area. Meanwhile, online real-time communication with video has become an everyday matter.

As noted above, in text-based communication (including that in education) the absence of nonverbal cues could present a problem. Derks et al. (2008) point out how "the lack of nonverbal cues in CMC also has consequences for the decoding and interpretation of a message by the receiver. Because there is no facial feedback, the writer is uncertain whether the receiver will interpret the message exactly how he or she intended it." Therefore, the absence of such nonverbal cues in online text-based communication is compensated for by various new tactics. Riordan and Kreuz (2010) argue that "there are cues available in CMC for expression of emotion and meaning" and they designate several categories, such as capitalized words, vocal spelling, repeating punctuation or emoticons. They demonstrate how communicators may adapt to a lack of nonverbal communication by employing more strategies.

In fact, a number of studies have examined the effects of these adapted communication strategies in CMC. Older examples describe the effects of using emoticons which "give expression to our thoughts" and "influence online message

interpretation" (Derks et al., 2008). The same authors further examine the most frequent motives behind emoticon use by secondary school students in Heerlen, the Netherlands: "expressing emotion", "strengthening the message", "regulating the interaction" and "putting into perspective". Thompson (2016) is of the view that "emoticons play an important role in clarifying the meaning of a message, providing some compensation for the absence of nonverbal cues that are available in speech."

Overall, it seems evident the quality of communication in online education could be called into question and the form may have some disadvantages. Interplay between quality of communication and satisfaction of students and academics is to be expected. Students in online courses declare feelings of isolation, they sense a lack of personal contact with teachers or peers, and in general they miss "real people" (see Tawil, 2019). The frustration of long periods online is a frequent topic of discussion among psychologists and sociologists, whose findings have even appeared in popular form in newspapers (see e.g. Dorňáková, 2021). According to Tawil (2019): "To overcome feelings of isolation, learners need to become socially connected with their peers and instructors." The situation with the COVID-19 pandemic unfortunately restricted significantly all forms of personal contact.

To sum up, the lack of a cue system in text-based education leads to a deficiency in many components in communication, including pragmatics. One solution to this might be synchronous methods of learning using video. In asynchronous lessons it is highly recommended to use substitution strategies, such as emoticons, emojis, capitalized words, and so on.

RESEARCH GOALS AND HYPOTHESES

As previously mentioned, the educational process in the last several months was highly challenging for both university students and teaching academics. One of the likely reasons for this is the unnatural form of communication during the COVID-19 period, given the restrictions on free movement of persons. Throughout this extended time frame, communication at universities assumed an exclusively online form (synchronous and/or asynchronous).

Therefore, the main goal of this research was to investigate the effects of online education in this area of communication and describe the problems as perceived by academics and students. An analysis was conducted of the specific means of communication, IT and communication tools used by students and academics at the Faculty of Education, University of West Bohemia (hereinafter referred to as FPE). One aspect of the research was also to describe the level of satisfaction with the effectivity of online lessons.

The main objective of the research was to confirm the primary hypothesis:

H1: Certain conversational components are not being realized in the online educational process.

We also worked with three support hypotheses:

H2: Most of the students and academics were missing contact with "real people" during the period of COVID-19 online lessons.

H3: There is interplay between the perceived effectivity of the lessons and satisfaction with the IT tool being used.

H4: Most academics missed the personal communication aspect and tried using various methods for more effective communication.

METHODS

The participants,116 in total, were students and academics from the FPE. The group consisted of 72 academics and 44 students. Participants were asked to complete an online questionnaire; participation was voluntary.

The aim was to incorporate as many study specializations as possible, which is why the participants are teaching or studying a variety of study programmes.

Table 1: Specialization of participants

Specialization	Percentage of participants
Humanities	29
Foreign languages	24
Natural science	20
Art	14
Sports science	9
Technical science	4
Total	*100*

(Source: Own)

The questionnaire contained 10 items focusing on the methods and IT tools used in education during the COVID-19 pandemic. Participants also commented on the effectivity of their seminars and communication within the academic community. The final item invited respondents to add comments of their own.

RESULTS

The results show that, during the COVID-19 pandemic, academics at the FPE were teaching mainly via videoconferencing. This synchronous way of teaching was most used by 83% of academics: 25% were teaching every lesson with a videoconference, 30.6% taught "with video" more than 75% of lessons, and 27.8% used this method in more than 50% of lessons.

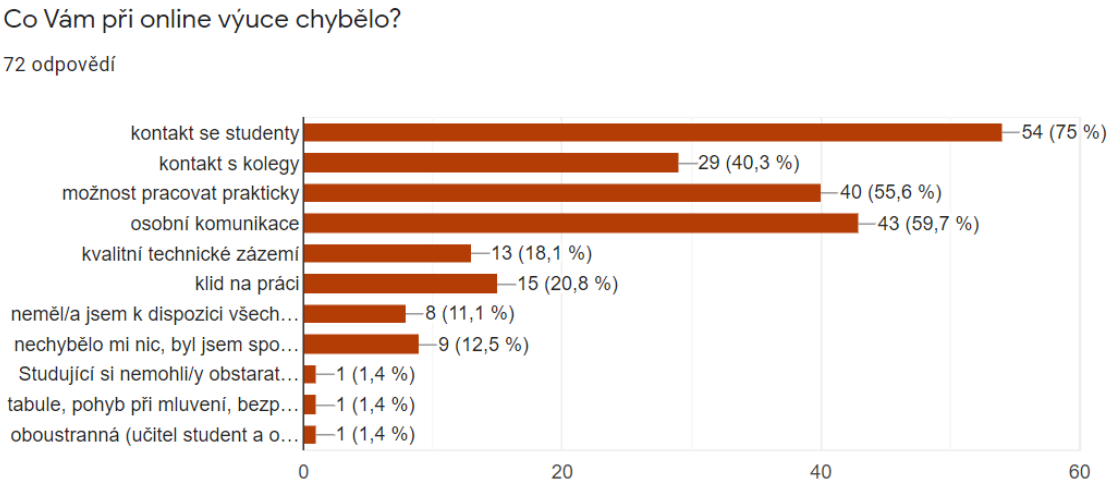
The answers show the most frequently used IT tools in the COVID-19 period were Google Meet (30.6% academics), MS Teams (25%), Google Classroom (19.4%) and Zoom (9.7%).

The following paragraphs present the detailed results related to the hypotheses.

H2: Most of the students and academics were missing contacts with "real people" during the period of COVID-19 online lessons. – *Confirmed*

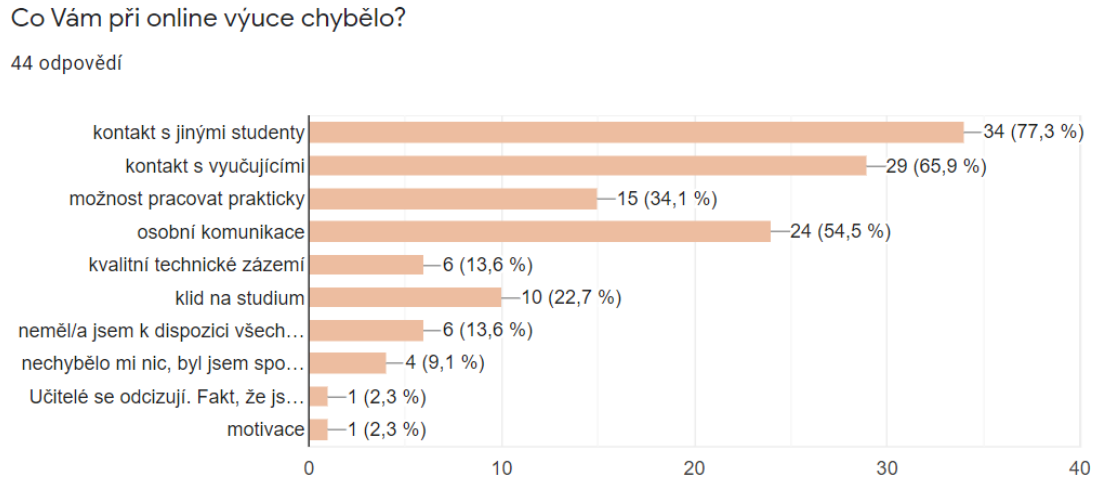
As described above, students in online lessons very often miss the contact with teachers and peers, and in general with "real people" (Tawil, 2019). As can be seen in the diagrams, this hypothesis was confirmed. *I do miss the contacts with students* was the most frequent answer of both academics and students.

Diagram 1: *What did you miss during online education?* Answers by academics: contact with students (75%), contact with colleagues (40.3%), possibility to work practically (55.6%), personal communication (59.7%), good technical equipment (18.1%), peace and quiet for work (20.8%), I didn't have all the materials available (11.1%), I didn't miss anything, I was satisfied (12.5%), free comments.



(Source: Own)

Diagram 2: *What did you miss during the online education?* Answers by students: contact with other students (77.3%), contact with teachers (65.9%), possibility to work practically (34.1%), personal communication (54.5%), good technical equipment (13.6%), peace and quiet for studying (22.7%), I didn't have all the documents available (13.6%), I didn't miss anything, I was satisfied (9.1%), free comments.



(Source: Own)

H3: There is interplay between the perceived effectivity of the lessons and satisfaction with the IT tool being used. – *Not confirmed*

The questionnaire contained two questions related to this topic. The first dealt with the effectivity of online education. Overall, 80.2% of academics were satisfied with the effectivity of their lessons: 22.5% completely satisfied and 57.7% partly satisfied. As regards the IT tool used, 90.2% of academics and 90.9% of students were satisfied (or partly satisfied). The answers to both questions in combination are shown below.

Diagram 3: Were you satisfied with used IT tool? The answers by academics satisfied with the effectivity of their online lessons.

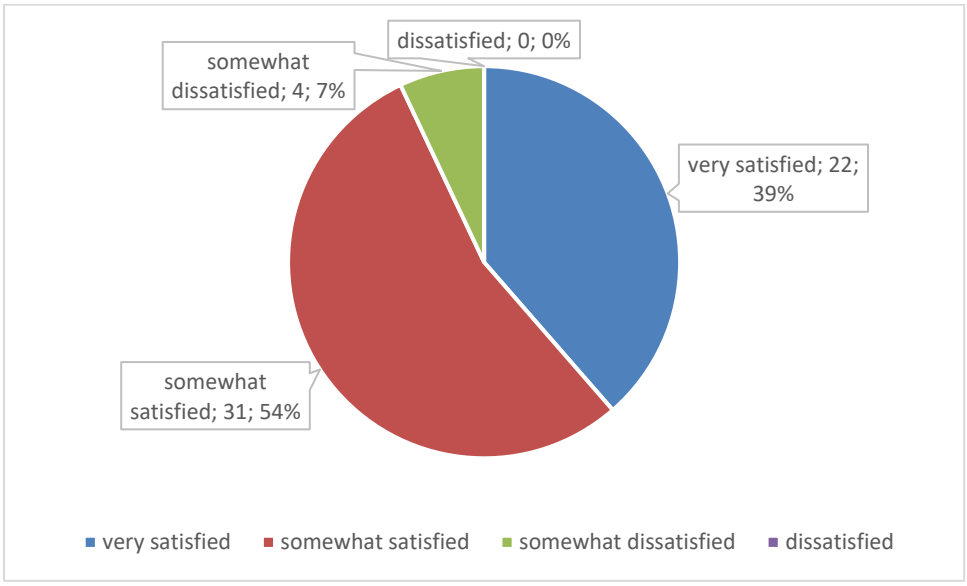


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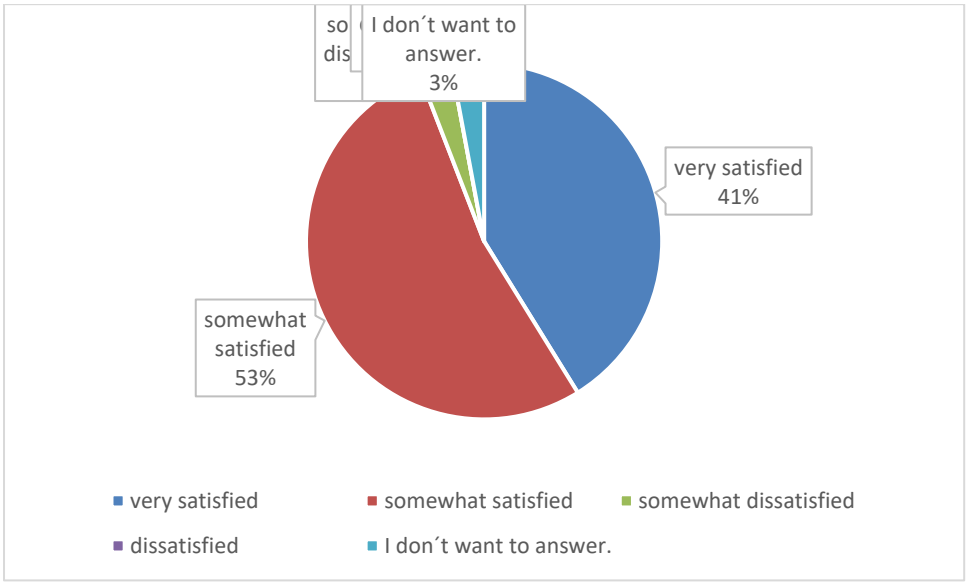
Diagram 4: Were you satisfied with used IT tool? The answers by students satisfied with the effectivity of their online lessons.



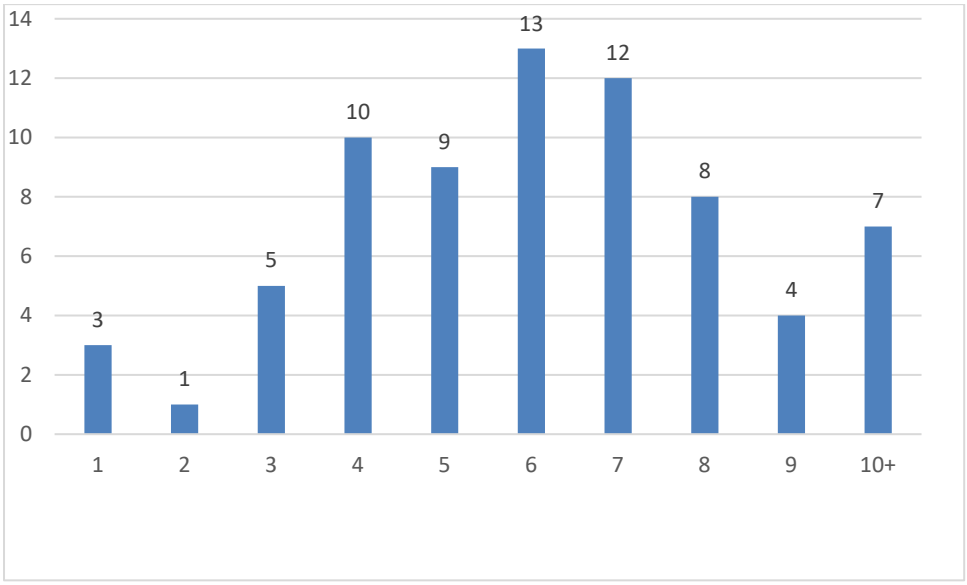
(Source: Own)

Nevertheless, the group of academics dissatisfied with the effectivity of the lessons also contains a large number of those who were satisfied with the IT tool (77%). The same trend can be observed in the student group, where 89% dissatisfied with the effectivity of the lessons were satisfied with the IT tool. Thus, a correlation between the perceived effectivity of the lessons and satisfaction with the IT tool being used was not confirmed. On the other hand, in a separate question, 67% of academics considered the IT tool used for videoconferencing as crucial. The ambiguity of the results means H3 cannot be confirmed.

H4: Most of the academics missed the personal communication aspect and tried using various methods for more effective communication. – *Confirmed*

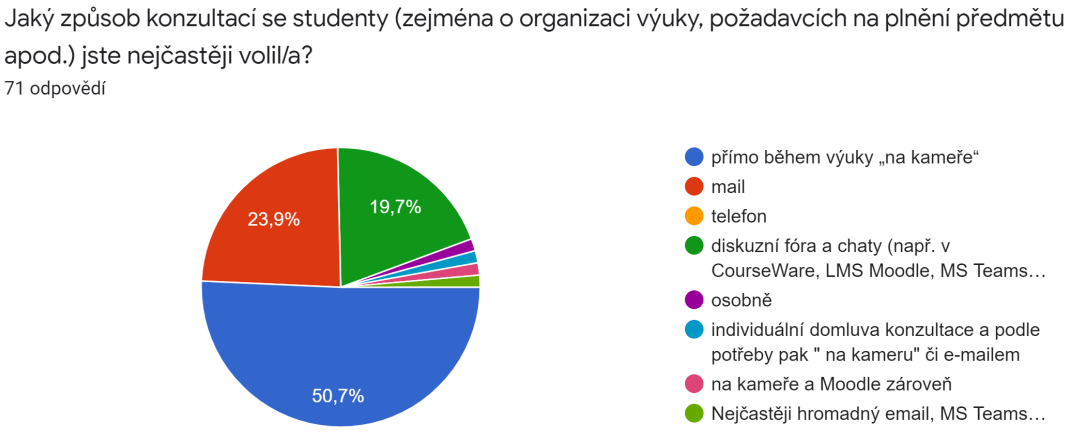
In response to the question "*What did you miss during the period of the online education?"*, 75% of academics answered, "*contact with the students*" and 60% "*personal communication*". As mentioned regarding H2, missing "real people" was also confirmed. The results below show that academics wanted to use various strategies of communication to fill this gap.

Diagram 5: Number of IT tools used by academics in the educational process. (e.g. one IT tool was used by three academics, two IT tools by one academic, three IT tools by five academics, etc.).



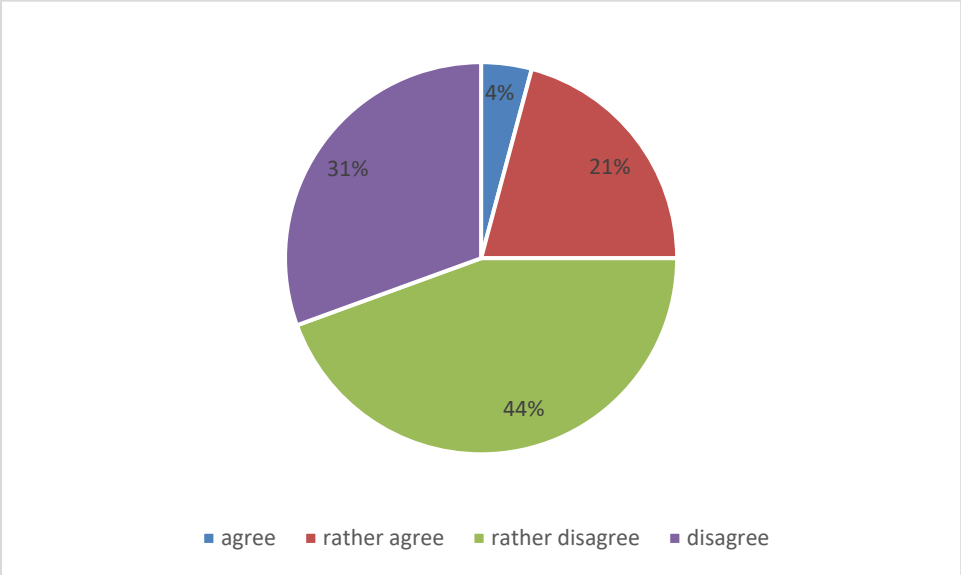
(Source: Own)

Diagram 6: *Which way of consultation with students (especially in terms of organization of teaching, seminar requirements and others) did you use?* Answers by academics: 50.7% during the lesson "with video"; 23.9% e-mail; 19.7% forum discussion and chat (e.g. in CourseWare, LMS Moodle, MS Teams …); personally; individual consultation by appointment and as required either "on camera" or via e-mail; on camera and Moodle simultaneously; most often group e-mail, MS Teams.



(Source: Own)

Diagram 7: The exclusive use of written communication with students is completely sufficient.



(Source: Own

Other results in the questionnaire indicate the aspiration and experiments of academics to communicate more effectively. For example, two thirds of academics supplement written communication with videoconferencing; 79% use support strategies (underlining, another colour, etc.) in written communication to emphasize important items in the tasks for students; 75% prefer using video during the session; 68% use support tools for communication during videoconferencing, such as a small hand for signing up, or emoticons to express some particular feeling.

To sum up, we can observe the aspiration of academics to use various supplementary communication strategies to overcome the lack of nonverbal/paraverbal communication during online education.

H1: Certain conversational components are not being realized in the online educational process. – *Confirmed*

As indicated above, 60% of academics and 54.5% of students missed personal communication during online education. As previously suggested, this might be due to the absence of certain conversational components.

The description of elements in written and spoken communication also reveals many unfilled gaps. Only 26% of academics consider the effectivity of synchronous education the same as in classroom teaching. Most academics (75%) think communication with students is more effective in a video conference than in written form.

In order to overcome the weaknesses of online communication, synchronous lessons with video were used. According to the academics, this is one way to achieve better understanding and decode the actual emotions of students. Video also assists comprehension of the "real" meaning of an utterance and indirect signals. Altogether 81% of academics claim they can better recognize if students understand everything well.

According to the academics, written communication seems to be less effective than real time communication with video. Furthermore, approximately half of the academics described difficulties in uttering such pragmatic-based elements of language as jokes and

irony. They also mentioned problems associated with understanding certain specific communicative content.

In accordance with H2 and H4 and findings already mentioned, we can also confirm hypothesis H1.

DISCUSSION AND CONCLUSION

This article deals with communication problems in university education during the COVID-19 pandemic in 2020 and the first half of 2021. The primary research goal was to describe this situation at the Faculty of Education, University of West Bohemia.

One of the reasons for some specific differences between personal and online communication may be the lack of paraverbal and nonverbal cues in an online situation. Especially in the written form of online communication and online meetings without video, these signals are missing. Their absence may be a reason for a failure in communication or misunderstandings in CMC used in online education.

Riordan and Kreuz (2010) mention particular categories of communication elements which help supplement the lack of nonverbal cues in written communication. Our results correspond to this theory. Academics at the FPE use various graphic strategies to accentuate certain specific information for students. We can also confirm the ability of academics and students to adapt for the lack of nonverbal elements in online communication.

As can be seen, substitution and supporting strategies are important also in education in synchronous form. The results show a preference for using video during online sessions. Participants mentioned the possible misunderstanding of jokes, irony and suchlike when video was not used. To sum up, the lack of a cue system in online education could be resolved by using video or supplementary and support strategies in written communication. One of the free comments emphasizes the point quite clearly: *"I preferred the meetings with video because of the possibility to see the gestures and nonverbal communication. I generally missed the student's reactions that's why I sometimes didn't know if the lesson failed or not."*

Three of the four hypotheses were confirmed:

H1: Certain conversational components are not being realized in the online educational process. – *Confirmed*

H2: Most of the students and academics were missing contacts with "real people" during period of the COVID-19 online lessons. – *Confirmed*

H3: There is an interplay between the perceived effectivity of the lessons and the satisfaction with the used IT tool. – *Not confirmed*

H4: Most of the academics missed the personal communication and were trying to use various ways for more effective communication. – *Confirmed*

In summary, the results show that the effectivity of online lessons at the FPE during the COVID-19 was perceived as high. Academics were teaching mainly via videoconferencing. There is a clearly observable preference for a support communication strategy using video, as participants described some general problems of online communication (misunderstandings, unsuccessful interpretation of jokes, irony etc.). The results further indicate that the reasons for using video may also include the absence of a

nonverbal cue system and personal contact. In this regard we can see the desire of academics to adapt the means of communication to the online situation by using a variety of heterogenous strategies.

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COVID REALITIES IN HIGHER EDUCATION: REVIEW AND EVIDENCE FROM UKRAINE

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Abstract

The paper is devoted to the review of the COVID impact on the higher education trends currently being observed in the world. The trends examined include digitalization of the educational process, introduction of new forms and methods of teaching, new approaches to the organization of the educational process, internationalization of higher education, an increasing role of short-term courses and programs and MOOCs. The survey of Ukrainian university lecturers' opinions was used as a demonstration of the professional readiness for strengthening of the mentioned trends. The survey sample involved 200 respondents of Sumy State University and Sumy National Agrarian University (Ukraine) and is representative in terms of demonstrating the state-of-art in the Ukrainian higher education with the focus on challenges. The research conclusions were delivered under the context of the literature review and the practicing lecturers' feedback analysis. The paper highlights the importance of relevant skills for academic staff to be effectively competitive not only at the international, but also national scale. Among the main findings was that in overall the COVID-19 pandemic influence on the higher education trends may be estimated as positive in terms of qualitative and digital approaches. These include inclusiveness, increased use of additional online resources, raised demand on digital skills both of educators and students, the rocketed value of the live communication with a teacher, etc. The paper also investigates the other impacts of the lockdowns which may be classified as negative and are still under discussion.

Keywords

Higher education. COVID-2019. Pandemic. Universities. Digitalization. Short-term courses. Internationalization.

INTRODUCTION

In recent years, higher education has been experiencing a period of active change. There was a transition to a new era in the society development and, as a result changed the needs of potential consumers of educational services, which affected the value and importance of academic education. There is a need to create a new paradigm of the educational process that will meet the needs of modern social development and will utilize the digital solutions more effectively engaging larger layers of the society, e.g. elderly

people or rural residents. For example, the World Bank believes that it is essential to ensure a balanced network of educational institutions able to satisfy the society needs, to strengthen their transparency, and effective communication with stakeholders, but there is a problem in some countries, such as Ukraine. (Bondar, 2021.) Along with all mentioned, the spread of COVID-19 has created new challenges. However, not all consequences of the pandemic affect the development of education as clear as it may seem at first glance. More and more evidence come to prove that some of the impacts are positive and would have never happened or would happen with a delay if not the COVID lockdowns.

In this study, it is proposed to investigate the main trends describing recent education development through the prism of the positive and negative impacts of the pandemic. These include digitalization of the educational process, the introduction of new forms and teaching methods, new approaches to the organization of the educational process, internationalization of higher education, increasing the role of short-term courses and programs, and open mass online courses. (García-Morales et al., 2021).

In overall, it can be recognized that the impact of COVID on the use of digital tools and approaches in teaching is positive as it is confirmed empirically. For example, M. Gaebel, T. Zhang, H. Stoeber, and A. Morrisroe (2021) indicated that the number of online staff meetings increased by 95%, which automatically means certain improvement of some digital skills, also the use of new teaching methods and tools increased by 92%, and the number of users of the online library increased by 65% (Gaebel et al., 2021). Moreover, various forms of academic activities organization are used according to the type of training sessions, as stated in the report "Student Life During the COVID-19 Pandemic Lockdown: Europe-Wide Insights." (ESU 2021).

The introduction of new forms and teaching methods is actively taking place in almost all EU universities, except those that have been using them traditionally before the pandemic. The most popular forms are distance learning and blended learning. In European countries, most universities (75%) offered such approaches to studying, and in some countries - 100% of the institutions. (Gaebel et al., 2021) It should be noted that these decisions are also strictly connected to the overall quarantine regime rules in each particular country as in overall the educational services stakeholders (students and parents) mostly would prefer offline studies. At the same time, the question remains about the effectiveness of intensive use of such approaches to improve the quality of education. For example, on one hand a student receives a wider range of sources and tools to use for studies and presentation of the results, on the other hand it brings along technostress, fatigue and worsening of eyesight and overall health conditions. Empirical studies demonstrate that isolation influences emotional balance of students decreasing the motivation for studies sensibly. (European Students' Union, 2021; Zamora et al., 2020) In addition the students' wellbeing, especially of female students, has worsened in terms of their ability to pay the study costs. Some of the students simply do not have a quiet place for themselves to study.

However, 80% of respondents (the same survey) say that the digitalization of the educational process will provide new experiences and competencies for students. (Gaebel et al., 2021) That is easily understandable in the context of the latest notions at the labour markets for the well-paid positions: the white-collar positions are not comprehendible anymore without a candidate to be fluent in digital skills relevant for the profession.

In Ukraine, universities also have their digital solutions and platforms for remote work or access to learning materials. For example, Sumy State University (further –

SumDU) offers students distance learning opportunity, as well as the MIX-platform to study specific disciplines. There is also a solution for external users which is called Examenarium that allows collaboration with external providers of educational services, thus, allowing SumDU teachers to commercialize their knowledge and research outcomes. In addition, there is a fully electronic documents flow within the university due to the big distances between the campus parts. Sumy National Agrarian University (further - SNAU) has developed a more traditional approach – it uses a Moodle platform for these purposes.

In this context it is worth noting that the pandemic has positively impacted the development of platforms for mass open online courses. For example, Prometheus (Ukraine) published statistics stating the number of learners increase from 400,000 in 2020 to 1.5 million at the end of the year, while the number of certificates issued doubled. (Prymachenko, 2021). This last fact may also be explained by the obligatory requirement of professional qualification advancement by many professions while the face-to-face opportunities were restricted. The other interesting explanation is that some people feel the urge to use the lockdown time at home more effectively and to achieve those results that had to be previously postponed due to the need to go to work every day.

It is logical to forecast that under the influence of COVID-19 lockdowns, the potential of such forms and approaches will grow. The universities will find the solutions to diversify the experiences of their learners, including the fully remote studies and even internships. On one hand, this will help to attract a larger audience to the educational process, as well as to commercialize educational products, and on the other hand, it again raises the issue of quality assurance, socializing, assessing the quality and control of students' knowledge (e.g. 60% of respondents in Albania are concerned with this fact (Gaebel et al., 2021) and the formation of some competencies that depend on the practice in real life situations. However, there are solutions offered by some teachers or institutions which try to imitate the real-life situations at maximum to provide the necessary experiences to students: e.g. movie cuts for medical students to determine the diagnosis symptoms, home-delivered individual toolkits to expose a learner to necessary practical skills, personal projects which require real-life experiences to be then virtually combined in one group project, virtual internships and trips with follow-up home assignments related to real-life situations. With the demand from the educators and learners, of course, the range of solutions also grows (learning platforms, tools, approaches to material delivery, interactivity, augmented or virtual reality, etc) along with their quality and economic effectiveness. Nevertheless, despite the creativity of the educators and the variety of digital tools offered, there is several subjects that cannot be provided with satisfying set of digitally based solutions. U. Zakharova, K. Vilkova, G. Yegorov (2021) noticed that not all specialties can replace teaching in classrooms with online teaching, this is crucial for many technical specialties and medicine. (Zakharova et al., 2021).

In addition, if to consider this problem in terms of the formation of competencies, at the first glance the challenge is to develop hard skills, yet there is also a not less important task of the formation of soft skills (e.g., teamwork, sociability, leadership, crisis management) which may suffer strongly as well. Similar issues S. Packmohr and H. Brink (2021) highlighted in their research. The authors emphasize that the integration of digital approaches has taken place faster at the technical level. However, the concepts and culture of teaching require qualitatively new solutions. (Packmohr and Brink, 2021).

Some researchers note that the willingness of students to perceive the increase in the degree of digitalization of education positively strongly depends on the development of infrastructure and technological, economic, cultural, and behavioural basis (Mikhaylova

et al., 2021). Thus, the speed and quality of digital approaches implementation vary considerably from country to country and even from region to region (Mikhaylova et al., 2021). Additionally, students from different countries assess the most significant risks differently. For example, A. V. Noskova, D. V. Goloukhova, A. S. Proskurina, and T. H. Nguen (2021) note that Russian students see significant risks in dehumanization, severance of social ties, and possible loss of student status. For Vietnamese students, the most significant risks are mainly related to the fear of the declining quality of education (Noskova et al., 2021), which is also an interesting fact to note under the context of cultural aspect of the problem.

COVID-19 pandemic brought up to the light the two-fold nature of the problem: on one hand there is a challenge of universities technical readiness and students' skills and abilities to study fully online, on the other – the teachers are also subjects of the process who are supposed not only to be able to demonstrate high digital skills, but also to integrate their pedagogical knowledge into the online teaching. Monteiro Angélica Reis (2021) note that there is still a need to improve the skills of teachers in the use of digital technologies in education. These data were obtained in a study of digital literacy's impact on social skills and lifelong learning in Portugal. (Monteiro and Leite, 2021) The recognition of lifelong learning as something normal, popular and beneficial has started to develop recently in Ukraine as well. Especially important are the notions of high interest namely to the qualitative education, leaving behind the formal approach just to get a certificate. Somehow learners started to value their personal time spent ineffectively on online studies.

However, the most unequivocal COVID-19 affected areas are related to internationalization, including cooperation in the field of research and academic mobility. The pandemic has seriously affected all types of (academic and professional) mobility, as well as international enrolment which brought most of earnings to some institutions (decrease of enrolment on 50% in the US (Grothus, 2020)), decrease of going to study abroad on ca 30% from China (AACSB, 2020). The most radical impact (reduction to almost zero) has been on international short-term mobility (including short study missions, research visits, and conferences). Long-term credit mobility (up to one academic year) seems to have decreased by at least one-third, and often by half, in most countries (significantly depending on the epidemiological situation in the countries of departure and destination). Virtual mobility has not become a way out of the situation in most European countries or some individuals (Grothus, 2020). For example, some of the students did not manage to use the opportunities of the Erasmus+ programme simply because they have become ineligible or have graduated. (Grothus, 2020). However, developing countries have used this opportunity to organize and conduct both short-term and long-term virtual mobility programs for teachers and students at all levels. For example, in 2021, 281 students and 91 teachers passed such programs at SumDU (Ukraine), at SNAU – 11 students and 46 teachers (Director's Annual Report SumDU, 2021; Vice Rector's Annual Report SNAU, 2021).

The general trend is negative, as the ability to cooperate and conduct research in overall has decreased, as noted in the De Gruyter Author pulse survey (2020). (Watchorn and Heckendor, 2020) 48% of researchers have produced less than they usually did. It should be also stressed that the decrease is more sensible in the countries with lower income. In addition, scientists have faced financial and psychological difficulties that have reduced productivity. This complex problem is even more intensified by the fact that 86% of respondents said that teaching and counselling students took much longer. More time for these duties leaves less time for others – like research or professional skills and

knowledge advancement. Over 70% of academics define online teaching as the main obstacle to do research. One more aspect is not very much noticed in this context: most of the teachers either have children who should study and thus disrupt their attention, or they are forced to use a single PC/laptop for the whole family needs. Especially this is disturbing for young parents who have extra troubles and challenges.

Thus, **the primary purpose of this paper** is to determine the impact of the pandemic on the digitalization of the higher system of Ukraine and to study the readiness of teachers to effectively reform approaches to the organization of the educational process, in particular in terms of:

- digitalization of the educational process,
- introduction of new forms and methods of teaching,
- new approaches to the organization of the educational process,
- internationalization of higher education,
- an increasing role of short-term courses and programs and MOOCs,
- professional readiness of teachers.

The paper highlights the importance of relevant skills for academic staff to be effectively competitive not only at the international, but also national scale. However, there are other impacts of the lockdowns which may be classified as negative and are still under discussion.

The analysis results of the COVID impact on the higher education trends currently observed in the academic world are presented below.

METHODS

In order to get the comprehensive view of the challenges, the authors designed mixed-method research: in particular, the literature review was made using the planning, conducting, and reporting phases and covered about 50 available in English, Russian and Ukrainian publications related to the topic (journal and conference papers, research papers, projects and surveys reports, official websites). A review protocol started with the design of the research questions and the search strategy as a response to the set question. After the information analysis and synthesis, the authors made comparison of those with the results obtained during their own survey. This was later supported by the empirical data collection. The collected information was analysed via deductive and inductive approaches to build a comprehensive overview of both the current trends and perceptions of educators working under the COVID pandemic conditions.

The survey sample involved 200 respondents of Sumy State University and Sumy National Agrarian University (Ukraine) and is representative in terms of demonstrating the state-of-art in the Ukrainian higher education. It was conducted in the last months of 2020, after which a month was spent for the literature review and one more month for summing up the empirical observations of educators' experiences throughout the lockdown.

The survey was launched via a Google Form manager and consisted of 15 questions. The form was disseminated among the academic staff of two universities. The questions covered were the following:

1) Has the Covid-19 crisis led to other changes at your institution both in administrative and teaching areas?

2) How would you describe your institution's position towards digitally enhanced learning and teaching?
3) Do you agree or disagree with the following statement: The educational process became more inclusive after shifting online.
4) Is digitally enhanced learning considered in the internal quality assurance process at your institution?
5) Which administrative levels provide support to the development of digitally enhanced learning?
6) What are the top 3 enablers of digitally enhanced learning and teaching at your institution?
7) What are the top 3 barriers to digitally enhanced teaching you face?
8) Does your institution offer the following teaching\delivery modes?
9) How would you describe the professional recognition at your institution of the short courses (non-degree) where you have received certificates, micro-credentials or badges?
10) What are the main impacts of digitally enhanced learning and teaching forced during the COVID pandemic, that have been observed by you?
11) Does your institution offer MOOCs or other forms of open learning?
12) What is the main motivation for your institution in offering MOOCs and open learning?
13) What measures have been useful for improving digitally enhanced learning and teaching at your institution?
14) Do you think the internationalization processes have enhanced within your institution during the COVID pandemic?
15) Which of the following infrastructures can students or teachers access at your institution?

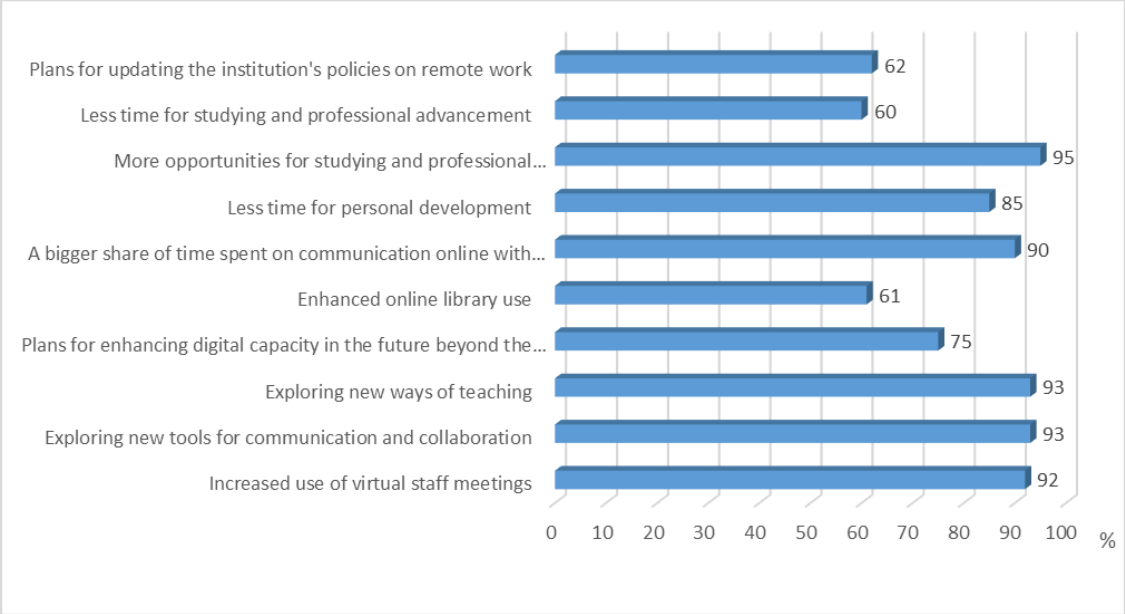
The answers to these questions are representative in terms of demonstrating the issues range and the state-of-art of online teaching and learning of Ukrainian universities. The analysis results were presented to the several groups of teachers including those who teach to foreign students and the obtained conclusions were confirmed by 95,4%. The survey results were enriched with the empirical experiences analysis and the literature review.

RESULTS

According to the survey (Fig.1), conducted in two Ukrainian universities among the teachers including those training foreign students, the COVID-19 has seriously influenced the administrative and teaching situations in the institutions. Thus, it motivated the administration to review the plans for updating the institution's policies on remote work (62%), for enhancing digital capacity in the future (75%) as well as to use more virtual staff meetings (92%). The teachers were also massively pushed to explore new tools for communication and collaboration and new ways of teaching to stay effective and engaging for learners, however, they admitted that they had less time for personal development, studying and professional advancement. Therefore, to stay effective in their

teaching the educators had to spend more of their personal time for professional advancement, which influenced their family and social relations, as well as health. Even though 95% of educators stress on an increased number of opportunities for studying and professional advancement, the time spent on communication online with students consumes their ability to use them.

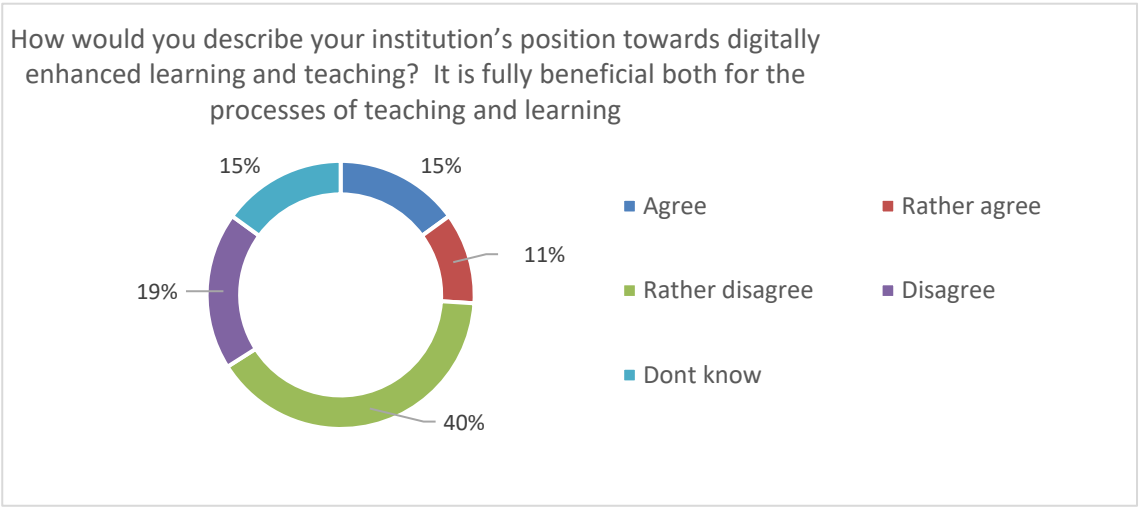
Figure 1: Main changes in studying process caused by pandemic.



(Source: Own)

It is interesting to note, despite certain personal inconveniences, 40% of respondents noted that their institutions see the digitally enhanced learning and teaching fully beneficial. Faculty and departments support their development (55%) (Fig. 2). There is a perception that digitalization is a feature of progress that cannot and should not be avoided and COVID restrictions somehow "helped" to embrace it even faster than before.

Figure 2: Institutions position and administrative support of digitally enhanced learning.



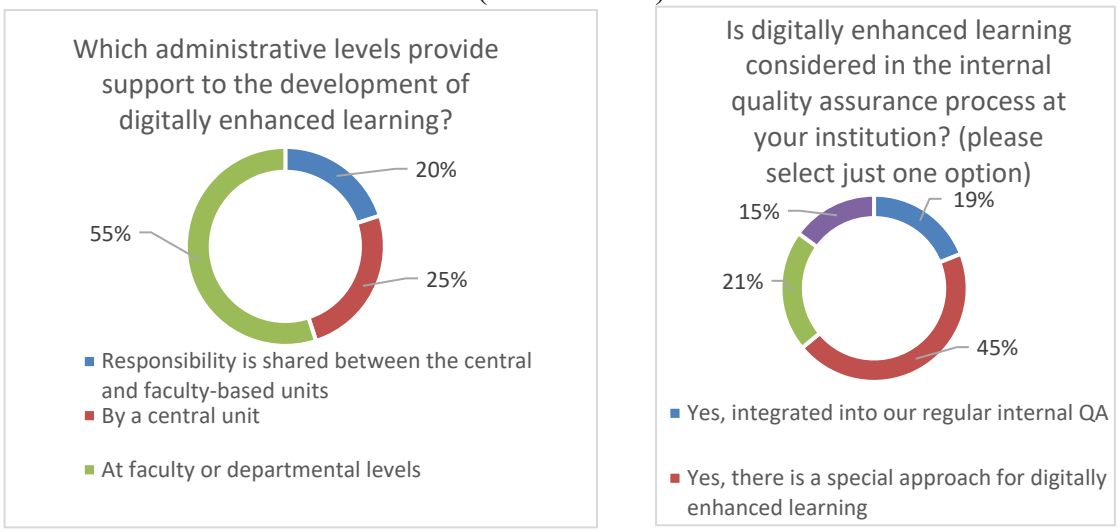
(Source: Own)

40% of respondents also rather disagreed that the educational process became more inclusive after shifting online. This may be explained by the level of wellbeing of the

students, especially those coming from the disadvantaged families (living in one room with the rest of the family, one device for several family members, bad Internet connection, etc) or rural areas. Still there is an advantage of availability of the educational material online 24/7 and the assignments that do not require physical presence in the class, especially for students with fewer opportunities, which are, however, very few in most Ukrainian universities.

Figure 3: Digitally enhanced learning and quality assurance.

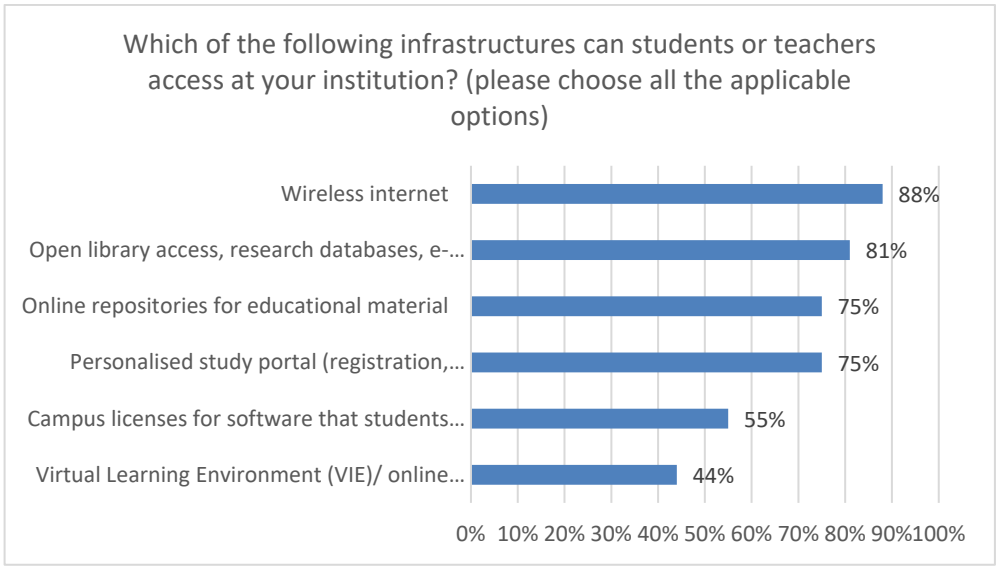
(Source: Own)



(Source: Own)

As the quality assurance system is under the process of development in most of the Ukrainian universities, 45% of teachers responded that a special approach for digitally enhanced learning was considered in the internal quality assurance process at their universities (Fig. 3).

Figure 4: Digitally enhanced learning and quality assurance



(Source: Own)

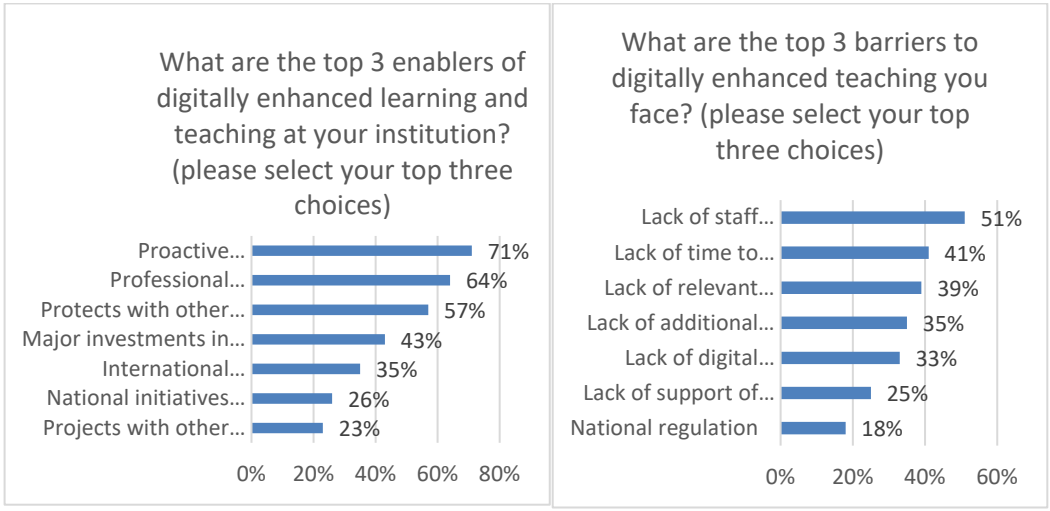
Both universities appeared to be well equipped for the challenges of the remote studies (Fig 4.), as they both provided wireless Internet to the students and teachers, as well as a personalised study portal offering the services of registration, transcripts, grades,

study plan, etc. 75% of the teachers appreciated the use of online repositories for educational material and 81% - of open library access, research databases, e-journals.

It is interesting to note that the top enablers of digitally enhanced learning and teaching were defined as follows (Fig. 5):

- Proactive participation of staff and students (71%).
- Professional development and training of teachers (64%).
- Projects with other higher education institutions (57%).

Figure 5: Main enablers and challenges of digitally enhanced learning.



(Source: Own)

The proactive behavior as well as the opportunities for professional development or travelling were limited during the lockdowns, however, the digital technologies allowed to keep the contacts and the project running. The face-to-face events were turned to online, which somehow even increased the number of attended events of professional interest by proactive teachers and students. This happened due to a simple fact of economizing time and money for travelling.

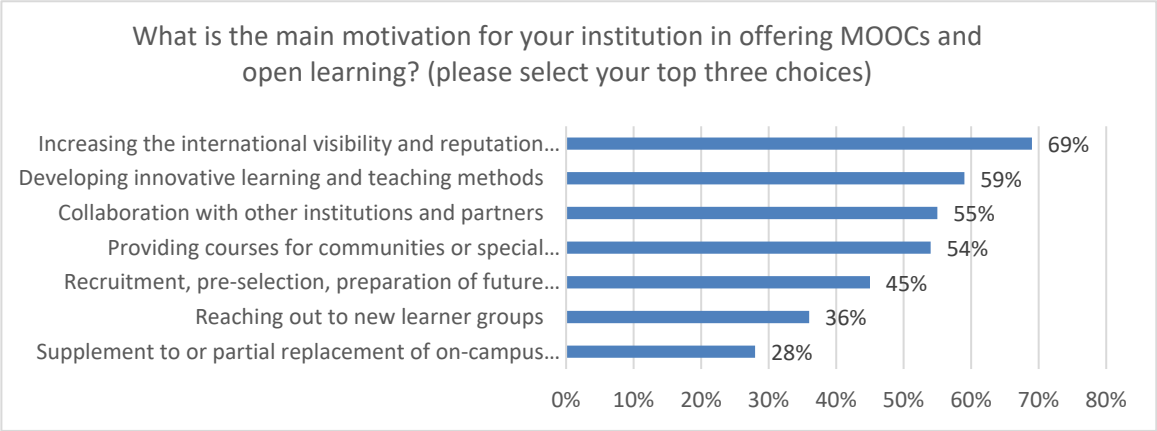
The 52% of respondents have also marked that they rather agree with the statement that the internationalization processes have enhanced within their institution during the COVID pandemic, mostly focusing on international cooperation opportunities development. This includes the participation in international online events that expand the chances to find a partner, making the meetings affordable and cheaper, and more common - being held online. Another 25% stressed that travelling restrictions made it challenging to cooperate with foreign partners, yet possible even though it took more efforts.

The important comment here is that both institutions representatives stated that their universities provided virtual student mobilities, MOOCs and other forms for open learning, and online professional advancement courses for teachers. On the other hand, the teachers named the following main impacts of digitally enhanced learning and teaching forced during the COVID pandemic, that observed:

1) It encourages the revision of teaching methods and innovates pedagogies (87%).
2) It dramatically raised the value of the live communication with me as a teacher for students (74%).

3) It challenges learning and teaching in foreign languages (69%).
4) It makes learning and teaching more flexible, regarding time and place (49%).

Figure 6: Motivating factors for MOOCs usage.



(Source: Own)

As both universities recognise the use and applicability of MOOCs and other open learning resources, the main motivation for them to offer these resources is (Fig. 6):

- increasing the international visibility and reputation of the institution,
- developing innovative learning and teaching methods,
- collaboration with other institutions and partners,
- providing courses for communities or special stakeholder groups.

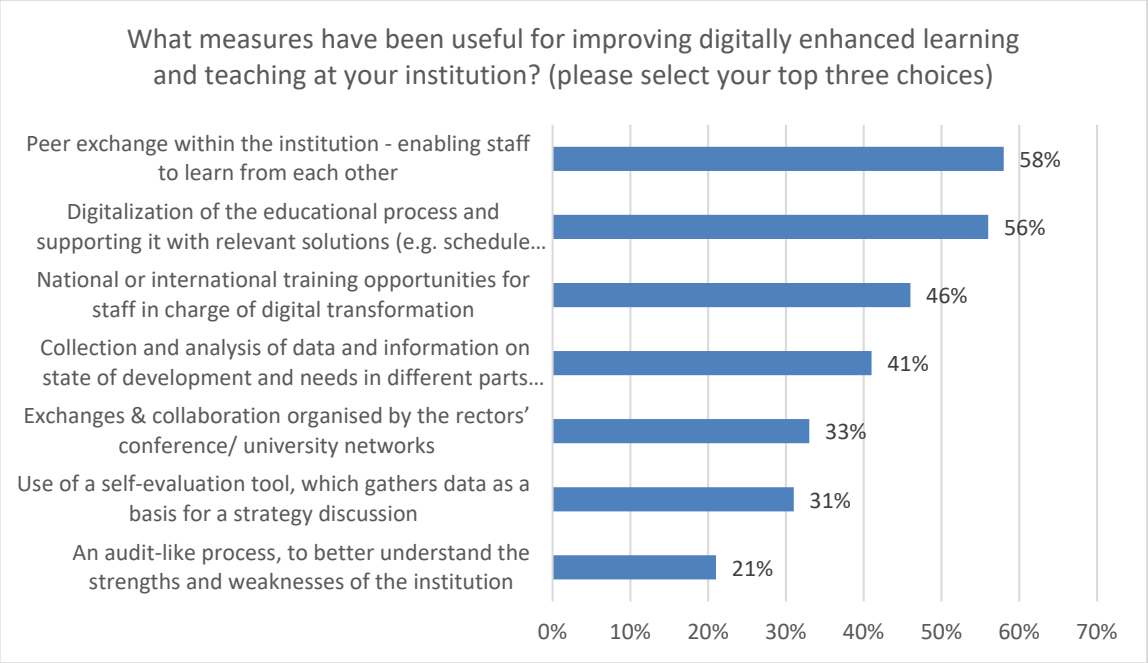
The respondents named the top barriers to digitally enhanced teaching as (Fig.5):

- Lack of relevant digital skills (39%).
- Lack of time to gain relevant digital skills (41%).
- Lack of staff motivation (51%).

The lack of digital skills relevant for teaching fully online is not the problem valid only for Ukrainian teachers, it started to be discussed right after the middle of the first lockdowns. This refers as well to the next two identified barriers with the rare exclusion of those universities which manage to organize the good balance between the teaching duties of the teachers and the others like research or organisational/administrative work.

As a response to the challenges the teaching staff and students face in terms of digitally enhanced learning and teaching, both universities take the following measures (Fig. 7): 56% of respondents marked digitalization of the educational process and supporting it with relevant solutions (e.g. schedule of classes, digital environment for communication with students, etc); 46% - national or international training opportunities for staff in charge of digital transformation; 58% - peer exchange within the institution by enabling staff to learn from each other.

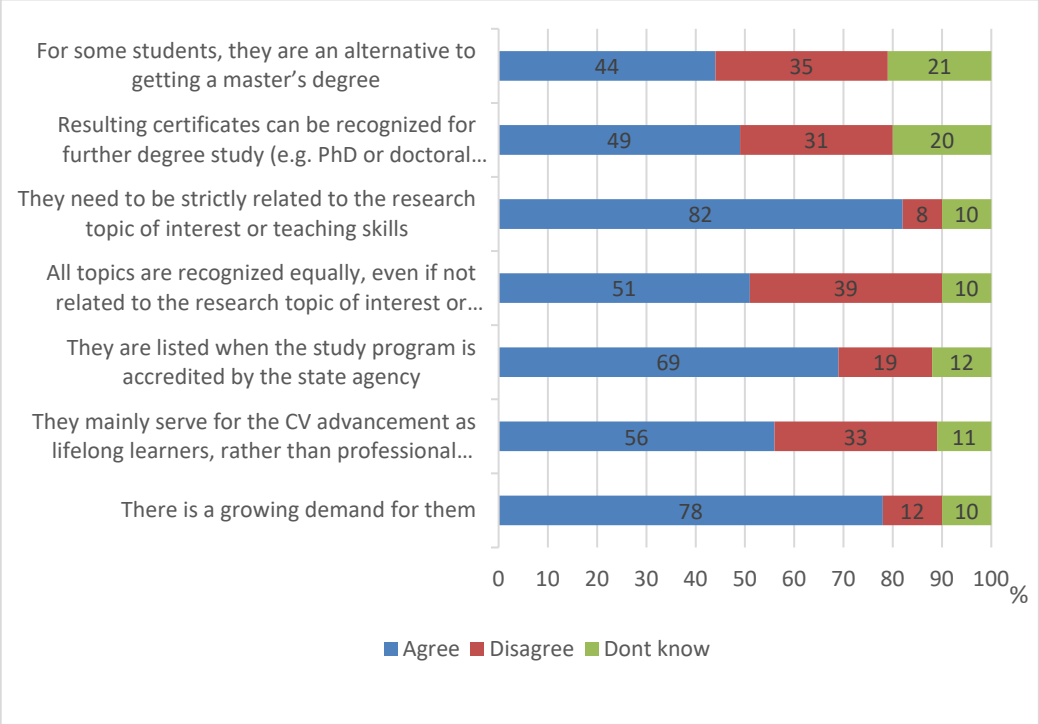
Figure 7: Measures for improving digitally enhanced learning.



(Source: Own)

However, in terms of professional recognition of their digital skills advancement, 78% of respondents (Fig.8) admitted that there is growing demand for the short courses (non-degree) where they can get certificates, micro-credentials or badges, as they are listed when the study program is accredited by the state agency (69%). The only specifics here is that they need to be strictly related to the research topic of interest or teaching skills (82% of responses).

Figure 8: Recognition of studying results.



(Source: Own)

The presented above statements were supported as well by the literature overview provided in the paper. All the mentioned above conclusions about the state-of-art of digital teaching and learning in Ukraine reflect the overall trends present in the world, which were presented in the literature overview above. There is a little specific about the cases of selected two Ukrainian universities.

DISCUSSION AND CONCLUSION

The article is devoted to the review of the COVID impact on the higher education trends currently being observed in the world, which are: digitalization of the educational process, introduction of new forms and methods of teaching, new approaches to the organization of the educational process, as well as internationalization of higher education and an increasing role of short-term courses and programs and MOOCs. Basing on the literature overview, empirical studies, and the survey of 200 Ukrainian university lecturers' opinions the following conclusions were made:

1) in overall the COVID-19 pandemic influence on the higher education trends may be estimated as positive in terms of qualitative and digital approaches.
2) In terms of inclusiveness: the full shift to online teaching led to a twofold effect in this regard. The students from socially disadvantaged groups appeared to be marginalized even more because of Internet speed, accessibility, laptops or PCs availability, comfortable conditions for studies, etc. The students with psychological issues and who are socially alienated got excluded even more. The students with fewer opportunities but living in families that are able to provide them with resources, were able to use the advantage of remote studies.
3) The increased use of additional online resources had also a twofold impact as on one hand it enriched and diversified the offered learning material, on the other hand it added to the technostress and technological fatigue, as well as challenges to the eyesight of the users, both teachers and students.
4) The need to use more online resources of a diverse nature led to the raised demand on digital skills both of educators and students, which has to be satisfied either by the home university or by external institutions.
5) As a consequence, the teachers in particular need additional time for self-education and further professional improvement which became a challenge under the COVID lockdowns circumstances. The need to stay fully online has rocketed the value of the live communication with a teacher. Because of personal specifics, extra digital skills needed or other reasons, the students needed more attention from the teacher, which took away the time from their personal or professional development.

To sum up, these and other impacts of the lockdowns presented in the paper, mostly may not be classified purely as negative or positive, and some are still under discussion. Each institution came to the conclusions that it needs to find the balance between these effects using its management and digital solutions available within its infrastructure and specifics. The survey is representative in terms of demonstrating the overall trends in the Ukrainian higher education as they later coincided with those presented in the research papers or other reports, as well as with the empirical studies.

The research outcomes highlight the importance of obtaining the relevant skills by academic staff to be effectively competitive not only at the international, but also national scale. As well as it stressed on the importance of the home university full administrative, managerial, and digital support of the teachers' efforts and initiatives in this regard. The research findings may be applied by the relevant university managers to improve the online education process in their institutions not only under the COVID lockdowns conditions but also for the better organization of blended or extramural studies.

It is also worth noting that comparing the survey results obtained from Ukrainian respondents, we can conclude that they slightly differ from similar surveys in other countries, e.g. the USA. Interestingly, their justification, in addition to significant differences in economic development and social preconditions may also lay in cross-cultural features of models of organizational behaviour. For example, according to Hofstede's model, Ukraine is a more collectivist and paternalistic culture. Thus, a greater degree of independence in studying can decrease the overall level of motivation to learn. In addition, in collectivist cultures, social interactions have a much more significant impact on feelings of psychological well-being. In general, a reduction of social contacts on a regular basis can lead to a deterioration in the development of emotional intelligence. In long term perspective digitalization of studying can affect the features of organization behaviour and culture peculiarities. Thus, the study of cross-cultural features regarding the effectiveness of digital technologies in education will improve approaches to the organization of educational activities and can become the basis for future research.

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SPECIFICS OF MATHEMATICS EDUCATION IN THE PREPARATION OF FUTURE TEACHERS IN PERIOD OF PANDEMICS COVID-19

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Abstract

During two semesters of the academic year 2020/2021, distance learning was implemented at Faculty of Education at The University of Ostrava due to COVID-19 pandemic. We implemented online learning via MS TEAMS and LMS MOODLE. Although digital competencies of teachers at Department of mathematics are at a very good level, this situation brought new challenges that both teachers and students had to face. During this online learning, we realized an action qualitative research. As a research goal, we set ourselves to identify interaction between subjects (students, teachers) during online education in two semesters of the academic year. For the research, we chose a qualitative methodology, we used the method of observation, interviews with students and text analysis. During the action research, we observed an increase in students' motivation to use digital technologies, we identified critical points of digital teaching and learning in individual courses. The preparation of this education seems to be much more time consuming and technically demanding, but on the other hand, prepared materials are also available for the next period.

Keywords

E-learning, Blended Learning, Education of Future Teachers of Mathematics, Distance Learning, Didactics of Mathematics

INTRODUCTION

In Autumn 2020, most universities in Europe and The University of Ostrava too, found themselves in a situation where, due to COVID-19 pandemic, education was moved to distance learning. This was a challenge for both teachers and students in spite of educating via Blended Learning had been implemented at this university for several years. LMS MOODLE was used mainly for systematization of e-materials, management of students' learning, presentation of new learning resources, evaluation and cooperation among students in digital environment. The transition to a complete distance learning in Autumn 2020 was a new and unusual situation for both students and teachers. The situation in a society (lockdown, uncertainty) also affected the psyche of students and teachers. However, education was relatively seamlessly transferred to the digital environment MS TEAMS. In the next part, we will introduce environment at the Department of Mathematics and subjects to be discussed.

The Department of Mathematics with Didactics of Faculty of Education at The University of Ostrava mainly provides mathematics education in following programs: Bachelor's Mathematics with a focus on education together with the follow-up Master's

degree in Mathematics for the second primary education stage, Master's Teacher Training for the first primary education stage, Bachelor's Teacher Training for Kindergartens. It also covers teaching of statistics and using of quantitative methods in pedagogical research in other study programs.

The Mathematics program with a focus on education are dominated specialized subjects such as Algebra, Mathematical Analysis, Analytical and Synthetic Geometry supplemented by the subjects The Use of Computer Science in Mathematics, Working with Pupils in a Mathematical Clubs, etc. In the program of Mathematics for the second primary education stage are dominated didactic-mathematical subjects such as Didactics of Mathematics and various types of practices. In the Teacher Training program for the first primary education stage are dominated didactic-mathematical subjects supplemented by some theoretical foundations, such as Basics of Propositional Logic and Set Theory or 2D and 3D geometry. There are only didactic-mathematical subjects in the Kindergarten Teacher Training program.

The first two programs have only a full-time form, the others have a full-time form and a combined form of education. Before the pandemic, mathematics was taught in all programs by full-time form using e-learning courses via MOODLE. During the pandemic, other platforms were gradually switched, e-learning courses were initially used for some subjects and the university e-mail was used as communication. In some subjects they had already been used platforms such as MS TEAMS, Google Meet, etc. Gradually, all education of mathematical and didactic-mathematical subjects moved mainly to MS TEAMS using e-learning courses and communication via MS TEAMS and university e-mail.

RESEARCH DESIGN

The qualitative action research methodology was used for our research. Our goal was to identify the interaction between educational subjects (students, teachers) in distance online education during two semesters of academic year from Autumn 2020 to Spring 2021. We chose a qualitative methodology for the research, we used the method of observation during online learning, interviews with students and text analysis (student tasks and projects).

According to Konopásek, qualitative analysis and interpretation of data is searching for semantic relationships between them and connection of descriptive categories into logical units (Konopásek, 2007).

According to Gavora, qualitative research is based on assumption that individuals construct social reality themselves in the form of meanings and interpretations. The research seeks to capture and describe these meanings and interpretations. It uses research methods such as unstructured observation, unstructured or semi-structured interview, narrative interview, etc. (Gavora, 2010).

The authors of article are also four researchers who carried out an action research within online learning of mathematical subjects to collect data and improve educating in specific conditions.

In the Pedagogical Dictionary, an action research is characterized as a type of pedagogical research and its purpose is to directly influence and improve a certain part of educational practice, it solves current needs of educational institutions. It applies

intervention strategies, proposes recommendations and tries to implement them. (Průcha et al., 2003).

Turek says that an action research is a practical research of teachers in a classroom, or a type of pedagogical research carried out by teachers that responds to current teaching problems (pedagogical experimentation). He further states that an action research is focused directly on improving, upgrading, positively influencing of teaching practice, while its results are directly used in pedagogical practice. At the same time, their contribution to development of broader generalizations or concepts and scientific theories is not excluded. It is an integral part of education (Turek, 1996)

According to Kostrub, constructionist design of education is a projection, designing and social architecture. It is a conceptual art that students share together and with their classmates and teachers via discursive and narrative nature of teaching, in which they design, discuss, describe, present, approve, evaluate, judge, argue, create and transform intangible products into material forms and vice versa. It is based on the assumption that learning processes are particularly effective if we create something for others during them and lead a discourse on it. It is about what is essentially intelligible, coming from the mind, thinking not from senses. This is done as a teacher-led intentional but indirect participation of students as well as the teacher in teaching activities, but the teacher remains in a position of consultant when he is invited by students to consult their ideas while he is avoiding pointing out mistakes (mistakes are identified by students by using their critical thinking). Constructionist education takes place by didactically thought-out but conceptually open teaching activities and discourse, guided argumentation, fact-handling, discussion in a certain intellectual interface of arguing subjects, in the form of individual discovery, but also group discovery (learning groups) thanks to which common knowledge and understanding are created. (Kostrub, 2020).

In the next part are presented the research implementation and interpretation of four researchers - the authors of this publication (a researcher and a teacher is marked 1 to 4), according to individual courses (marked A to D).

IMPLEMENTATION AND EVALUATION OF RESEARCH

Research 1A: a field of study Teaching for the first primary education stage, subject Geometry

In this course, students consider and connect knowledge focused on the content of Geometry of the first primary education stage in four thematic units - planimetry, stereometry, geometric representations and the degree of geometric shapes. The key method is to solve problems, mostly through sketches, draws or calculations. Before the pandemic, full-time education took place in classrooms, unlined or squared boards were used to demonstrate the solution and students cooperated. Students used drawing supplies, crayons, scissors, office papers, solid models, unlined and squared papers. During the pandemic, online education took place, the tasks were solved on paper as standard.

The main problems were:

- Presentation of solutions for both teachers and students,
- Students' cooperation.

The teacher first used an external camera for presentations, some students complained about poor quality transmission. Therefore, the teacher later switched to working on a shared whiteboard. Presentations of student solutions remained an unresolved issue. They partly used a shared whiteboard, but there was still a need to present the solution on paper. They tried to use a camera, but the image was not always legible and some students stated that they did not have a camera. So the teacher was completely losing the ability to provide feedback.

The fulfillment of compulsory subjet's output was diagnosed by semester work before the pandemic, students solved practical tasks and submitted in paper form and by a written exam where students demonstrated knowledge of theoretical content. During the pandemic a form of submitting the work was changed to electronic, a problem was some records quality and misunderstanding of some types of tasks (this was manifested only with the submission of final work, so a teacher often reflected several times in detail and a student corrected). During the pandemic, students were using more consultations with teachers and electronic resources, especially e-courses, which are available for each subject. Some of them bought a license for an electronic textbook. Students in the full-time form of study were evaluated comparable to groups in previous years. Students in the combined form were worse and it could have more causes. We consider, time burden in their jobs to be the most likely (mostly teachers), but also lower digital literacy (older users).

Students' motivation is generally lower, comparable before and during the pandemic. They consider subject's content to be demanding, the pandemic did not make the situation any easier for them. They complained about impossibility of face-to-face cooperation, longer feedback. Combined students met the requirements for the subject's output much later than before the pandemic, some of them did not do it at all. The reason can be that the most of them are practitioners and during the pandemic they taught online their pupils and could not combine this time-consuming obligation with their studies. On the other hand, students appreciated availability of electronic resources and new knowledge in using online methods, such as group work, shared whiteboards.

The critical point of the content was:

- Generalization, where students had great difficulty to change experienced
- "formula – application" algorithm to construct a relationship / formula. The
- reason could be more difficult cooperation,
- Symbolic notation of the structure which was probably underestimated by the teacher (in full-time education he organizes the notation on the board, in online he did not solve it),
- Some stereometric constructions in free parallel projection, where students did not have fixed rules and conventions of projection (eg regular tetrahedron),
- Determination of shapes'content in a square lattice, where tasks are drawn from textbooks for the 1st grade of Elementary School, new and little experienced for students though.

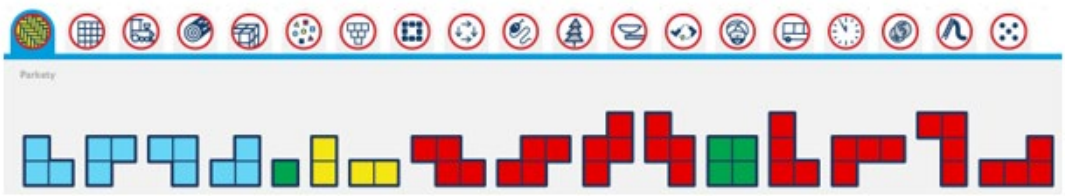
Research 1B: a field of study Teaching for the first primary education stage, subject Didactics of geometry

The subject follows up Geometry. Students get known with various methods and forms of teaching Geometry in the 1st grade and discuss them. They concentrate on the constructivist concept, specifically the genetic method (method of building schemes, reference), which has great demands on working with teaching aids. The education includes didactic videos and their analysis. Students work with printed textbooks for the 1st grade of primary schools. At fortnightly intervals, students participate professional practice in mathematics lessons at primary schools. Before the pandemic, full-time education took place in classrooms by the form of practical workshops with using of a large number of aids. Students were collaborating, walking free around the classroom, watching, discussing and analyzing didactic videos of geometry teaching. During the pandemic, there were online lessons, students worked with aids in front of the camera.

The main problems were:

- The need to replace standard aids - students helped themselves by things from their own household, which can be beneficial for future practice,
- Solution presentation - problematic was the orientation of modeled formations (timber shapes, cubic structures…), when the internal camera took the opposite view. The solution was an external camera, which only the teacher had. The problem was partially solved by using a shared whiteboard adapted for the genetic method - Collboard (collboard.com), where it was possible to present the solution in prepared environments, see the figure.
- Students' cooperation - work was partially provided in groups, which the platform additionally allowed, but teacher's feedback was very limited
- Presentation of didactic videos online was not possible due to various delays for individual users. The teacher sent a link to chat and footage, the students watched it separately, later a joint analysis took place. The problem was impossibility to watch the video together, stop at the necessary place, discuss, etc.
- Working with a textbook - students do not have their own printed textbooks and it would be relatively expensive to buy them (this is whole textbook series). So we used an electronic textbook, which has certain specifics due to the printed one and in the way of its using does not completely replace it for practice.
- Professional practice - students participated in educational practice by form that was currently implementing in a primary school. Their new experience with the online form of working with pupils was interesting, which they evaluated very positively and beneficial for practice. The technical problem was initial difficulties of some schools to connect the student (external person) to the school's remote platform, after solving it, the schools gained new experience.

Figure 1: Collboard.



(Source: Own)

The fulfillment of compulsory subjet's output was diagnosed by semester work before the pandemic. Students compiled mental schemas of geometric objects and

suggested a set of graded tasks for pupils and realized them during education at the first education stage at Primary schools and analyzed pupil's solutions. This content was preserved during the pandemic and we did not encounter any problems. Students used consultations, electronic textbooks and other electronic materials, especially e-courses, comparable to the ones before the pandemic. Students of both forms of study were evaluated approximately the same as students before the pandemic. The motivation of students is generally high, given mainly by connection to parallel professional practice. During the pandemic, students were much more interested in distance learning, ideas for own producted teaching aids and methods of formative assessment of pupils. We do not know of any critical points related to the pandemic.

Research 1C: fields of study: Teacher Training for Kindergartens, Pre-primary Pedagogy, Special Pedagogy, subject: Pre-mathematical activities

Students in practical activities go through theoretical and especially practical understanding processes of comparison, assignment, sorting and arrangement. Following this, they are thinking about building numerical and spatial ideas of preschool children.

The fulfillment of compulsory subject's output was diagnosed by semester work before the pandemic. Students suggested a set of graded activities from pre-mathematical activities, implemented them in preschool education and analyzed children's strategies. It was not changed during the pandemic (kindergartens in the Czech Republic were open at the time, they did not attend online lessons). Students used consultations and electronic materials comparable to the ones before the pandemic. Students of both forms of study were evaluated approximately the same as students before the pandemic. The motivation of students, especially combined students, is generally high. It did not change during the pandemic. We do not know of any critical points related to the pandemic.

Research 1D: fields of study Teacher Training for Kindergartens, Pre-primary Pedagogy, Special Pedagogy, subject: Didactics of Elementary Mathematics

The subject follows up Pre-mathematical activities. Students acquaint and discuss the constructivist methodology of numerical and spatial ideas developing in selected didactic environments suitable for preschool education. The method makes claims to working with teaching aids. Education includes didactic videos and their analysis.

The fulfillment of compulsory subjet's output was diagnosed by semester work before the pandemic. Students suggested a set of graded activities from mathematical didactic environments, implemented them in preschool education and analyzed children's strategies. Kindergartens in the Czech Republic were closed for a time during the implementation of subject so students needed more time to complete tasks. They did not participate in online classes, they carried out the implementation by full-time form. Students used consultations and electronic materials comparable to the ones before the pandemic. Students of both study forms were evaluated approximately the same as students before the pandemic. The motivation of students, especially combined students, is generally high. It was not changed during the pandemic. Students became interested in using of digital educational technologies in generally, tutorials and applications, such as Collboard. They were interested in robotic toys related to computer thinking development. Due to distance learning, there was a partial misunderstanding some didactic environment's rules and their application in a group of children. The error was only discovered during the final reflection with the teacher. However, the scheme was corrected and the error did not harm children in such a short time of experimental verification.

Research 2A: a field of study Teaching for the first primary education stage, subject Arithmetic 3

The subject's content is to acquaint students with basics of education based on genetic constructivism in the field of arithmetic at the first primary education stage. The basis of subject is to get acquainted with arithmetic didactic environments, which are the main elements of such designed education.

Before the pandemic, education was conducted associated and active mainly. Students got acquainted with educational methods via their own activities, education was based mainly on cooperation and followed up joint solution of tasks either activity or on the board. After the transition to distance learning, cooperation was the biggest problem. Education via MS TEAMS was led by students. A group of students prepared materials for given environments, led education and they asked questions so that other students could try to find possible solutions. While pre-pandemic education was based much on dramatization, cooperation and activities, during the pandemic it was mainly based on an individual approach. Discussion took place only when common solutions were identified in shared environment.

At time of pandemic, it was necessary to complete presentations on individual environments. Before the pandemic, students were evaluated primarily for their abilities to create and solve tasks in given environments. During the pandemic, focus shifted partly to preparation of lessons comprehensively and also more emphasis was placed on creating tasks. Before the pandemic, motivation was mainly in solving tasks. During distance learning, motivation shifted towards their preparation for education. Critical points consisted mainly of a limited possibility for cooperation and dramatization during education, where students did not have available tools for manipulative activities, sufficient technical equipment, sometimes a weaker signal on their part.

Research 2B: a field of study - Mathematics program focused on education (Bc. Degree Teaching mathematics for the second primary education stage), subject Fundamentals of Mathematics

The subject's content is to equip students with basic knowledge and skills in the field of intuitive set theory and algebra. Before the pandemic, education was based on full-time lectures and exercises, supplemented by e-learning course contained mainly printed study materials. During the pandemic after transition to distance learning, education was initially based on self-study and consultations. Gradually, e-learning materials were supplemented by videos devoted to problems solving.

The next step was complete transition to online learning of this subject via MS TEAMS using supporting e-learning courses. Because of time consuming, lectures mainly summarized basic theoretical concepts, definitions, statements, etc. After that more time was devoted to tasks solving in exercises, which took place mainly frontally using a graphics tablet as a board. A teacher stated a task which he recorded on the tablet. Subsequently, students were given time to think and after it, a student dictated the solution, and the teacher wrote it down on the tablet so that everyone could see it and enter into it with their notes and comments.

Critical points were mainly limited cooperation among students (in pairs, triplets, etc.) Like in full-time education, there was worse technical equipment of some students (signal outages, problems with images, etc.) A joint discussion in solving problems at the board was also limited.

Research 3A: a field of study: program Mathematics focused on education (Bc. Degree Teaching mathematics for the second primary education stage), subject Seminar in Mathematics

As the main aim of this course, a strengthening the basic mathematical knowledge of the student is considered. From the initial recapitulation of number fields and arithmetic chapters, the student continues through the topics of the linear algebra solving the conditions of solvability of mathematical problems. The algebraic calculus is explained using numerical and graphical methods. In more complex problems, including absolute values and inequalities, the zero-point method can be suitably applied for purposes of the clarification of the process of solving the given task. The overview of elementary functions of a real variable is continuously followed by an introduction to combinatorics. Finally, the number field of complex numbers is described with implementation of particular operations. The practical application of mathematical chapters will be demonstrated in software Octave, wxmaxima, libreoffice, simreal and geogebra. The appearance of the constraints was instead only from the online form of the finalization of the requirements of the seminar. The final works were not presented physically; however, the platform of the MS Teams was utilized in the online format.

Research 3B: a field of study - Mathematics program focused on education (Bc. Degree Teaching mathematics for the second primary education stage), subject Mathematical Analysis

The aim of the course is to introduce basic concepts of the theory of a single variable real function. It involves a concept of real functions, basic properties of them, domain, range, graph of a function, representation of a graph function using mathematical software, limit of a function, continues functions, derivative of a function, representation of the derivative in geometry and physics, total differential of a function, local and global extrema of a function, Roll and Lagrange Theorem, course of a function. The technology of the MS Teams has been used due to the pandemic situation according to the classical requirements, which the students must fulfilled.

Research 3C: a field of study - Mathematics program focused on education (Bc. Degree Teaching mathematics for the second primary education stage), subject Mathematical Statistics

The course extends the contents of the course Introduction to Probability. It gives the introduction to mathematical statistic and involves a concept of a random sample, descriptive statistics, principles of estimation theory, regression and correlation analysis, testing hypotheses, parametric and non-parametric methods, statistic data evaluation using statistical software - MS Excel, PAST Statistics. The constraints of the pandemic situation have not been so significant for the generally form of the utilization of the software possibilities (e.g. Barot, Burgsteiner and Kolleritsch., 2020; Korenova et al., 2019) independent on the online or full-time education of the course. The exam questions were realized only by MS Teams sessions for the real feedback by teacher and students.

Research 3D: a field of study - program Erasmus+ (Bc. Degree for Teaching mathematics for the second primary education stage), subject Numerical Methods

The course introduces numerical methods which can be suitable applied in construction of educational materials for mathematics. In the introduction, the basic concepts and properties of chosen mathematical problems are explained. These problems are further solved using the numerical methods. There are the approaches of differential and integral calculus. Further, the basic methods of optimization are presented for the

purposes of an analysis of a course of functions. Chosen examples are implemented in MS Excel and Octave. The elementary essential techniques of programming are explained. This course was offered in the digital form for the foreign incoming students in the frame of the Erasmus+ session. There were not the critical constraints due to the education with regards the submission of the seminar works.

Research 4A: a field of study - program Mathematics focused on education (Bc. Degree Teaching mathematics for the second primary education stage), subject Synthetic Geometry 1

The aim of subject is to repeat, deepen and expand the basic knowledge of planimetry acquired which students have learned at secondary schools. Thematic course's areas are: Principle of axiomatic construction of geometry, Polygons, Sets of points of a given property in a plane, Euclidean constructions and construction problems, Group of identical representations and Group of equivalences and Apollonius problems.

Full-time education was focused on the constructionist teaching strategy in the digital environment. Full-time learning before the pandemic took place in atmosphere of social constructivism (projects, working in pairs, group work, exploratory learning, etc.). Students used both classical drawing aids (a compass, a ruler) as well as GeoGebra dynamic geometry software - mostly used Geometry application by GeoGebra for smartphones or GeoGebra Classic 6 for notebooks.

During distance learning was a possibility for cooperation in groups limited. Students did not have an opportunity to work in groups or pairs, despite MS TEAMS allows it. Students' willingness to create team projects was low. They justified it by different levels of their technical equipment at home (internet speed, PC quality or NB). We observed that using GeoGebra divided students into two groups: most of them preferred the ability to solve problems using GeoGebra, but a smaller group of students preferred drawing on paper using traditional drawing tools.

The teacher used screen sharing via MS TEAMS for presentation. We used MS PowerPoint presentations, GeoGebra constructions, videos and animations. These materials were also available to students offline via LMS MOODLE and MS TEAMS. Critical points of distance learning in this course were especially feedback and evaluation of students. Before the pandemic the fulfilment subject's compulsory output was diagnosed by final test. In the winter semester, they passed a test, but it was not possible for time and technical reasons to provide a test that could have evaluated students' knowledge objectively. A problem was also students' homework presentation because not all students had a functional camera on a PC, or had a slow Internet connection. Most students sent a photographed solution on paper or a screenshot of the solution via GeoGebra.

The main problems were:

- Keeping a constructivist strategy of teaching and learning due to students' reluctance to work in teams,
- Presentating of solving construction tasks by students,
- Measuring knowledge by tests (it was difficult to ensure objectivity in e-tests due to the creativity of students in illegal cooperation during the test).

Research 4B: a field of study - program Mathematics focused on education (Bc. Teaching mathematics for the second primary education stage) subject Synthetic Geometry 2

The aim of subject is to repeat, deepen and expand the basic knowledge of stereometry acquired which students have learned at secondary schools. Thematic course's areas are: Positional and metric properties of spatial formations, mutual position and deviation of lines and planes, classification, composition and properties of identical representations in space, group of similarities, Polyhedra, Euler's theorem.

Full-time education focused on the constructionist strategy of education in a digital environment, similar to the course Synthetic Geometry 1. This course was implemented in the summer semester, so teachers and students already had more experience with distance online learning. Students used both the classic drawing aids (a compass, a ruler) and dynamic geometry software 3D Calculator by GeoGebra for smartphones or GeoGebra Classic 6 for notebooks. We also used GeoGebra Augmented Reality application, which is suitable for spatial imagination developing and greater visualization.

During distance learning in this semester, we focused more on solving problems in pairs or triplets. Instead of tests, students solved projects, they could arrange group work via MS TEAMS, their motivation for teamwork in solving projects and homework was improving. They submitted video tasks and projects which also contained an audio track - the procedure and explanation of solving tasks. During the online meetings, we presented these videos by screen sharing and a discussion took place among students, which also developed critical thinking. Students were motivated to use GeoGebra 3D Calculator.

The main problems were:

- Time-consuming preparation of teachers and students,
- Technical problems of students (slow internet, broken camera, etc.).

DISCUSSION AND CONCLUSION

During two semesters of distance learning of mathematical subjects at Faculty of Education at The University of Ostrava, which took place online via MS TEAMS and LMS MOODLE, we observed an increase in digital literacy of students and teachers. During the action research, we observed an increase in students' motivation to use digital technologies, we identified critical points of digital teaching and learning in individual courses. The preparation of this education seems to be much more time consuming and technically demanding, but on the other hand, prepared materials are also available for the next period. We will further qualitatively evaluate and publish research's results.

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DIGITIZATION OF INCLUSIVE EDUCATION DURING THE PANDEMIC TIMES

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Abstract

The article reveals the main digital tools that allow everyone to intensify classes. Peculiarities of application of active teaching methods in universities in online and offline forms in the period of pandemic under conditions of inclusiveness are considered. Authors identified the problem areas and process of using digital technologies in inclusive groups. The recommendations on the organization of online classes in inclusive groups are formed. The primary task of inclusive education in the context of accelerated digitalization is to update the content, methods, and organizational forms of educational work, modernize educational programs, develop and implement effective digital teaching materials and transition to a personalized and result-oriented organization of the educational process.

Keywords

COVID-19, inclusive education, digitalization, digital technologies, digital storytelling, PBL.

INTRODUCTION

The COVID-19 pandemic that has swept the world has posed a challenge for higher education – to ensure the implementation of the educational process using digital technologies (Evans-Amalu, Claravall, 2021). The education landscape is suddenly faced with a need, entrenched digitalization. While these transformations are ingrained and whether they will continue in the future is not yet known (Pelletier et al., 2021). The only thing asserted is that the higher education landscape will never be the same. The system of higher education depends on worsening epidemiological situations and the COVID-19 outbreak during 2019-2021. The initiators of these changes were professors who, in short lines, needed to master new teaching tools within the framework of existing methods. Transforming the learning environment from offline to online has proven challenging for several reasons. Firstly, inequality of access to digital technologies. It is important to emphasize that the digital divide exacerbates the "traditional" educational inequality associated with the physical, cultural, psychological, and social capabilities of applicants belonging to different social groups. Inclusive and equitable access to digital technologies should be ensured by the institution of higher education or by participants in the educational process

(professors, students, or their families) (Iivari, Sharma, Ventä-Olkkonen, 2020). Higher educational institutions cannot provide students with the necessary devices and stable access to the Internet. The development of information and communication technologies is narrowing the technological digital divide. Devices become more accessible. Different types of inequalities between people who use digital technology to enhance productivity, creativity and others who use it passively to perform traditional routine functions are persistent and widening. Secondly, the difference in the level of digital literacy between professors and students. That can lead to uneven learning and different learning effects. Therefore, the choice of effective teaching methods and digital technologies should be contributing to meeting the individual needs of students with disabilities. At present, the scientists focus on methods and tools of inclusive education in schools, but higher education remains unaddressed.

METHODS

The inclusive approach is caused in education the need of societies and governments. The main criterion of inclusive education is the maximum social adaptation. In the future - the professional and labor adaptation of children with disabilities. The application of a systematic approach to the modification of the educational process at universities for students with disabilities in a pandemic made it possible to rethink the role of the professor; carefully selected teaching methods aimed to "ensure the unity of education, upbringing, and development" (Babanskiy, Babanskiy, 1989); replacing traditional methods with digital tools that allow you to intensify classes. This approach is aimed at the continuous development of the teacher's competence, which creates conditions for the professional and personal development of students. In this respect, competence always manifests itself in organic unity with human values. Since only under the condition of competence a value attitude towards activities, people, the surrounding reality, and personal interests will be achieving a highly professional result. Simultaneous subject-activity (Lodde, 2019) and acmeological approaches determine the choice of teaching methods and digital tools for students with disabilities. The created educational environment contributes to the formation of personal and professional competencies in persons with disabilities.

LITERATURE REVIEW

Recently, the issue of inclusive education in the university is increasingly covered in the scientific works of western schools' scientists, but Ukrainian scientists still stay away from such research. At present, the scientific paper of Ukrainian scientists' focuses only on education methods in high education. Among foreign scientists in the field of inclusive education in higher educational institutions, the work should be noted: B. Morgado, M.D. Cortés-Vega, R. López-Gavira, E. Álvarez (Moriña, 2016; Morgado et al., 2015), Y. Zhang, F. Rebrina, F. Sabirova, J. Afanaseva (Zhang et al., 2020), T.M.Egorova, N.N. Belukhina, T.S. Akhmedzyanova (Egorova, Belukhina, Akhmedzyanova, 2018), V. Marín-Díaz (Marin-Diaz, 2017), H. Lourens, L. Swartz (Lourens, Swartz, 2016) and many others. Inclusive education at Ukrainian universities became possible only after the ratification of the United Nations on the Rights of Persons with Disabilities in 2009. The aim of this article is analyzed digital tools of inclusive teaching at Universities that allow to intensify classes in online and offline forms in the period of pandemic COVID-19, identify problem areas and process of using digital technologies in inclusive groups, provide recommendations on the organization of online classes in inclusive groups.

RESULTS

The main message of inclusive education in higher education institutions is “universities are creating for students; non-students are creating for universities”. Universities should understand students' specific needs and students correspond to the profile of the university and the conditions of the quality of education. The peculiarity of inclusive education lies in its dynamism because there is a constant adaptation of the learning environment to the individual characteristics of each student. The key to the successful implementation of the inclusive education model in higher education institutions is professors' cooperation to increase student learning and achievement. Well-designed, meaningful curricular tasks form students’ self-directed learning skills and motivate them to participate more actively in learning (Park, 2019). Educators should develop an effective inclusive education system that increases student autonomy in the educational process. And the professors’ must play the role of facilitator, guiding and helping the learner in shaping the trajectory of his learning activity (Rogers, 1995). Most of the facilitators viewed the students as colleagues (McLean, 2003). Achievement of these characteristics requires painstaking, serious work of the professor in choosing methods and forms of training.

Digital technology in inclusive education. The role of digital technology in the educational needs of people with disabilities is much more varied. On the one hand, they must, like their peers, acquire the knowledge and skills necessary in the society in which they live. On the other hand, they have (by definition) additional requirements (often referred to as special educational needs) caused by functional limitations that affect students’ ability to access standard educational teaching method and techniques. In this context, for students with disabilities sing, digital technology is vital. They take an important place in providing high-quality education for students with disabilities. Thus, it is possible to meet the specific educational needs of various groups of students, including persons with disabilities (Mirkarimova, 2017). Among the main types of digital technology that used in inclusive education are following (Chupakhina, 2019):

- standard technologies: personal computers (desktops, laptops, netbooks, tablets) with built-in functions for people with disabilities;
- accessible data formats or alternative formats: accessible HTML, DAISY (digital format standard for recording digital audiobooks, braille printers, displays and language synthesizers, etc.);
- assistive technologies – hearing aids, screen readers, keyboards with special functions, alternative communication systems.

Students with disabilities can use various digital applications as auxiliary tools in learning. They can install it on PCs, tablets, smartphones, etc. Table 1 shows examples of digital supplements that are freely available. And the students with disabilities for full access to the educational process can research any digital supplements.

Table 1: Recommended digital supplements for inclusive education.

Problems	Recommended digital supplements
Speech development	applications of alternative communication (Govori.org), development of diction (Digital Inclusion)
Hearing impairment	applications for sign language translation (Spread Signs), recognition, speech recording, sound amplification (Petralex), sound-to-text conversion (Voice Writer), for subtitles (Hangouts Meet); sign language ("Sign language. Learning to dactyl", "Spread Signs")
Visual impairment	programs for controlling the device using voice, reading text on the screen (Google Language Synthesizer, TalkBack screen reader); special adapted devices for working with a computer (yellow keyboard, with capital letters and numbers, displays and keyboards with Braille, touch-sensitive smartphones for the blind); Braille voice typing applications (G-Suite)
Cerebral palsy, autism	alternative communication programs that allow you to communicate using icons - in text chats and during video conferences (Sesame Internet messenger, Speak Silently: Autism Dialogue application, Quick Talk, Scene Speak); some similar resources have already added a simplified analog of the keyboard, numbers and basic signs, which allows you to combine icons and text, creating associated grammatical structures for remote communication

(Source: Own)

INCLUSIVE EDUCATION AND DIGITAL TECHNOLOGY: REFLECTING ON METHODS AND TOOLS

The effectiveness of using digital technology in the learning process directly depends on the tested combination of forms and teaching methods. Before the pandemic COVID-19, synchronous forms of learning were used for all, without exception, full-time learning students and asynchronous for distance learning students. But during and post-pandemic, most universities switched to distance learning. In the context of distance education, the combination of synchronous and asynchronous teaching methods is more effective.

According to professor-student interaction, several main groups of methods and tools are distinguished (Zhang, Rebrina, Sabirova, Afanaseva, 2020; Musifullina et al., 2020):

- personalized learning using technologies such as email, forum, chat, social media;
- active interaction of participants in the educational process (interactive training): videoconferences, instant video messaging, simulation and role-playing games, round tables, discussions. Interactive communication between students is an irreplaceable source of knowledge. They help to overcome the social isolation that is typical for children with disabilities.
- teaching based on the presentation of educational material on digital media or posted on the Internet;
- self-study methods in which students work with educational content practically without the participation of a professor and classmates;
- methods impact the course design process with web technologies (integrated training packages used for joint work with information resources, group work with remote technologies).

These methods and tools can use most professors because it requires minimal digital literacy. The professor can meet with students during video meetings, audio communication, chatting, and, at one time, through e-mail, a blog, a lecture in the recording gives them material and tasks to work out at a convenient pace on their own. Regular feedback to discuss the achieved results is essential, but it is irrational to require it on every task.

Educators who will raise their digital literacy to a higher level using more advanced methods and digital tools: project-based learning, problem-based learning, digital storytelling, simulating, web-quest technology, research-oriented learning.

In higher education institutions, the process of inclusive education uses the project-based learning (PBL) method. It provides for the search for non-standard solutions to real problems, during which students acquire new knowledge and acquire skills and abilities in research. The training process in PBL is creating the specific circumstances in which the student relies on the acquired knowledge, independently identifies, and comprehends the professional educational professional problem, searches, and substantiates the most optimal options for its solution (Batyayeva et al., 2016; Thomas, 2000; Thomas, Mergendoller, Michaelson, 1999). Learning using this method provides a full-fledged mastery of the problem in real-life situations with the maximum use of evidence-based information resources. The methodological basis of PBL is competence-based and contextual approaches with the leading role of the situational approach (Lopanova, Sudakova, 2016).

Students receive a practical task even before they have acquired knowledge of the object under study. Students with disabilities work together in small-shared groups to solve a problem: analyze a problem, share ideas, form hypotheses, study additional information, and choose optimal solutions. The acquisition of new knowledge and skills occurs in the process of searching for options and making decisions. The problem-based approach complements the reproductive approach by actively involving the student in the learning process.

The main stages of problem-oriented learning are awareness of the problem, its solution in the course of the hypothesis, and verification of the solution. There is no universal model of PBL. Key steps to PBL are as follows (Sibul, Smirnova, 2017; Lopanova, Sudakova, 2016):

- Understanding and clarification of texts, terms, concepts. Each student of the workgroup needs to read the material, defining any unfamiliar terms that interfere with group work.
- Formulation of the problem to be discussed. It is crucial to see different perspectives and definitions of the problem. A problem must form precisely. Students can solve this problem. They can offer their views on the issues, but all proposals must be discussed and included in the agreed list.
- Brainstorming to discuss the problem, suggesting possible explanations taking into account prior knowledge, identifying areas of insufficient knowledge.
- Revising steps 2 and 3 to transform the consideration of the problem(s) and possible solutions.
- Formulate educational tasks.
- Individual study of the problem. During which students collect information that meets the assigned educational tasks.
- Sharing the results of an individual study of the problem. Each team member presents their findings, discussing inconsistencies and clarifying ambiguities.

To increase the effectiveness of PBL using different software tools. These software tools allow students to produce their mental models (ideas, strategies, ways of understanding based on previous experience). In this case, the information received earlier is updated. Also, these tools help develop metacognitive skills, including the correct interpretation of the information received about the problem of its solution, considering various factors. Such tools help to organize the process of arranging and presenting their knowledge also. The use of digital technologies allows students to visualize and structure teaching information, formation skills to reformulate tasks, to

make the transition from intuitive understanding to the formalized description (Kostousov, Simonova, 2020). Such tools can be, for example, constructors of mind maps, concept maps, information visualization programs, etc.

A key aspect in joint work on projects of students with disabilities is the development of skills for effective teamwork and leadership qualities. In offline learning, the PBL method into practice by building effective teams. Determine the position of each student in the teams' carried out on the Belbin or Hogan test, etc. Who works on the project online and independently organizes joint work outside the audience? In distance learning in a pandemic COVID-19, such teams can discuss the project in separate rooms in the Zoom video conferencing service while working together on the visualization of the project, which on the available data stores is located (for example, Google Drive, Dropbox, WineDrive et.).

PBL often encourages students to develop their hard skills and soft skills at the same time. On the one hand, PBL stimulates reflective thinking while searching and analyzing the necessary information (Diehl et al., 1999; Krajcik, Blumenfeld, 2006; Moursund, 2002; Thomas, 2000). Technological tools can facilitate learning (Mohamadi, 2018). But it requires the skills to use digital technologies to visualize research. The integration of new technologies and multimodal resources can support a variety of tasks and projects, further enhancing reflection. On the other hand, PBL develops social skills for students with disabilities and the formation of its ability to interact with peers (Bell, 2010). That is particularly important for people with disabilities. In general, the PBL method, "students to learn by doing and applying ideas" (Krajcik, Blumenfeld, 2006). The PBL method encourages students to reflect on the progress of the work and the result. Students can choose from many research methods and presentation of the results obtained. The use of the PBL method has shown a positive effect on the development of competencies (Beier et al., 2019; Habok, 2015; Holmes, Hwang, 2016; Kaldi, Filippatou, Govaris, 2011; Torres Vaca, Gómez Rodríguez, 2017).

The other method is problem-based learning. It tangled with Project-based learning. The similarity of teaching methods is as follows: involvement in the educational process of practical problems and situations; intrinsically attractive and motivational; more often multidisciplinary; help you practice collaboration, problem-solving, and critical thinking skills in your work. But there is a significant difference between PBL and problem-based learning. Problem-based learning focuses on the problem and the problem-solving process, while for PBL – the main goal is to get the final product. In any discipline, Problem-solving learning can be used. While the underlying problems will differ between disciplines, there are common characteristics. Some of them are: the problem should encourage students to seek a deeper understanding of concepts or theories; the problem should contain tasks, the solution of which should be multidiscipline; make informed decisions and defend them; if the problem involves a multi-stage solution, then the initial steps should motivate students to explore further; the stages of problem-solving in a group should be complexity to encourage students to unite to achieve the goal.

The digital storytelling method deserves special attention. Digital stories are 2–5-minute products that include images, text, audio, video, and other media. So, J. Ohler describes how digital stories use "personal digital technology to combine a number of media into a coherent narrative" (Ohler, 2008). This method is equally effective formal (Sadik, 2008; Yang, Wu, 2012; Boyko et al., 2021; Polianovskyi et al., 2021) and non-formal (Davis, 2004; DeGennaro, 2008; Freidus, Hlubinka, 2002; Wexler, Eglinton, Gubrium, 2014) education.

Digital storytelling gives students a place and time to share and reflect on their experiences with others (Kim, Jia, 2020). They present some information (the information received by the student according to a digital story preparation) as a kind of experience (knowledge). Preparing and presenting digital narratives by students in a group allows them to take a fresh look at their work (Lambert, 2018). For example, focused attention on presentation, clarifying questions, etc. Increasing the effectiveness of using the digital storytelling method consisted of the use of digital

tools. The most readily available tools can the office software from a variety of manufacturers are used. Different office software has a similar set of tools. Its design works with texts, tables, databases, creating presentations, etc. A more advanced tool is multimedia technology, which allows you to combine text, images, audio, and video clips in a presentation. Digital storytelling encourages both students and professors to use multimodal resources (Jewitt, 2008; Kress, Leeuwen, 2001) to share their stories with others. Combining multimodal resources provides a new way to convey meaning to a single component and an entire work (Hull, Nelson, 2005). In addition, digital storytelling can use Virtual Reality (VR) technologies, which allows "the use of computer graphics systems in combination with various display and interface devices to provide the effect of immersion in the interactive 3D computer-generated environment" (Uğur, Kalayci, 2007).

Regardless of the use of digital tools in the digital storytelling methodology, maximum involvement of students with disabilities is have realized. Particular attention to this technique is the need to present the topic under study using a voice and answer the questions (Shelby-Caffey, Úbéda, Jenkins, 2014; Park, 2019). This digital tool demonstrates it is effective for university students, who learn to process and interpret large amounts of information. Students with disabilities formulate their own opinions and provide recommendations. To do this, they need opportunities to engage in metacognition and participate in guided reflection.

The availability of digital technologies and the possession of defined skills by participants in the educational process (both professors and students) affect the tools used for digital storytelling.

Another effective method of simulating knowledge through the implementation of practical tasks is the method of imitations (the method of variable-dual learning). This method combines innovative teaching methods and the active use of information technology. The training takes place in the form of a role-playing game, imitating the activity of the economic system. Its internal conditions of the economic system are as close as possible to the corresponding from the basic economics unit. The aim of this method in the learning process is the acquisition of practical skills. A conditional enterprise (of any line of business) consists of several departments. For example, for the economic direction: the department of marketing, financial planning, personnel management, etc., for a technical enterprise it is technological, design, metrological, quality control department. The firm operates as a real enterprise and performs the corresponding functions. Each department has its structure, leader, job descriptions, strategic plan, and real tasks. To develop joint plans between departments, they exchange documentation, hold meetings. The virtual enterprise is a joint venture of two partners (enterprise and higher education). The enterprise determines what to teach, the institution of higher education determines how to study, combining training in a traditional educational institution with practical training.

The simulation allows students to try themselves in the role of employee (manager, president of the company). Students can explore the enterprise system and solve professionally oriented problems. This method is engagement the student and gets their attention. Simulations streamline professional knowledge, prepare students for making motivated decisions in future activities, contribute to the formation of strategic thinking and planning skills, develop the ability to work in a team, etc. (Nozhovnik, 2012). This approach allows students to delve into the essence of the problem and acquire new knowledge.

The simulation method creates opportunities for the formation and development of professional and corporate competencies among applicants for higher education. Students with disabilities gain experience of participating in the business processes in the virtual enterprise, contributing to social adaptation and self-realization.

A constructive approach to teaching people with disabilities is the web-quest technology, based on a project-based teaching method and focused on attracting students to the educational process. The practical tasks in the studied discipline are included in the web quest, which provides

for an independent purposeful search by students of knowledge to complete the task. The student is offered an assignment on a specific topic, for which he needs to collect material on the Internet. The professor forms the interactive search activity of students, determines the parameters of this activity, controls it. Information or part of it is presented on the site for independent or group work of students, it can be located on the same site or on different sites. Links to some of the sources are provided by the professor, and some of the students find themselves using search engines (Romantsova, 2008).

In this process, the professor plays the role of a mentor (an advisor). If difficulties arise in completing a task, a mentor will come to the rescue and suggest the right direction. The web quest technology enables working in groups; motivates people to acquire knowledge on their own; develops critical thinking, communication, leadership qualities; responsibility for the results of their activities (Budilova, 2017). Students gain practical skills to compare, analyze, classify information. A web quest is a mini project, that can be developed not only by the professor but also by the student.

The teaching function is closely related to the research function. Implementation of science research in the learning process for senior disability students should use research-oriented learning (inquiry-based education). The research activity of students is a mandatory and vital component of the training of future specialists of any specialty. Research is increasing knowledge; formation of independence, professional competence; creative activity; self-realization; research skills and abilities; updating professionally significant knowledge, especially for students with disabilities. The essence of the research-oriented teaching method is the integration of scientific research methods into educational cognition, the convergence of classroom and extracurricular research activities, the implementation of the principles of cooperation in the relationship between the professors and students, and students among themselves (Ibragimov, 2019).

This method aims to form students' style of scientific thinking, which is the basis for solving research problems. The research-oriented teaching method consists in analyzing the process of which students use the methods of scientific activity. In particular, the formulation of a problem to be solved; search for ways and methods of its solution; checking the possibility of using these methods for solving and the adequacy of the possible results of the problem posed; observation, experiment, hypothesis formulation, theory substantiation, data processing, generalization of work results, interpretation of results, development, and justification of proposals (Hrytsay, 2017; Antifeyeva, Petrova, 2020; Gvozdeva, 2014). The educational process is organized in such a way as students model the main elements of scientific research. With this approach, education is considered a teaching model of science. In general, research activity consists of certain stages (Table 2).

Table 2: The main stages of organizing the research work of students.

Stage name	Stage content
Study planning	Choosing a research topic, formulating a problem and a working hypothesis, determining the object and subject of research, its goals, and objectives.
Informational	Search and selection of information, accumulation of facts on the research subject, obtained by other researchers.
Experimental	Set up and experiment to obtain facts, new knowledge about the subject of research.
Analytical	Analysis of facts, public relations, interpretation, vision of correlational and causal-inherited links, formation of regularities
Registration of research results and their presentation	Providing the research results of the type required for publication and their publication

(Source: Own)

Digital technologies are used to increase the efficiency of students' performance of research tasks. At each stage, a set of information technologies is used. At the research planning stage, it is

advisable to use Internet services and programs for creating mind maps (for example, MindMeister, Google, Freemind, BubblUs, MindMup, LOOPY, WiseMapping, iMindMap). At the information stage of search and selection, search engines are used (Google, Bing, Yahoo!, etc.). In the process of accumulating information, Internet bookmarking services will come in handy (for example, Papaly, booky, Evernote, Raindrop, Saved, Pocket, Instapaper). You can save the accumulated information in online storage (for example, Google Drive, Microsoft OneDrive, Dropbox, iCloud Drive). At the experimental and analytical stages of statistical processing and analysis of data is recommended to use special programs (Statistica, SPSS, MathCad, SYSTAT, MathLab, and others). For the stage of registration of research results and their presentation, its visualization is necessary. In addition, programs for statistical data processing contain the function of information visualization very often.

The use of more advanced digital tools in inclusive education creates new opportunities for teaching students with disabilities in offline and online forms of education. All methods and digital tools can be used equally effectively in an ordinary and inclusive higher education landscape. Adaptation of digital tools for inclusive education maintains cognitive interest and motivates students; create conditions for professional and personal development; satisfy both the educational and individual needs of students with special needs through the ability to adapt educational tasks and the choice of an optimally comfortable pace, etc.

The correct selection of educational methods allows you to relieve emotional stress, create a situation of success, correct behavior, and give students with disabilities the opportunity to feel confident in themselves.

Ensuring equal access to higher education in the context of digitalization of the educational process involves bridging the digital divide among both professors and students with disabilities. Neither one nor the other to a greater extent have the ability and experience of using most digital technologies. In a pandemic, each of the participants in the educational process needed to quickly acquire these skills on their own. For professors of students with disabilities, at the initial stage, it was self-education, and for some time – a variety of courses, which made it possible to increase their digital competence. And, for students with disabilities, the dependence on the help of parents has increased, which does not contribute to the formation of independence. Accordingly, the primary task of inclusive education in the context of accelerated digitalization is to update the content, methods and organizational forms of educational work, modernize educational programs, develop and implement effective digital teaching materials and transition to a personalized and result-oriented organization of the educational process.

CONCLUSIONS

Inclusive education and the COVID-19 pandemic have posed new challenges for the higher education system. The only possible way to continue the implementation of the educational activities for all participants was the use of digital technologies. The rapid development of the digitalization process, on the one hand, creates new opportunities for the implementation of the educational process, and on the other hand, hinders it. Digital inaccessibility (lack of access to digital technologies; unstable Internet; lack or lack of digital skills) has become the main problem. Despite many obstacles, professors have become the initiators of change in higher education institutions. Turning to the opinion of leading scientists and teachers highlighted the main digital tools that can implement the educational process by professors with basic and higher digital skills. Depending on the physiological and psychological characteristics of persons with disabilities, they can use various digital applications for more effective involvement in the educational process. Most of the apps for people with disabilities are free. The formation of professional and personal

competencies by persons with disabilities directly depends on the correct choice of teaching methods through a specific set of tools are implemented. And in the modern context, educational tools are becoming more and more associated with digital technologies. The components of the teaching methodology for persons with disabilities are not invariant objects of didactics. Teachers' approaches and techniques are a (self) tuning mechanism of interrelated and interdependent elements, which indicates the need for further research.

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ON-LINE TEACHING DURING AND AFTER PANDEMIC ON CTU IN PRAGUE

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Abstract

The centralized development project "Distance education as a tool for university development" is aimed at increasing the professional knowledge of university staff in the field of distance education and blended learning, including a key element, which is the transfer and application of experience and good practice within participating universities. This paper is a report of the analysis of the current state of the background for the implementation of distance education and blended learning at CTU in Prague.

Data collection took place in April and May 2021 through an electronic questionnaire. The questionnaire for data collection was divided into questions into five groups, namely 1) Strategy, 2) Equipment, 3) Organizational support, 4) Economic support, 5) Obstacles to the implementation of distance / on-line / blended learning / digitally supported education at universities schools.

Keywords

Strategic plan. Distance / online education. Methodology. LMS. Synchronous teaching. Asynchronous teaching.

INTRODUCTION

The sudden switch to online learning during the pandemic presented teachers and students with a situation the majority of them had not met before. Up until the pandemic much discussion of online learning, or e–learning, has been preoccupied with the practice of teaching online and the debate about whether being online is ‘as good as’ direct face-to-face teaching. Although online learning has been available since the 1990s there has been resistance in the profession to adopting this pedagogical opportunity that the technology afforded. Some of the poor designed software available has also coloured the view of what was possible. However, in the sudden global lockdowns and the resultant university closures, this debate has become moribund because there was no alternative and, in the crisis, some more teacher friendly software has been developed and rapidly deployed (Younnie et al., 2021).

STRATEGY OF DISTANCE EDUCATION AT CTU IN PRAGUE

If we want to discuss about the issue of distance and on-line education at CTU in Prague, it is first necessary to delimit this area in terms of Long-term plan of educational and scientific, research, development and innovation, artistic and other creative activities of CTU in Prague for the period 2016-2020[1].

Diversity and availability – CTU will develop electronic study support systems and use their potential for the education of specific groups of students:

- to develop both methods and technologies as well as the contents of electronic study aids and to look for other possibilities of their use for streamlining and individualizing the educational process,
- to contribute actively to the dissemination of knowledge in society,
- to expand unrestricted public access to study materials,
- to establish core IT infrastructure for teaching support,
- to support open access distribution for pedagogy as well as science and research purposes,
- to support the creation of MOOCs (massive open online courses),
- to build an institutional online repository of the results of pedagogical and scientific activities,
- to support and develop open educational resources publicly accessible
- to support Open Access (OA) as instant free online access to publications

The implementation plan of the CTU Strategic Plan for 2020 is based on the Strategic Plan of the CTU Educational and Creative Activities in Prague for the period 2016–2020. At the same time, the strategic document takes into account the Annex to the Long-term Plan for educational and scientific, research, development and innovation, artistic and other creative activities of CTU in Prague for the period 2016–2020 and is further based on the CTU Strategy approved on 25 November 2015.

As stated in Priority Objective #2 Diversity and accessibility, in the field of study aids, CTU will pay attention to the availability of study literature for full-time students and especially for combined/distance form of study programs, both in printed and electronic version; CTU will develop systems for effective administration and communication with students, emphasize electronic study aids and expand the potential of specific groups of students.

The strategic plan of CTU 2021+[2] deals, among other things, with increasing the quality and success of studies. CTU in Prague is committed to providing education with a high level of quality and international reputation. Operational objectives include the use of smart solutions, innovation and modern technologies and student-centred approaches to teaching. There are some specific measures to do so:

- To increase the share of online lectures and study materials in digital format.

[1] https://www.cvut.cz/dlouhodoby-zamer
[2] https://www.cvut.cz/strategicke-materialy

- Create an open digital educational platform also for the public, including foreign ones.

Instruments: Digitization of teaching materials in accordance with the Open Educational Resources program ("Open Educational Resources program" include all courses, study materials, modules, textbooks, video streaming, tests, software and any other tools, materials or techniques used to promote access to knowledge. (Dlouhá, 2015)

At the CTU in Prague, the methodology of distance education was issued as part of the Rector's Order. In addition to LMS Moodle, the Office 365 platform was deployed during COVID-19, specifically MS Teams for synchronous teaching (chat, organizing meetings, sharing files and working with other applications). In addition to user manuals, a number of trainings were offered to academics, which were provided by the Computer and Information Centre of the Czech Technical University in Prague. In the "second wave" of the corona crisis, distance learning for MS Teams was already fully automated. To this end, the Rector's Order No. 18/2020 was issued to reduce the risk of coronavirus infection, which came into force on 12 October 2020. Part III. The Rector's order was devoted to the readiness of CTU for contactless teaching, which is implemented using two systems, LMS Moodle, which is designed primarily for storing documentation and materials for individual subjects (asynchronous teaching) and MS Teams for video teaching (synchronous teaching). It was important that this order clearly established a uniform methodology for establishing Teams, which was guaranteed at the university level - Teams were established automatically by means of special form inside information system CTU (IS KOS). Rector's Order No. 18/2020 was replaced by Rector's Order 21/2020.

METHODS

Terminology used explanation

Digital education is the use of information technology (IT) in teaching and is referred to as e-learning.

Online learning offers many benefits to students, including the ability to study flexibly and from a location that suits them. Online learning is when you attend online courses instead of in a physical classroom.

Distance learning is a multimedia form of guided study that provides new educational opportunities and supportive educational services for usually self-studying adult participants, where the main responsibility for the course and results of education lies with the students.

Blended learning is a term for combining standard teaching (full-time, presentation, face-to-face) with e-learning. It is a combination of several teaching forms at the same time, the appropriate mixing of which leads to an optimal educational result.

Hybrid learning is a way of combining traditional classroom teaching and the provision of digital courses that emphasizes the use of the best options for each learning objective. This means that, unlike mixed learning models, which seek to balance full-time and online aspects of the course, hybrid classrooms vary greatly according to the subject taught and the needs of specific groups of students.

Survey

The COVID-19 pandemic has affected all aspects of our lives. Czech higher education is no exception in this respect, although it was better prepared for the arrival of a pandemic than other sectors. (MSMT, 2021)

Within the Development project "Distance education as a tool for university development" was prepared questionnaire for each university participated in the project. CTU in Prague has 8 faculties which are very different, so situation in online education is also different. We prepared questionnaire based on questionnaire of DP and sent it to representative of each faculty to receive global view on situation. In this paper we would like to present the most important and the most interesting results of the survey.

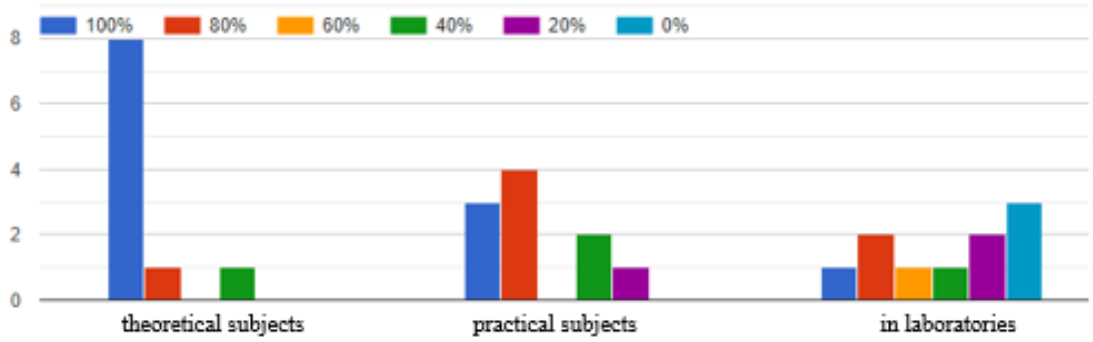
RESULTS

In total, we received answers from 6 faculties - the Faculty of Civil Engineering, the Faculty of Mechanical Engineering, the Faculty of Electrical Engineering, the Faculty of Architecture, the Faculty of Information Technology and the Faculty of Biomedical Engineering and the Masaryk Institute of Advanced Studies.

Our questionnaire had 22 questions and here are some results.

Q: Studying at the faculty enables, if necessary, the implementation of online supported education in teaching.

Figure 1: Implementation of online supported education in teaching.

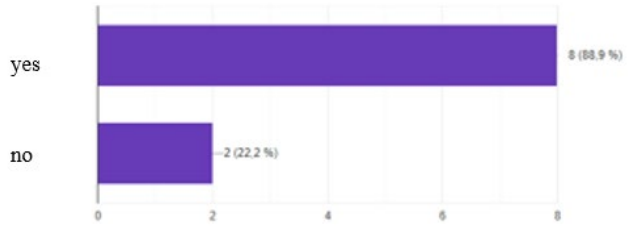


(Source: Own)

According to the respondents, distance 100% faculties allow the study of theoretical subjects. On the contrary, for teaching in studios, testing rooms or laboratories, the number of universities increased with the decreasing percentage of the possibility of implementing an online form of this teaching, and some faculties chose the 0% option for this variant. For practical subjects, the options of 20% and 40% were most often chosen for the implementation of online teaching.

The approach of individual faculties to the centrally set rules for the preparation of supporting materials for teaching in the online environment is different.is a part of the development strategy of the faculty since 2021, mainly in the combined and distance form of study.

Figure 2: The approach of individual faculties to the centrally set rules.

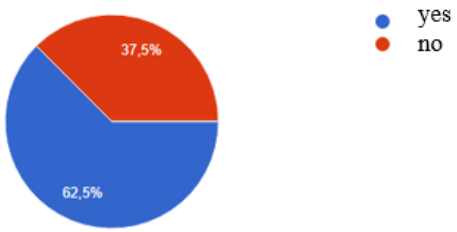


(Source: Own)

The concept of the development of distance / digitally supported education is in most cases included by faculties as part of the strategy. The inclusion of this strategy from 2022 was then declared by 23 universities for all forms of study.

Q: The concept of online education development will be part of the faculty's development strategy from 2022 for all forms of study.

Figure 3: Concept of online education development.



(Source: Own)

As mentioned above, the strategy of the concept of online education development is formulated in general terms as a part of the Long-term plan of CTU, or Strategic plan of CTU 2021+, while it can be further specified at the level of individual faculties or non-faculty institutions, incl. implementation action plan and deployment.

The inclusion of this strategy from 2022 was then declared by two thirds of faculties.

Q: The faculty centrally monitors students' feedback on the implementation of online education.

Figure 4: Students' feedback.

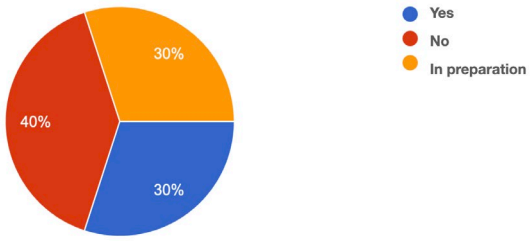
(Source: Own)

In this case we received 100% answer “yes”. The feedback is provided by the CTU Student Survey, or by other specific surveys at the faculty level.

Q: Has the faculty set centrally rules for the preparation of supporting materials for teaching in the online education environment?

The approach of individual faculties to the centrally set rules (structure, templates, etc.) for the preparation of supporting materials for teaching in the online environment is different. One third already has rules, one third is preparing.

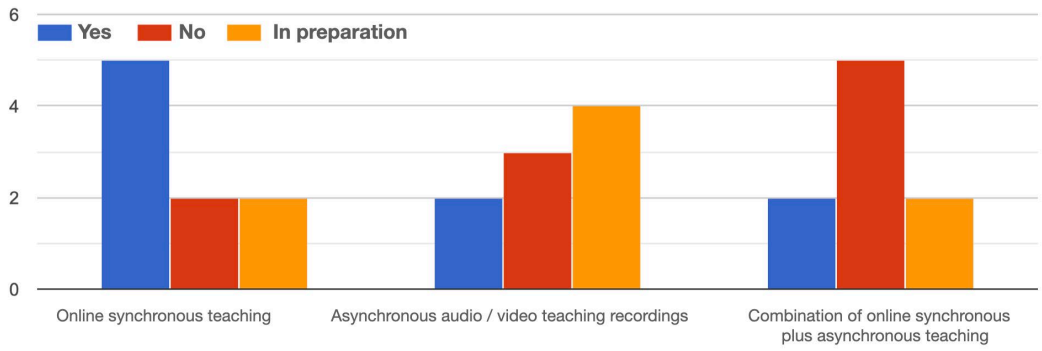
Figure 5: Central online education rules.



(Source: Own)

Q: In the environment of online education, the faculty has centrally set rules for the length of:

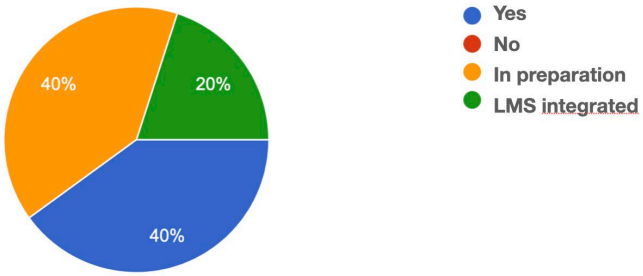
Figure 6: Central rules for the scope and length of the educational unit.



(Source: Own)

Q: Has the faculty centrally set rules (methodology, manuals, instructions) focused on a combination of synchronous (e.g., MS Teams) and asynchronous tools (e.g., LMS Moodle) for the implementation of online supported education?

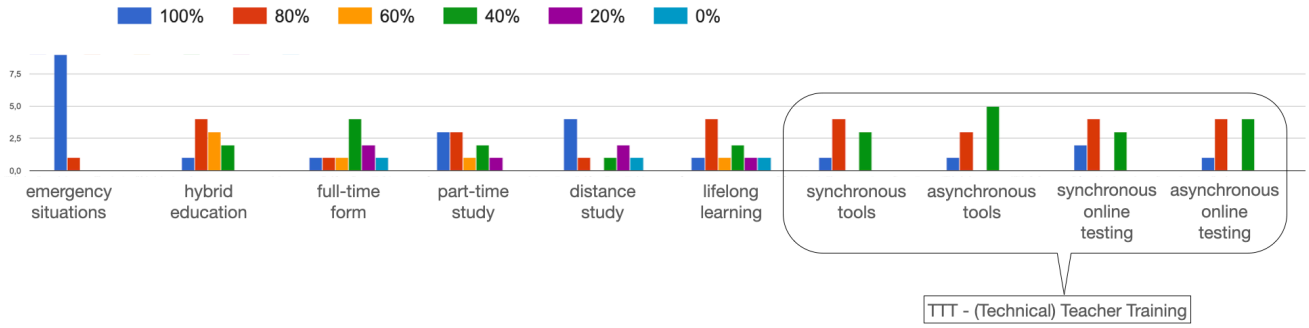
Figure 7: Existence of synchronous and asynchronous tools methodology.



(Source: Own)

Q: What importance does the faculty attach to online education in the following activities: express on a scale from (maximum importance) 100% 80% 60% 40% 20% to 0% (minimum importance).

Figure 8: Importance of activities.



(Source: Own)

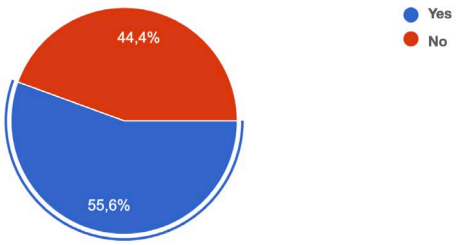
Q: The faculty is primarily using for online education.

Figure 9 Technological solution.

(Source: Own)

Q: There is a central schedule at the faculty for deploying taught courses in the LMS environment before the beginning of the semester.

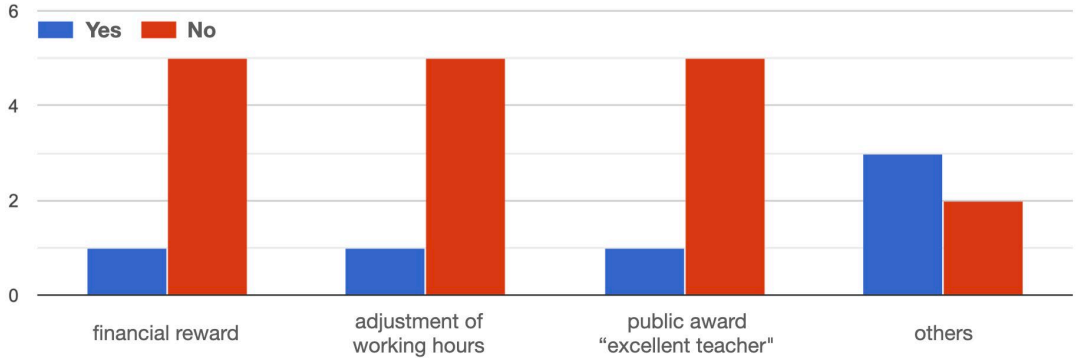
Figure 10: Central schedule.



(Source: Own)

Q: How does the faculty stimulate staff for the creation of teaching materials (e.g., multimedia materials)?

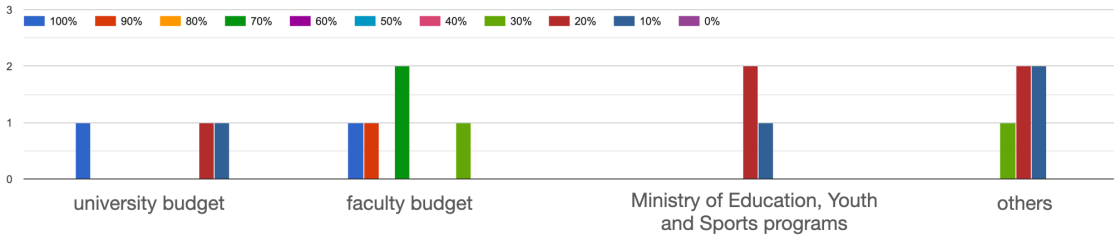
Figure 11: Stimulation of academic staff.



(Source: Own)

Q: Economic resources for providing online education.

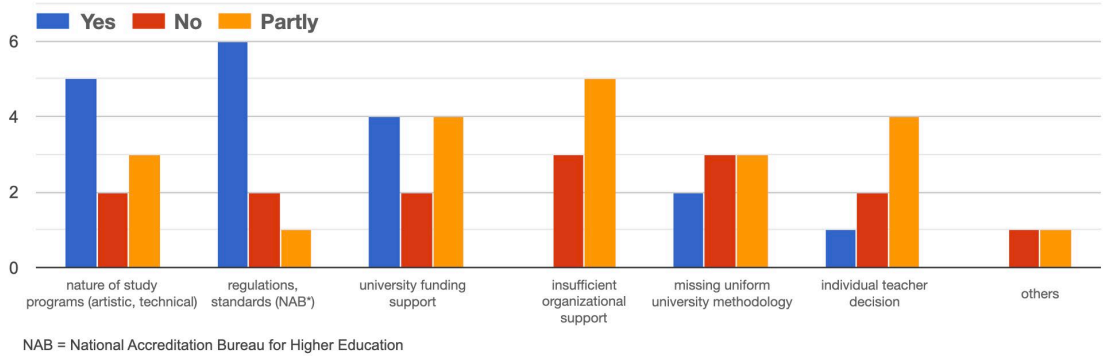
Figure 12 Economic resources.



(Source: Own)

Q: Obstacles in the implementation of online education.

Figure 13 Implementation obstacles.

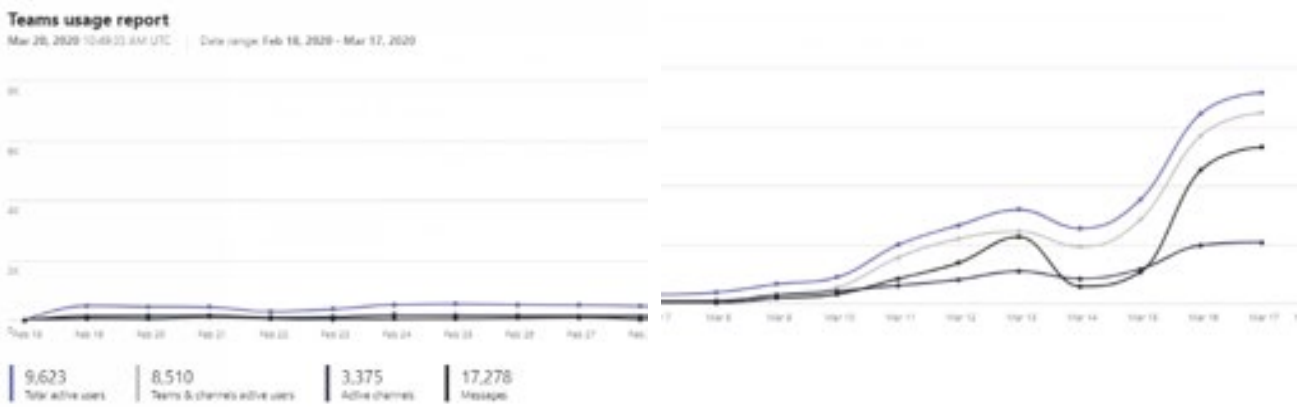


(Source: Own)

DISCUSSION AND CONCLUSION

Starting from March 10, 2020, so-called non-contact teaching methodology was introduced at the CTU in Prague, full deployment started on March 16, 2020, with 2,255 Teams established during first ten days. Computing and Information Centre opened up and filled these Teams approximately with 900 students and teachers on the basis of data available (identities) in the study information system. By 18 March 2020, approximately 50 Teams had been formed from two or more subjects (by merging), roughly 50 Teams were created according to timetable sheets (by splitting) (Andres et al., 2021a).

Figure 14: The onset curve of the transition to the distance form of education.



(Source: Andres et al., 2021a).

As mentioned, the CTU in Prague has gradually taken such measures aimed at unifying the rules for distance and/or online learning (synchronous teaching, asynchronous teaching). On the other hand, faculties have the opportunity to implement strategy with respect to their own priorities. Looking at the individual measures of CTU faculties and the students' results in corona time, CTU students succeeded very well (Prazska technika, 2021). Comparing the current survey with comparative ones (Andres

et al., 2021b), it is obvious, pandemic triggered a change to a new teaching and learning standard.

A return to the original state will certainly not occur. Under current conditions, it seems that hybrid teaching can represent a new paradigm for tertiary education. This area is currently being addressed as an institutional plan at CTU in Prague, and it mainly concerns the purchase of specific hardware as an investment project.

ACKNOWLEDGMENT

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VACCINATION ATTITUDES AND DIGITAL TRANSFORMATION OF EDUCATION DURING COVID-19 PANDEMIC: UKRAINIAN EXPERIENCE

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Abstract

Only 50 % of Ukrainian population believe that vaccines are effective, which calls into question the epidemiological safety of the country in the context of COVID-19 and the other infections, and requires active research of possible factors that play a crucial role in decision-making about vaccination. The present work aims at studying people's attitudes towards vaccination in general and against COVID-19 and what are the consequences of population digital literacy in vaccine decision making. The study involved 276 people aged 18 to 60, residents of Ukraine. The participants of the study were offered a questionnaire which consists of 84 questions, developed by the authors in accordance with the research objectives. The study found out that in addition to socio-psychological and personal factors, the awareness of the population is of a great importance, namely the information that residents of Ukraine receive through the active use of the internet. The data show that the availability of reliable information from the competent authorities or figures in the field of medicine is not an indicator that directly leads to a positive vaccine decision making. As a result, the problem of the population digital literacy and the responsible attitude of the country to form a high culture of using information, as well as thorough psychological preparation, is relevant now as never before, and digital education is one of the major ways to do that.

Keywords

COVID-19. Vaccination. Decision making Digital literacy Digital competence., Digital education.

INTRODUCTION

Vaccination has been heralded as one of the potent ways of disease prevention in populations. Despite the benefits vaccination offers and the significant achievements made in public health, the practice continues to experience opposition leading to vaccination hesitancy. The historical reasons for hesitancy are diverse and complex, often associated with political, scientific, and religious factors. Individuals with different concerns may refuse to be vaccinated, delay the vaccination, influence others to refuse, or accept the vaccines while feeling ambivalent. Because vaccination success depends on high uptake rates, vaccine hesitancy impacts the acceptance of routine vaccines is a growing worldwide problem. To understand the growing complexity, hesitancy, and attitudes towards vaccines, it is important to explore the previous literature related to this topic. The topic could not be more relevant at this time of the COVID-19 pandemic because the demand for the life-threatening disease is expected to be high. That is why digital education could have been used as one of the most efficient methods to reduce overall vaccination hesitancy among the population of different age, educational and professional background.

LITERATURE REVIEW

Previous literature identifies at least seven factors promoting vaccine hesitancy. Majid and Ahmad (2020) found that previous experiences play a significant role in promoting vaccine hesitancy. They also found that orientation towards natural living played an influential role in promoting vaccine hesitancy, delay, or rejection. Many studies point to parents' explicit rejection as responsible for children who do not get one or several recommended vaccines (Lee et al., 2020; Seoane et al., 2020; Vulpe, 2020). Studies indicate that perceptions of other people and misinformation promote vaccine hesitancy and negative attitudes (Hornsey et al., 2020; Loomba et al., 2020). Experiences of interacting with healthcare providers help in promoting negative attitudes towards vaccination.

Research shows that distrust in health system stakeholders is a significant determinant of vaccine hesitancy, acceptance, or rejection (Reuben et al., 2020; Vulpe 2020). In examining the attitudinal and demographic predictors of vaccine hesitancy, Reuben et al. (2020) found that distrust of the medical profession, age, education level, and religiosity were significant predictors of vaccination hesitancy and attitudes. In another study, Hornsey, Lobera, and Díaz-Catalán (2020) found that vaccine hesitancy and negative attitudes were strongly correlated with conventional medicine distrust. Mandatory vaccine policies influence people's decisions to hesitate, accept, or reject vaccines. In a recent study in Australia by Edwards et al. (2020), it was reported that females, individuals from low-income households, and those living in disadvantaged areas were more likely to hesitate or resist vaccination. In contrast to previous research, however, Edwards et al. (2020) found that younger people were likely as those aged 35-44 years to intend to receive the COVID-19 vaccine, probably to the widespread fear associated with the disease.

Political identity, ethical values, and news consumption tend to promote vaccine hesitancy. Investigating how social media consumption affected the vaccine intentions in US and British samples, McAndrew and Allington (2020) demonstrated that the differences in both countries were associated with social media, political identity, and ethical values. The authors found that social media consumption more than legacy media's COVID-19 updates influenced their vaccination hesitancy. Hornsey, Finlayson, Chatwood, and Begeny (2020) investigated social media use by prominent political figures in the United States to advance anti-vaccination discourse among their supporters. Investigating the psychological characteristics related to vaccine hesitancy in the UK and Ireland samples, Murphy et al. (2021) reported that those resistant to a new vaccine were less likely to use the traditional and authoritative sources of information compared to those accepting vaccination. Studies in Turkey explain the role of ethical values and the competing notions of traditional values versus modernity in promoting vaccine hesitancy (Ergur, 2020; Özceylan et al., 2020). For example, Ergur (2020) demonstrated the social causes or criticisms of modernity in promoting resistance to new vaccines and indecision attitudes toward vaccines. These studies show it is likely that those who subscribe to such political identities can develop vaccine hesitancy. How the individuals obtain information concerning the disease, and its vaccination plays an influential role in promoting vaccine hesitancy and attitudes. Furthermore, perceived ethical values profoundly influence vaccine acceptance and the formation of positive attitudes towards new vaccines.

PERCEVIED RISK OF THE DISEASE

The risk people associate the disease with being protected against is a significant determinant of vaccination decisions (Betsch et al., 2018). The risk perceptions are measured as the severity of the disease symptoms and the likelihood of contracting the disease (Brewer et al., 2007). These perceptions are often associated with an emotional dimension that involves anxiety, fear, and worry (Loewenstein et al., 2001; Slovic et al., 2004). Previous studies show that individuals who consider the risk of contracting a disease as low often believe the disease symptoms are mild, causing little worry (Betsch et al., 2018). Thomas et al. (2016) found that such people are less likely to get vaccinated and more often remain unvaccinated.

The risks related to COVID-19 have elicited substantial attention since the World Health Organization (WHO) declared the outbreak of COVID-19 a global pandemic on March 11th, 2020 (WHO, 2020). The declaration came with the call for nations to take urgent, aggressive, and extensive measures to control the spread of the disease. As a result, many recent studies reported people's perceptions of COVID-19 as a life-threatening disease (Dryhurst et al., 2020; Glöckner et al., 2020; Murphy et al., 2020; Ward et al., 2020). The perception that the disease is life-threatening is likely to affect people's intent to accept vaccination to protect them against the disease.

Looking at the various aspects of perceived risk, research shows that people who perceive a disease to pose a greater risk engage more in preventive measures such as social distancing in the case of COVID-19 (Dryhurst et al., 2020; Faasse & Newby, 2020; Ward et al., 2020; Wise et al., 2020). Malik et al. (2020) investigated the relationship between perceived risk and willingness to receive a prospective vaccination against the disease. They found that US respondents who reported higher risk perception of COVID-19 more often reported willingness to accept a prospective vaccine against the disease. Investigating the likelihood of German respondents accepting vaccination against COVID-19, Glöckner et al. (2020) reported that those who rated the likelihood of getting infected as high and the disease's consequences as severe were more often likely to show higher intentions to accept vaccination.

On the other hand, Faasse and Newby (2020) conducted a study at the early stage of the COVID-19 pandemic in an Australian sample and found that those who perceived higher disease severity did not significantly predict intentions to accept COVID-19 vaccination. However, the respondents' opinion changed with the widespread outbreak of the disease in Australia, raising the intentions to accept the vaccine. Ward et al. (2020) also established in a French sample that the perceived risk of contracting COVID-19 heightened the respondents' intentions to take a prospective COVID-19 vaccine. These studies are consistent with other research that links the acceptance of a vaccine to the perceived risk of the disease that the vaccine is intended to protect recipients from (Barello et al., 2020; Bertin et al., 2020; Bryden et al., 2018; Murphy et al., 2020; Salali & Uysal, 2020). The research emphasizes the significance of the perceived risk of disease on people's decision making about vaccines, but the studies seem to disagree on the most relevant components of risk perception.

People's perception of how safe the vaccine is a significant factor in a vaccination decision. According to Betsch et al. (2018), the acceptance of vaccination is likely influenced by perceived vaccine safety. The SAGE Working Group on Vaccine Hesitancy found that individuals who perceived a vaccine as safe were most likely to consider vaccination (MacDonald, 2015). However, the development of COVID-19 vaccinations is still nascent, and information about their safety is still limited. Previous research suggests that people tend to develop their views based on existing vaccination attitudes when the knowledge and experience about a new vaccine are limited. For example, studies demonstrate that attitudes to

vaccines to protect children against diseases predicted the intentions to accept Zika virus vaccination (Harapan et al., 2019). Incidences such as GlaxoSmithKline's Pandemrix vaccine adverse reactions that might affect attitudes towards new vaccines. The vaccine was linked to an increased risk of narcolepsy in those who received it (Sarkanen et al., 2018). Sarkanen et al. (2018) reported that the connection between the Pandemrix vaccine and narcolepsy received a great deal of media attention, potentially leading to vaccine hesitancy, particularly to those vaccines associated with influenza. It is possible that the resulting vaccine hesitancy might escalate to prospective COVID-19 vaccines due to the effect of the public's dented trust.

Past misinformation about vaccine safety could influence vaccine hesitancy or eventual rejection. For example, a publication in 1998 linking the measles, mumps, and rubella vaccine to autism generated a lot of concern. Although empirical research clarified the publication as false, some people may harbor fears about new vaccines based on the unsubstantiated piece of information (Karlsson et al., 2019; Sarkanen et al., 2018; Seoane et al., 2020; Vulpe et al., 2020; Wang et al., 2019). Political actors are also another source of misinformation concerning vaccine safety. Hornsey et al. (2020) investigated the impacts of political identity and conspiracist ideations on vaccine hesitancy. The authors found that those who subscribe to a certain political persuasion are likely to believe messages being championed by their political wing concerning vaccines. However, in instances where the vaccine-preventable disease is considered less risky, the perceived vaccine risk might outweigh the perceived disease risks (MacDonald, 2015). On the other hand, people might be persuaded to accept the vaccine when the disease's perceived risk is very high regardless of the vaccine concerns.

Psychologists are beginning to learn more characteristics associated with beliefs in conspiracy theories such as cynicism, mistrust, and Machiavellianism and how they promote conspiracy beliefs against vaccines (Abalakina-Paap et al., 1999; Douglas & Sutton, 2008; Goertzel, 1994, Swami et al., 2010). These studies suggest that a possible intervention to vaccine hesitancy is focusing on individuals that have characteristics that make them believe conspiracy theories (Jolley & Douglas, 2014). This can be accomplished by focusing on the health locus of control using various tools such as the Cynical Distrust Scale (Clarke et al., 2008), Health Locus of Control (HLC) Scale (Wallston et al., 1976) and Global Belief in a Just World Scale (GBJWS) (Lipkus, 1991). Theorists (Sunstein & Vermeule, (2009) argue that anti-conspiracy information can be directed at individuals that are receptive to conspiracy theories to reject conspiracy claims against vaccines in order to promote their uptake.

METHODOLOGY

The research team of the faculty of psychology of Taras Shevchenko National University of Kyiv conducted an online study of the population of Ukraine aged from 18 to 60, which allowed to analyse the connection of socio-psychological, personal factors and beliefs of the individual with the attitude to vaccination, which can be useful for solving the problem of mass refusal of vaccination. Overall, 181 respondents took part in the study. The sample consisted of 96 women, 85 men, and one person indicated their gender identity as "other". The average age of the sample is 36.44, the average age of men is 42.5, and the average age of women is 35.04. In accordance with the purpose of the study, the following empirical methods were used: multidimensional health control locus scale (HLC, developed by K. Wallston), the Cook-Medley cynical hostility questionnaire, the Dark Triad Dirty Dozen questionnaire, a questionnaire with questions concerning attitudes to vaccination in general and individual COVID-19 vaccines. The wallston health locus control scale (HLC) (1976) includes 11 statements with different wording (I – internal, E – external), which are rated from 1 (strongly

disagree) to 6 (fully agree). The technique is designed to predict personal behavior related to health. Quantification of a specific form of psychological defense, behavior, social position, and corresponding personal orientation, "Machiavellianism," was studied using Johnson's Dark Triad Dirty Dozen questionnaire (2010). The subjects were offered only the Machiavellianism scale, which contains 4 statements, rated from 1 (completely disagree) to 6 (completely agree). The study also used the Cook-medley cynical hostility questionnaire (Hostility pharisaic virtue scale. Q. 19) (2008), which is designed to study cynical hostility, defined as persistent, negative attitudes towards others, with cognitive, affective, and behavioral components. To measure this indicator, the subjects were offered 5 statements included in the scale of hostile cynicism. The subjects rated their attitude to each statement from 1 (strongly disagree) to 6 (fully agree). To identify the tendency to believe in the Justice of the world, we proposed the I. Lipkus scale of faith in a just world (GBJWS) (1991), which was created from a group of elements aimed at assessing people's beliefs about whether they get what they deserve and whether they deserve what they get. We used only a personal subscale containing 10 statements, which the subjects rated from 1 (strongly disagree) to 6 (completely agree), according to their beliefs. Another tool that we used was the questionnaire, which was designed to collect information about age, gender, marital status, type of romantic relationship, number of children, degree of religiosity, degree of trust in sources of information about vaccination, and attitude to vaccination. The questionnaire also included questions about the attitude of the subjects to specific vaccines, such as: BioNTech/Pfizer (developed in Germany, USA), Moderna (developed in the USA), Oxford AstraZeneca (developed in Sweden and Great Britain), CoviShield (Indian analog of the AstraZeneca vaccine), Sputnik V (developed in Russia), Sinovac Biotech (developed in China).

RESULTS

The average age of the respondents is 36. On the cynicism scale, the average value is 18.69, which indicates that most people in the sample are characterized by cynical thinking. Since such people tend to think that the whole society acts only in its own interests, even if it claims that the actions committed are committed in good or altruistic intentions, we allow the view that cynics can be skeptical of the health system, especially during the COVID-19 pandemic, due to limited public awareness.

The following average values were obtained on the internal locus of control and external locus of control scales, 12.95 and 18.89, respectively. It suggests that the sample has a more pronounced external locus of control, a tendency to attribute external factors of influence to all events in their lives. That is, one way or another, such people tend to believe in fate, chance, luck and do not believe that everything that happens in their lives is the result of their own actions.

Table 1: Descriptive Statistics According to the Research Scales.

	Mean	Standard Deviation	Median	Asymmetry	Excess
Age	36.44	12.69	35.50	0.19	-0.81
Cynicism	18.69	4.73	18	0.11	-0.275
Internal Locus of Control	12.95	3.54	13	0.05	-0.48
External Locus of Control	18.89	5.09	18	0.39	0.255
Belief in a Just World	37.85	4.44	38	0.001	-0.126
Machiavellianism	11.46	4.45	11	0.248	-0.250
Benefits of Vaccines	20.92	2.81	21	0.095	0.150
Safety of Vaccines	19.65	6.53	20	0.066	-0.458
Source Trust	24.3	5.24	25	-0.419	0.710

(Source: Own)

As for the scale of faith in a just world by I. Lipkus, we got an above-average value of 37.85. thus, we can say that our sample is characterized by a belief in a just world, where everyone gets what he/she deserves. Since individuals with a belief in a just world tend to feel completely in control of their lives, we assume that they may also tend to judge that if a person leads a correct and ethical and moral lifestyle, then the world will have nothing to "punish" him/her for various diseases. It means that faith in a just world can provoke an ideological social movement to refuse vaccination, since “a good person will not get sick.”

Table 1 shows that the average value on the Machiavellian scale is 11.46, which corresponds to a lower-than-average level. It means that the subjects are less capable of deceiving and manipulating others in order to achieve their own goals.

On the vaccine benefit scale, the average value is 20.92, which corresponds to a lower-than-average level. It indicates a tendency of respondents to believe less in the need for vaccination. A lower-than-average level was also obtained for the “vaccine safety” scale, 19.65. This value indicates that to a greater extent, the respondents are afraid of vaccination and believe that vaccines can lead to inevitable consequences. The average value on the scale of trust in sources for vaccination was 24.3, which corresponds to an above-average level. It means that we can note the tendency of subjects to believe more and more different sources of information about vaccination.

The majority of respondents agree with the statement “most people do not like to force themselves to help others.” The majority of the respondents (27.4%) agree with this statement. Slightly less (23.23%) are more likely to agree, and 8.4% of the sample fully agree. Overall, 40.7% of the sample disagree with this statement to varying degrees. In response to the statement “most people will resort to slightly dishonest ways to gain an advantage, rather than lose them”, the majority of respondents agreed (40.1%). The smallest number (1.4%) received the answer option “I completely disagree”. The statement “No one cares what happens to you” received the most responses for the options “rather disagree” and “agrgee” (21.8% each). In general, in response to this statement, the sample was divided almost equally. In response to the statement “I think most people will prefer to lie in order to get ahead of others”, 37.3% answered rather agree. The statement “I often ask myself what hidden reasons another person might have to do something good for me” received the highest number of responses, 33% for the answer option “I don’t agree”.

On the locus control scale, 47% of the respondents agreed with the statement “If I take care of myself, I can avoid the disease.” The majority of respondents, 75%, do not agree that

health depends on good luck. Only 2% of respondents agreed with the proposed statement. More than half (66%) believe that they got sick because they did not do something themselves. Most people disagree with the statement "no matter what I do, if I'm going to get sick, I'll get sick" and believe that it is possible to change something personally. In response to claims about the randomness of the disease, the sample was divided almost equally. Overall, 64% of the sample do not agree that the doctor should be listened to. The audience was also almost equally divided in terms of the role of sports and nutrition as a factor in their own health. Thus, only 53% believe in the power of sports and nutrition. A smaller number of people (26%) do not see a link between their own actions, lifestyle and their own health. In addition, 97% are responsible for their physical well-being.

On the scale of faith in a just world, the majority of respondents believe that they deserve the reputation they have – this is 94% of the sample. The vast majority of subjects (42%) agree that they deserve to be happy. In addition, 30% of responses indicate a well-deserved punishment that respondents received in childhood. Only 1% disagreed with this statement. The vast majority, namely 34% of the sample, agree that there is a causal relationship in life on the example of a road accident. 33% of the subjects believe in workplace injustice. Only 12% of respondents disagree with the statement "If I follow my own diet, I will live longer." Most often, the subjects (73%) believe that a good attitude towards people is not necessarily an indicator of a large number of friends. Also, 68% of respondents are sure that the causes of adverse events in life are not necessarily their own bad luck.

Distribution according to the "Machiavellianism" scale, it is possible to see that the majority of respondents, 59%, do not agree that they tend to manipulate other people for their own good. Also, 33% of the sample agreed with their own tendency to manipulate others, 29% admit using tricks and lies to achieve what they want. However, the majority, namely 63%, do not agree with this statement. In addition, 44% of respondents admit using flattery to achieve what they want. Only 2% of the sample fully agree that they used other people on the way to achieving the goal. The largest part, which is 28% of the sample, does not agree with this.

The majority of the sample (76%) agree that it is necessary to be vaccinated so that previously defeated diseases do not spread again. Only 3% of the audience completely disagree with this opinion. Fewer people (35% of the sample) believe in the power of hygiene against the spread of dangerous diseases. The largest number of positive responses (40% of the sample) received the statement that vaccination benefits society by creating collective immunity. And only 9% of respondents did not agree with this statement. 28% of the sample is of the opinion that it is necessary to be vaccinated not only against deadly diseases, but also against less dangerous ones. The vast majority (51%) believe that the COVID-19 vaccine is less effective than previously created ones. 7% of the subjects completely disagree with this statement.

Analyzing the scale of trust in vaccination sources, it is possible to see that 34% of the sample do not trust the World Health Organization at all. The smallest number of people, only 6%, fully trust this organization. Only 12% of the sample consider the Ministry of Health to be a source of information about vaccination that is not trustworthy. Ukrainians trust information about vaccination from family doctors to the same extent as from the Ministry of health of Ukraine. Also, 9% of the sample do not trust their family doctors at all. And even less, 3% do not trust pediatricians. A larger number of subjects (20% of the sample) do not trust the information that comes from infectious diseases doctors at all; 4% of respondents fully trust them; 6% of the sample considers public doctors trustworthy. A larger number (18% of respondents) do not trust them at all. 74% of the sample believe that friends and relatives, as a source of information, are not trustworthy at all. None of the subjects showed complete confidence in this category. 34% of the sample do not trust the information that comes from

bloggers who do not have a medical education. This is an identical number of people who do not trust who. However, 6% of the subjects sincerely believe in the information they post on the internet. 5% of the sample fully trusts people who describe their personal experience online.

Table 2: Correlation Matrix.

	Cynicism	External Locus of Control	Source Trust	Machiavellianism	Religiosity	Readiness to Vaccinate
Vaccine Benefits	0.431 ** (p=0.000)	-		-	-	
Level of Infection Danger	-	0.220 * (p=0.022)	-	-	0.223 * (p=0.020)	
Religiosity	-	-	-	-0.246 * (p=0.010)	-	
Ministry of Health	-	-	-	0.229 * (p=0.017)	-	0.1847578* (p=0.02772)
Family Doctors	-	-	-	-	-	0.1899624 *(P=0.02355)
Family and Friends	-	-	-	-	0.207 * (p=0.031)	
Readiness to Vaccinate with Moderna	-	-	0.3524537 **(p = 1.695e-05)	-	-	
Readiness to Vaccinate with AstraZeneca	-	-	0.2857**96 7 (p = 0.0005653)	-	-	
Readiness to Vaccinate with CoviShield	-	-	0.3699493* * (p = 5.862e-06)	-	-	
Readiness to Vaccinate with Sinovac	0.201 * (p=0.043)	-	-	-	-	
Readiness to Vaccinate with Pfizer			0.2873636* * (p =0.000525 3)			

(Source: Own)

The next step in analyzing the obtained data is to identify significant relationships between the studied variables by creating a correlation matrix. It is worth starting by analyzing the

relationship between an individual's confidence in the benefits of vaccines and the level of cynicism. There is a moderate positive association ($r=0.431$; $p<0.001$) between individual confidence in the benefits of vaccines and cynicism. Cynics have a mostly analytical way of thinking and criticize everything, but they consciously assess the opportunities and risks of the medical field, so they have a positive attitude towards vaccination. Also, an interesting point of the study is the result regarding the relationship between the use of vaccines of different representatives and cynicism. Thus, there is a weak positive link between cynicism and attitude to the Sinovac vaccine (development: China). The higher is the level of cynicism, the more subjects tend to have a positive attitude towards vaccination with a vaccine developed by China. This is a manifestation of a nihilistic attitude to the opinions of society, in which the Pfizer vaccine has the greatest support in the Ukrainian environment.

It is worth paying attention to the fact that the scale "internal locus of control" does not correlate with any of the indicators. It means that the willingness to get vaccinated is not related to the internal locus of health control. The indicator of the degree of religiosity positively correlates with the degree of danger from infection (0.223*, p=0.020) and trust in such a source of information as relatives and friends (0.207*, p=0.031). The confidence scale for vaccination sources positively correlates with the willingness to be vaccinated Moderna (0.3524537 **,p = 1.695 e-05), AstraZeneca (0.2857**967, p = 0.0005653), CoviShield (0.3699493**, p = 5.862 e-06) and Pfizer (0.2873636**, p =0.0005253). No significant correlations were found between the source confidence scale for vaccination and readiness to be vaccinated with Sinovac and Sputnik V vaccines.

The study also revealed significant positive links between the level of readiness to be vaccinated and the degree of trust in the Ministry of Health of Ukraine and family doctors. There were no significant links between the willingness to get vaccinated and the degree of trust in WHO, pediatricians, infectious diseases doctors, public doctors who speak in the media, relatives and acquaintances, bloggers without medical education, and people who describe their own experiences on the internet.

DISCUSSION

As it can be seen, Ukrainian population in general does not trust the vaccine and the reliable sources that provide relevant information regarding the vaccines and vaccination process. Results of the study have shown that cynicism is one of the major factors that impacts the decision to vaccinate and almost directly defines the vaccination hesitancy of the Ukrainian population. Those who trust the sources about the vaccination are ready to get vaccinated with any type of the vaccine. No specific preferences regarding the preferred type of the has been found since those people who are ready to vaccinate do not give any specific preferences to the type of the vaccine. We assume that digital literacy plays a significant role in the overall attitude towards the vaccination process and vaccination hesitancy. The results show that many respondents have a tendency to believe bloggers without any medical education and it shows the absence of the corresponding educational level that concerns basic biological processes. Despite the critical situation that emerged because of the pandemic, Ukrainian government and society in general failed to launch corresponding programs or materials that would have increased the digital literacy of the population which could have resulted into the more efficient differentiation of the reliable and non-reliable information regarding vaccination. Vaccination hesitancy is a phenomenon that is directly linked to the conspiracy beliefs, and even though it has not been thoroughly researched in this particular study, it is evident that influencers without medical education may significantly impact the decisions that concern vaccination. Methods

of digital education would allow to increase overall awareness about the mechanism of the vaccination and its overall benefits, especially during the COVID-19 pandemics. Such results allow to state that current level of the digital literacy in Ukraine is insufficient since major part of the population is ready to refuse to vaccinate because of the irrelevant or illogical factors such as the position of media bloggers. This insufficient level also decreases the trust to the reliable sources that concern the process of vaccination and the benefits of vaccines in general. Based on results, people have to be more cynical in order to perceive COVID-19 as a serious threat and to be ready to vaccinate in general. Digitalization of education would allow to understand the effectiveness of the vaccine better and to increase overall awareness of population regarding the benefits of vaccination as a result of the increased digital literacy.

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Advanced Technologies

ARTIFICIAL INTELLIGENCE AS A TOOL TO PROMOTE EDUCATION

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Abstract

The study deals with some opportunities and ideas of the usage of artificial intelligence in education. Nowadays technology is getting more and more widespread. In regards of the rapid development and the ongoing pandemic we may ask ourselves, how could we put these new technologies in practice in the field of education. In this study, we present examples for the generation and evaluation of educational materials. The project focuses on the education of mathematics. Such applications already exist, which are capable of creating and then checking mathematical problems. However, we attempted to approach the problem from different direction, that by the help of artificial intelligence the application may pinpoint the cause of a wrong answer. In addition, the program may recommend topics to revisit based on the answers given. There are many applications which can easily correct all sorts of objective type tests. When it comes to longer answers, where the students can express themselves more with their own words, it is up to the teachers to read and evaluate. In our study we sought to come up with a possible solution to this problem as well, based on the models of some fundamental neural networks. The aim of the application is to extend the functionality beyond accepting limited pre-defined values. The aim of this research is to ease the teachers' work without restricting them.

Keywords

Artificial. Intelligence. Education.

INTRODUCTION

Digital technology plays an important role in everyday life and is prevalent in almost every field, including education. Schools are equipped with computers and the use of ICT tools has become an integral part of lessons. Digitalization is almost inevitable in the field of education. The various presentations to be submitted, the Internet, which replaces tangible textbooks, or the use of electronic books have become commonplace. But there is also the virtual reality, which is also of great interest. In addition, it also has educational projects (e.g., Leonar3Do), and the digital media (e.g., audio and video materials created for educational purposes) (Kalyani & Rajasekaran, 2018). Given today's situation, the epidemic has required online teaching and learning. The lessons were held using a computer, laptop or smartphone. So, both the handing over of the new material and the examination took place in the form of distance learning. Fortunately, there are systems (e.g., Moodle, EduPage) which assist delivery of the teaching, certain types of examination and the communication between the teacher and the student can be realized. However, the question whether these systems can make up for the teacher's explanation, any remarks that were made during attendance teaching in the case of, say, a practice example at a board. Taking the opportunity here, we would also like to turn to the important role of artificial intelligence, AI in short, in education. A list of software tools that use AI technology in education can be found (Chen et al., 2020). Focus on math education. A lot of literature (Ady & Terpecz, 2018), (Habib, 2018) deals with the use of AI in education,

where the emphasis is on the importance of E-Learning. According to them, the goal would be to develop an automated E-Learning curriculum generation software led by AI. A personalized curriculum and learning time are important. The AI devotes as much time to the student as the student needs. If we are talking about large groups, the teacher would not be able to do that in a few teaching hours. In contrast, the system is not only able to deliver the new material to the student on an appropriate schedule, but to constantly monitor its level of knowledge. As soon as a program detects a deficiency in a topic, it immediately indicates it. Thus, the student can build his knowledge on a stable foundation by repetition.

In addition to subject content generation, another important aspect is the accountability of acquired knowledge. Accordingly, in digital circles, the following common test types can be mentioned:

- closed questions
    - alternative choice
    - multiple choice
    - matching answers
- open questions
    - short answer
    - long answer
    - answer list

Of these listed cases the systems mentioned above handle closed questions as well as the best of open questions, where the program easily checks and scores students' responses according to the pre-set parameters by the instructor. However, in case the intervention of the teacher is inevitable. This is because these types of answers must be interpreted. We can try to find a solution to this problem again, starting with the operation of artificial intelligence. Literature dealing with AI (mostly) agrees that *"The basis of good artificial intelligence is the right quality and quantity of data and its intelligent processing"* (Pintér, 2019), (Ady & Terpecz, 2018). It is truly authoritative and important to use a qualitative knowledge base in which AI is able to evaluate student responses using samples. The goal is for AI to simulate teacher behavior. By this we mean trying to assess the student's knowledge and interpret their answers in such a way that draws attention to attention to the details that the teacher would expect during a live discussion response or dissertation. Be able to classify the student under these conditions.

In summary, in preparing our work we have tried to find solutions to the above two problems by developing programs that promote education in both subject content generation and accountability.

ALGORITHM FOR BASIC MATH LEARNING

As highlighted in the introduction, we focused on mathematics education and tried to focus on basic computer skills. The basic idea was to create a software that generates computational problems and checks the answers. In case of an incorrect answer, even though it interprets the obtained result and tries to point out the shortcomings. Simple and more serious task generators or control softwares are available online (e.g., Wolfram Alpha - Disadvantage of Continuous Network Access Ensuring Step-by-Step Solutions Display Monthly Costs). Our goal was to create an algorithm that simulated the teacher. This means that by checking the derivation of

examples of attendance instruction or tests, the teacher is able to notice which step may have caused the incorrect output result (e.g., sequence reversal, calculation, incorrect rounding, bad sign use, etc.). Based on this we built this part of our project. The created program is able to generate addition, subtraction, multiplication, division and last but not least bracketed tasks. These types of tasks are generated by the software according to the level of difficulty, based on the pre-set by the user. So far, we have created a total of 6 difficulty levels (EASY_1, EASY_2, MEDIUM_1, MEDIUM_2, HARD_1, HARD_2) which differ in the following parameters:

- multitude of operations
- generation interval
- handling a negative result
- decimal result management

Examining the filler's response depends on the example. Primarily following the generation, the software calculates the correct solution in a background variable. At the same time, additional background variables include the possible incorrect values that may occur most frequently. These types of errors were compiled based on literature (Nelson & Powell, 2017), consultations with mathematical educators, and our own experience. Before presenting our results on a specific sample, we describe the common types of errors involved in the project and their interpretations.

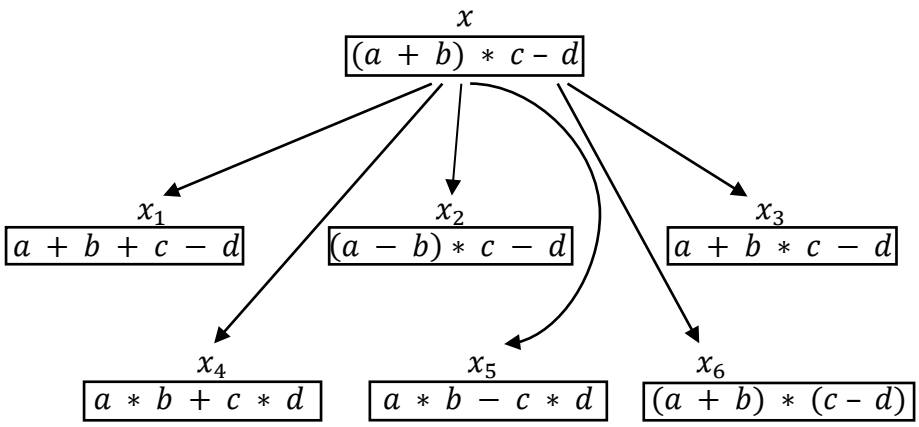
Table 1: Common errors in calculations.

Calculation error	Description	Conclusion, proposal
Settlement	The value specified by the respondent is 1 greater or less than the correct result.	Draw the student's attention to the tiny inaccurate calculation.
Swapping values	It is mainly characterized by subtraction or division (e.g., $a - b \rightarrow b - a$).	Draw the student's attention to the incorrect calculation. Demonstration example in case of multiple errors (e.g., $X€ - Y€ \neq Y€ - X€$).
Incorrect operation signal applied	For two operation signals within an example, it applies the same in both places (e.g., $a + b - c \rightarrow a + b + c$).	To draw the student's attention to negligence. In the event of multiple faults, repeat the function of the operating signals.
Swap operational signals	Swap 2 or more operators within an example (e.g., $a * b + c \rightarrow a + b * c$).	To draw the student's attention to negligence.
Mixing operation signals	Mixing due to designation or function (e.g., multiplication $\times$ instead addition $+$).	Draw the student's attention to the error. In case of multiple errors, repeat the notation forms and functions of each operator.
Priority	The calculation order is incorrect. For common parentheses or mixed tasks (e.g., $(a + b) * c \rightarrow a + b * c$).	Draw the student's attention to the incorrect calculation procedure. Repeat the priority of the sequence of operations in case of multiple errors.
Calculation in parentheses	Incorrect calculation of operations in parentheses.	Draw the student's attention to incorrect details.

(Source: Own)

Example of this type of sample and its associated common error outputs is shown in Figure 1.

Figure 1: Generated example shape - denoted by x and common errors - denoted by $x1, \ldots, x6$



(Source: Own)

Words describe short operation. If the answer of the respondent is equal to the value of x, which indicates the correct solution of the generated example, the positive evaluation is given. If the answer given by the respondent is equal to one of the generalizations $x_1, \ldots, x_n$ then the result of the calculation is incorrect and covers one of the frequently occurring error cases. Accordingly, the program notifies the user and proposes to review certain types of tasks - rules. If the value entered by the user is incorrect and differs from the existing common error cases, the program will notify the user, but it will not be able to suggest a review of previous topics. The interpretation and implementation of the control procedure according to Figure 1 in program code can be seen below:

```
x := correct_answer

if student_answer = x then
pc_answer := 'Correct!'

if student_answer = x1 then
        pc_answer := ' You have performed the wrong operations!
                        Check operation signals'

if student_answer = x2 then
        pc_answer := 'The result of the calculation in parentheses
                        wrong!'

if (student_answer = x3) or (student_answer = x6) then
pc_answer := ' You are not applying the calculation order
                        correctly!'

if (student_answer = x4) or (student_answer = x5) then
pc_answer := 'You have swapped operation signals!'
else
        pc_answer := 'Not correct!'
```

In the event of an error other than the $x_1, \ldots, x_6$ samples indicated above the student can also check their own answers. Mainly due to these types of errors, the display of a step-by-step calculation has been programmed, where in addition to the correct result, the path to it is also

revealed to the filler. This feature is otherwise available in all cases when completing practice tasks. With this solution, even young students can learn how to use each operation more easily and quickly, and can save time for teachers and parents in preparing and deriving the right examples.

The importance of feedback from the students' level of knowledge to the teacher cannot be neglected. As a result, additional information may be obtained while using the software, mint e.g., the time allotted for each task, the types of tasks causing the difficulty, the specific error cases that arise, which the teacher can easily read and draw conclusions about the abilities of the given student. The data is exported in a .csv extension, which the teacher can filter during the check in the following ways:

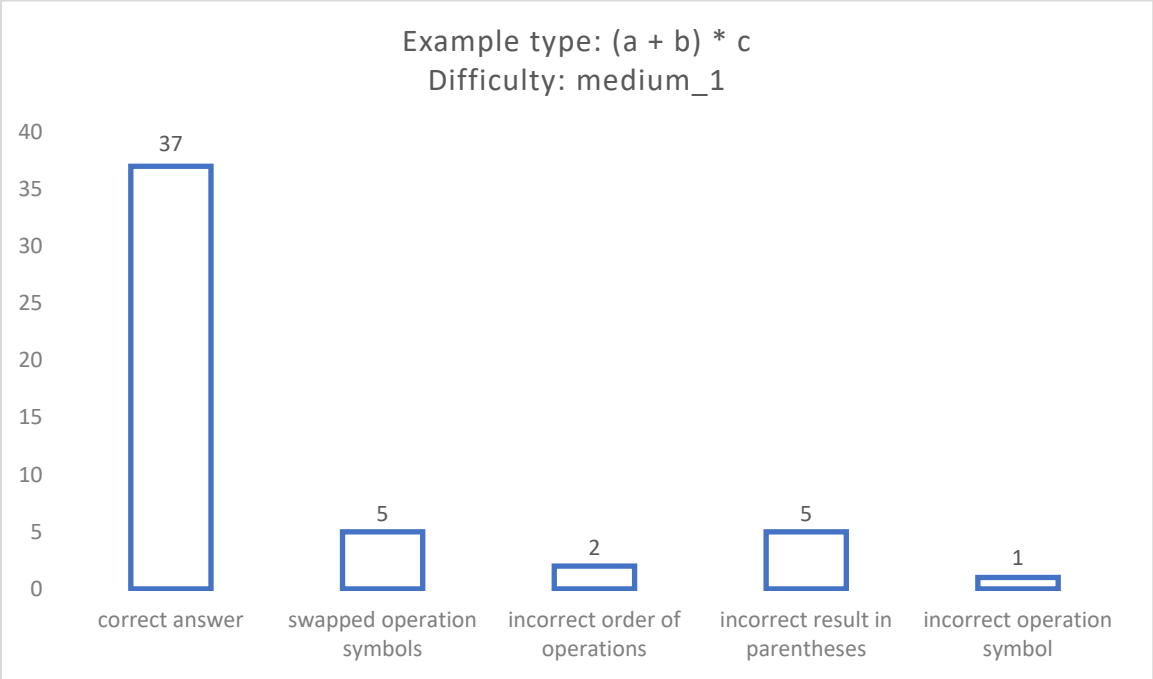
Table 2: Filter categories for exported data.

Example type	Difficulty level	Calculation time	Result

(Source: Own)

Figure 2 shows these types of filtered results.

Figure 2: The frequency of the results of the narrowed data set received by the software



(Source: Own)

It can be seen from the figure that the set of extracted data was narrowed down to the cases of examples of the form

$$(a + b) * c$$

the same applies for medium difficulty. It can be said that the student solved a total of 50 examples of this shape, of which the respondent gave a correct solution 37 times, which is 74% of the total multitude. For the remaining 13 tasks, the student made a mistake. Frequency of error types: 10% error can be attributed to the swapping of operating signals and also 10% to incorrect values calculated in parentheses. Incorrect application of the calculation order occurred with a frequency of 4% and incorrect operation sign with a frequency of 2%. When viewing the entire dataset, it is important to mention that by default, the data in Table 2 is listed

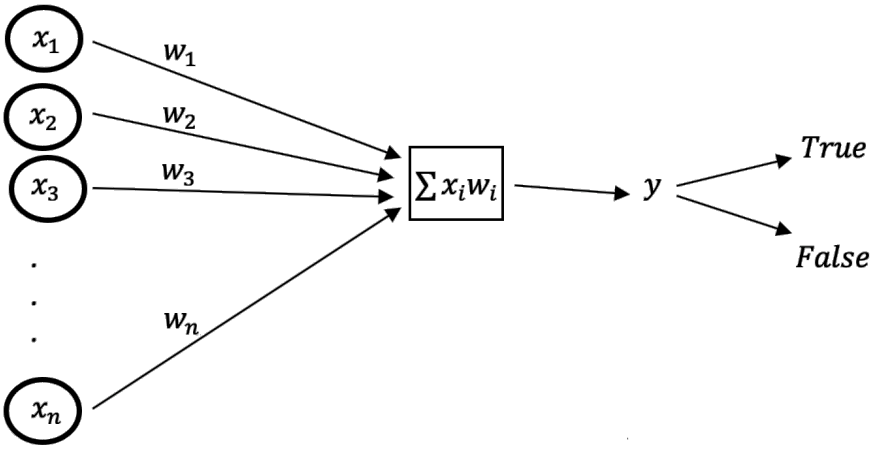
in chronological order so that the instructor clearly sees the deterioration or the improvement of the individual.

The software currently includes the five task types mentioned at the beginning of this chapter. Future development can be envisaged by expanding the existing example types and adding new types, even geometric tasks.

TEXT VERIFICATION ALGORITHM

Regarding examination, we have mentioned above the importance of the AI being able to judge the answers given by the student in her own words as correct. To do this, we need to introduce text checking algorithms that do not follow a simple predefined pattern to examine the students' response and decide its correctness. This would not be appropriate either, as the teacher himself does not expect the student to embed the received content word by word and to be able to recall it from comma to comma. The aim is to be able to reproduce the content with the students' own words. Take an example from mathematics and within that from divisibility rules. The division by two can be formulated as follows: *Any whole number that ends in 0, 2, 4, 6, or 8 will be divisible by 2.* However, even if the student says that: *Even numbers can be divided by two*. Of course, these sentences can be expanded and changed in terms of content. The point is that any modification of the response that also gives correct output should be considered true by the algorithm. This makes pre-submitted worded sentences and the exact order of the words within them obsolete. If we take the sample sentence used for divisibility by two, we can see that the listed values could not have been given only in this ascending order. Regarding the example the amount, of correct answers can be defined as 5! (factorial of 5). This means as many sample sentences for the machine and also accepts the answer given by the student compared to them only if the characters before and after it are the same. We will soon see that this is not the most viable way. A set of patterns is important but should be imagined in a more generalized form. On Figure 3, we need to highlight the key words of the correct answers to the given question, without which the answer would not be complete and which we would like to hear in the face-to-face answer anyway. And the student's answer should also be examined not by sentence, but broken down into elements and compared with the sample. The procedure for checking the correctness of the answer can also be thought of as a simple neural network. This is illustrated in Figure 3, where the elements of the student-given response are the input values denoted by x. The w weight values that want to indicate the values for the samples, which are determined by the teacher or the developer. It is important to choose these weights well, as this greatly affects the correctness of the algorithm output. These values and the pattern itself can be easily changed by the teacher-developer in terms of how much change is needed to get as close to the output as possible.

Figure 3: Text verification system structure: x denotes the inputs; w the weight values; Sum the summed values; y the threshold above which the response is accepted else discarded.



(Source: Own)

The question is, when can we talk about correct output? The algorithm considers the answer given by the student to be true if the sum of the product of the input elements and their respective weights ultimately exceed the minimum value for the samples defined by the teacher. Defining values is very simple. Let y be the threshold above which the output is *true*. Otherwise, it returns a *false* value. To determine the weighted sum of the inputs, we have given the following formula:

$$sum_{xw} = (x_1 * w_1) + (x_2 * w_2) + (x_3 * w_3) + \ldots + (x_n * w_n)$$

Once the weighted sum of the inputs has been calculated, we need to examine whether the value thus obtained, also known as the student 's response, exceeds the minimum criterion set by the teacher - developer.

If $sum_{xw} \geq y$, then $output = True$, else $output = False$.

We describe the practical outcomes of our program with a few examples. To the question, *"What number (s) are we called prime numbers?"* due to the student's answers, the algorithm judged the answers to be correct or incorrect in the following cases:

1. Answer: Numbers that are divisible only by 1 and by themselves.
   - **Correct!**
2. Answer: They have no more dealers than just 1 and their own.
   - **Correct!**
3. Answer: Divisible by 1.
   - **Incorrect!**
4. Answer: I do not know.
   - **Incorrect!**

The above illustrates the possible correct answers. The software can ignore spelling mistakes if the answer is logically correct. This feature is two-sided, as while the goal could be to encourage students to adhere to spelling, correct typing. On the other hand, when completing a time-consuming test, not everyone pays attention to typing correctly. Therefore, it is up to the

teacher to decide whether to enter non-spelled keywords while broadening the pattern, or to accept only logically and spell-correct values.

The program can process multiple sentence responses simultaneously. It can also manage individual characters (e.g., ? ! . , ; etc.), spaces and separate sentences accordingly. Thus, it can even examine the answer to a broader explanatory question. For example: History: "*Describe your knowledge of the 2nd World War.*". Therefore, it can be applied within the framework of other subjects.

During development, the program was provided with 50 theoretical mathematical questions, of which the test is randomly generated. The questions cover both basic and intermediate math topics. The data sample for the correct answers to each question was generally created by ourselves. Subsequently, since the goal is to recognize students' thoughts and language, we completed a 50-question test with 50 high school students. We expanded the data set with correct answers different from our sample. While completing the test we drew the attention of the students to the fact that they can answer a question in several ways. We expanded our data sample with the additional correct answers obtained this way.

CONCLUSION

We can state, the future of education is, to a large degree, related to the advances in novel intelligent technologies and the rapid development of computational capacities (Chen et al., 2020).

We recommend the use of the prepared subject content generation software even in attendance mathematics education. Some students do not prefer to speak when calculating the individual tasks in class, if the correct result did not come out or if they got stuck somewhere. In addition, it would be difficult for the teacher to check all the results in a class of 25-30 people. From the data extracted by the program the teacher would see on a person-by-person basis which parts were causing difficulties. In conclusion, the teacher can create personalized examples in the coming hours, aid the practice of difficult steps at the board or help with the selection of members in the case of group work. In addition, AI can help teachers with homework by suggesting more personalized activities based on the correct response rate and mistakes made. (Moreno-Guerrero et al., 2020).

Regarding the application of the text verification algorithm, it can be deduced that in case of a sufficiently large data sample, the computer can be entrusted with the verification of the answers to longer explanatory questions. In some cases, even the core answer set showed nearly 100% reliability. During the development the data set has already been expanded, so the software can perform more accurate evaluations from the initial state. Of course, further improvements will be added continuously, expanding the sample of correct answers to existing questions and adding new questions to the list of existing ones. So that more and more students need to be tested. Extracting a large amount relevant data requires the use of web-based tests in the future. The analysis of large datasets may provide additional opportunities for future development. More details about the analysis of large datasets can be found (Marín-Marín et al., 2019). And more about the major challenges and possible solutions of big data and AI in education can be found (Luan et al., 2020). With the right amount and quality of sample, the program may be applied even in remote learning.

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THE APPLICATION OF BLOCKCHAIN IN HIGHER EDUCATION

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Abstract

As more and more people start to acknowledge the cryptocurrencies' hidden potential and regret that they did not invest their fortune in the chosen tokens years ago, multiple questions arise. Is there any other beneficial aspect of the technology, which made cryptocurrencies possible, besides creating a digital gold rush? Does this approach really differ from the traditional web-based experience and may revolutionise the Internet? Is it possible to use blockchain in an educational environment? These questions are just as actual as difficult to answer, because the mentioned technology is currently in rapid development. Professionals of various fields trying to assess its true capacities and find its place among the other already proven digital solutions. Blockchain is a digital journal, where the information is recorded only once and cannot be modified in retrospect. Members of the network may access this log of different kinds of data. Another advantage of adopting this technology is the highly customizable and automated workflow which is realised by the help of smart contracts. On the other hand, institutes like universities are known for their complex ecosystem and therefore cautious attitude towards new trends. The paper consists of two main sections, the first covers the essential concepts and concerns regarding the topic. For better understanding code samples are included which were written in Python programming language. The second section of the paper evaluates the available literature dealing with the application of blockchain and includes use cases important from the perspective of higher education.

Keywords

Blockchain. Python. Computer Science. Education. Decentralised network. Programming

INTRODUCTION

Although the idea of a blockchain-like solution was proposed back in 1982, the first public proof of concept was introduced in 2008. This idea was later applied at the creation of Bitcoin. The technology amassed a significant amount of attention over the recent years. One of the main reasons behind the sudden popularity are the cryptocurrencies which aim to create fast, borderless financial systems where the traditionally essential role of banks is circumvented. By all means, this proposition is futuristic. Over the last ten years numerous projects arose and showed usage cases in and beyond the primary financial solutions, the so-called decentralised finance or DeFi in short. Recently more specialised usage cases started to appear which helped to grab the attention of other industries. The wide-scale adoption of blockchain technology greatly depends on the reaction of industry experts and the community. To better understand the impact of blockchain, first we would like to familiarize the reader with the platform itself. The idea to rely on decentralised platforms and move fully digital assets around may sound suspicious to one, but the technology is not limited to the cryptocurrency fever. The main purpose of this research is to gain insight into the basics of the blockchain and understand

the new concepts accompanying it. From all the available options, we chose Python as the programming language for this project, since it has all the necessary capabilities and is complemented by multiple libraries which can help in the development process. The secondary purpose was to evaluate the technology from the perspective of higher educational institutes (HEI).

METHODS

The research relies partly on the qualitative method of literature review. Since the technology is relatively new and rapid development can be observed as new projects and concepts are introduced frequently to solve different challenged. It is borderline impossible to keep up with the number of possibilities offered. Although some educational use cases are discussed in the available papers, the educational evaluation of the concept is less dominant.

Secondly, with a design-oriented approach in mind, we built a basic blockchain in Python to help understand the several new concepts and security features introduced by the blockchain technology. The code itself serves as a self-educational material for better understanding and to help in acquiring practical knowledge regarding the chosen topic. The included code samples are functionally limited snippets of the main code designed to demonstrate and ensure insight to specific functions.

WHAT IS A BLOCKCHAIN?

Blockchain is in fact a chain of blocks. It is fast, decentralised and immutable. At first, the technology offered a digital solution for problems like international money transfers. Where the traditional bank transfer takes days to complete, blockchain can accomplish results with lower fees in matter of minutes, or even seconds. The platform relies on automated digital processes, which speed up the traditionally lengthy procedures and eliminates the need of intermediaries like banks and other institutions.

Although the platform got its name from the mentioned feature, it also relies on cryptography and smart contracts. The blend of these three concepts is responsible for the supposed or real industry disrupting power of the blockchain (Friedlmaier et al., 2018). To understand the potential regarding higher education we need to discuss the technology's concepts. In addition, the concept of Non-Fungible Tokens (NFT) is introduced, which is rarely covered by previous research.

Blockchain

In its essence, Blockchain is an organised list of records or transactions. Each block in the blockchain contains information while the chained nature ensures a linear, chronological order. Every block contains information about the previous block, and information depending on the use case (Al Harty et al., 2019). For example, financial transactions contain information like details of sender, recipient, the number of the block, timestamp, etc. It intended to mimic the functions of the traditional accounting ledger. The records added to the blockchain are immutable. This ensures that the information cannot be edited in retrospect. Another safety feature is that every block contains an information fragment of the previous block. In many cases it is a hash value calculated from data contained in the previous block. This feature is responsible, that changing data in already existing blocks is extremely difficult. Manipulation of the recorded data would

usually result in failure since it either breaks the chain or must recalculate every subsequent block. The latter option is handled by the decentralised nature of the blockchain. Contrary to the traditional ledger, the blockchain ledger is distributed among the validating participants of the network and always must contain the same information. If there are different ledger versions present on the network, the implemented consensus algorithm decides and broadcasts the trusted version of the ledger. Notable choices are the computational power demanding proof of work (PoW) consensus algorithm used on the Bitcoin network and the proof of stake (PoS) concept recently adopted by Ethereum. To summarise, the blockchain itself stores the data in order, while the consensus algorithm guards the existing chain and decides on the addition of new blocks (Sharma & Batth, 2020).

Depending on the use case, different types of blockchain are being developed. From the perspective of educational application, we would like to mention two main categorical aspects. The first thing to consider is whether the given project required a public or private solution. On a public blockchain every user gets full access and the infrastructure is hosted on public computers. As a sign of cooperation and transparency public blockchains and their projects often feature open-source code. This enables the community to check and contribute to the code. In contrast, private blockchains are available for authorized users only and hosted at private servers. The second aspect is the permission set available for the users accessing the network. Permissionless blockchains grant equal read, write, commit rights to all of its participants, while permissioned approach grants different rights based on the hierarchy level. Federal or Consortium blockchains are similar to private permissioned blockchains except the authorised members are from multiple companies or institutes (Natoli et al., 2019).

Table 1: Common blockchain options.

	Permissionless	Permissioned
Public	Anonymous Open Hosted publicly Full access	Anyone can access and read data Authorized members can write and commit
Private	Authorized users have full access Hosted privately	Authorized participants can join and read Network operators can write and commit

(Natoli et al., 2019)

Cryptography

From a security perspective the blockchains like Bitcoin or Ethereum rely on cryptographic concepts. The blockchain itself benefits from the properties of hashing algorithms, like the different versions of Secure Hashing Algorithm (SHA). While the process is unusable for traditional communication, it is well tried for security purposes. This one-way process encrypts the messages to unique, fixed size hash values. The same message always produces the same hash, but a single character change in the message produces different, independent results in the hash. In the case of blockchain, the hash value is calculated from parameters like sender, recipient, number of the block, hash value of the previous block, timestamp. Although the compute time of the SHA algorithm is relatively low it would be extremely difficult to produce the same hash value without the knowledge of correct parameters.

Example code (Fig. 1) starts with importing the hashlib module which contains the necessary hashing functionality required for this kind of task. The process was executed

with the SHA3 (Keccak) version. Notice that the given input strings only differ by the last character, but the hashed outputs are different hexadecimal values.

Figure 1: The hashed values of text with 1 character difference.

```
import hashlib

original_message=b'16th international conference  DisCo 2021'
tampered_message=b'16th international conference  DisCo 2020'

print('Original message hash value: ',hashlib.sha3_256(original_message).hexdigest())
print('Tampered message hash value: ',hashlib.sha3_256(tampered_message).hexdigest())
```

```
Original message hash value:  4b11d758c9423289af2bcda2b9d48bf36146f426b1aca63335a6c0473c8ab6b7
Tampered message hash value:  cf19059d3823b76c845476697da99c37159ec34182a1a932ee60869d4593bd38
```

(Source: Own)

The second example (Figure 2) shows a simple representation with a low-level challenge included. The sample data used in the code are static string values purely for convenience. However, the generated hash must meet a condition. Namely, the output hash value must start with 00 digits. The more characters are predetermined the longer it takes to calculate a valid solution. Proof of work consensus algorithm implements high hashing difficulty as part of security perimeter. This approach values and rewards the verifying participants (miners) who own high hashing power. Besides the slower block generation, the immense amount of computational power and electricity drove the community to develop and improve more viable consensus algorithms. Proof of stake for example chooses one node (validator) randomly, but proportionately to the staked amount of cryptocurrency on the network. This solution validates transactions faster with decreased expenses. The process itself is presented on Figure 7 (Lantz & Cawrey, 2021).

Figure 2: Block hashing with added difficulty.

```
1  import hashlib
2
3  sender = 'Alice'
4  recipient='Bob'
5  block_number='25'
6  timestamp='2021.07.05,17:34:25'
7  previous_hash='0011d758c9423289af2bcda2b9d48bf36146f426b1aca63335a6c0473c8ab6b7'
8  new_hash=''
9  proof=0
10
11 while new_hash[0:2]!='00':
12     block_info=sender+recipient+block_number+timestamp+previous_hash+str(proof)
13     new_hash=hashlib.sha3_256(str(block_info).encode('utf-8')).hexdigest()
14     proof+=1
15
16 print('Valid hash: ',new_hash)
17 print('Proof: ',proof)
✓ 0.9s                                                                    Python
```

```
Valid hash:  006f6cd9f910ce7648b1c3a79b5cbdb8d9a835619b9330a2e3e3f65d8ec07c49
Proof:  222
```

(Source: Own)

To keep the blockchain safe and secure, asymmetric cryptography is featured besides hashing. This system allows users of the blockchain to have full control over their data

and give specific access to specific users. The algorithm creates a pair of unequal keys called private and public keys. The public key may be shared freely and it can be considered as an address. However, to access the incoming information recipient must use their private key, otherwise the content is beyond reach. Wallets created on blockchain have a public and private key generated, though the current method may differ by blockchain. To create a simple wallet, we first used the RSA algorithm (Figure 3) as an exemplification. Python has multiple modules capable of running the mentioned algorithm. Notable modules are the pycrypto, its successor pycryptodome (PyCryptodome, 2021) with extended features, and Python-RSA all offer the needed functionality. Pycrypto is a cryptography toolkit with support of multiple hash functions and encryption algorithms. Figure 3 shows a simple example of encrypting a string with the help of the generated public key and later decrypting it with the private key. The included outputs display the message in its original, encrypted and decrypted state (Stüvel, 2019).

Figure 3: Encrypting and decrypting a message with the RSA algorithm.

```
import rsa

(public_key, private_key) = rsa.newkeys(256, poolsize=4)

message = 'DisCo Conference'.encode('utf-8')
encrypted_message=rsa.encrypt(message, public_key)

print(message)
print('')
print(encrypted_message)
```

✓ 0.1s Python

```
b'DisCo Conference'

b'&\xca\xc5\x1ah\x80\xb2\xc3A\x05B\x06\xddv\xcc\xcd^\xbd\x11\xb1\x90j\xdf\x08\xffMv\xedem\x9e\xc
0'
```

Decrypting the message

```
message=rsa.decrypt(encrypted_message, private_key)
print(message.decode('utf-8'))
```

✓ 0.1s Python

```
DisCo Conference
```

(Source: Own)

Bitcoin and Ethereum wallets are generated by the help of Elliptic Curve Digital Signature Algorithm (ECDSA) and combines it with the above discussed SHA algorithm. Python libraries offering necessary capabilities are for example ecdsa (Warner, 2021), pycoin (Kiss, 2019) pycryptodome. In this type of approach, the keypair is used to generate an address, sign and later verify messages. The generated data, especially the address attempted to mimic the basic requirements of the Ethereum protocol. Since the mentioned system uses uncompressed public keys, it must be concatenated with the characters '04' as a prefix. Figure 4 presents a short Python code which meets the mentioned conditions (Lantz & Cawrey, 2021).

The address is derived from the public key. In the case of Ethereum, it runs through the hashing algorithm to get a 64 character long hexadecimal value. The address is the

first 20 characters of this value concatenated with '0x' prefix. The code regarding this process can be seen on Figure 5. Signing a document requires the hash value of the message and the sender's private key, creating a signature. The verification process compares the hash value of the file with the hash value of the signature decrypted by the sender's private key. If the two values are equal, the message is valid. As mentioned previously, Even the slightest change in data results in different hash values which leads to failure during verification. In Figure 6 three different verification attempts are presented, change in message or the use of inappropriate keys cause invalid results.

Figure 4: Generating asymmetric keypair with ECDSA.

```python
from ecdsa import SigningKey, SECP256k1
import ecdsa, hashlib

private_key = SigningKey.generate(curve = SECP256k1, hashfunc = hashlib.sha3_256)
public_key = private_key.verifying_key

private_key_str=private_key.to_string().hex()
public_key_str='04'+public_key.to_string().hex()

print('Private key length: ', len(private_key_str), '|', 'Private key value: ', private_key_str)
print('Public key length: ', len(public_key_str), '|', 'Public key value: ', public_key_str)
```

✓ 0.9s Python

```
Private key length:  64 | Private key value:
624b058a1aad0ac1ec0639dfb45e09d1867ce9dd3a8b78015b90472eda00c9b5
Public key length:  130 | Public key value:
04eeb94d22293755aa90d25264426d0f85347030848711ae7cbad85e78fa47386ec8ad15574acdd226c659a5f30fa39728e0e149428
6e69ec9ee72fb8443369d93
```

(Source: Own)

Figure 5: Generating an Ethereum address.

```python
public_key_encoded = public_key_str.encode('utf-8')
public_key_hash = hashlib.sha3_256(public_key_encoded).hexdigest()
address = '0x' + public_key_hash[0:20]

print('Encoded length: ', len(public_key_encoded), '|', 'Encoded value: ', public_key_encoded)
print('Hashed length: ', len(public_key_hash), '|', 'Hashed value: ', public_key_hash)
print('Address length: ', len(address), '|', 'Address value: ', address)
```

✓ 0.1s Python

```
Encoded length:  130 | Encoded value:
b'04eeb94d22293755aa90d25264426d0f85347030848711ae7cbad85e78fa47386ec8ad15574acdd226c659a5f30fa39728e0e1
494286e69ec9ee72fb8443369d93'
Hashed length:  64 | Hashed value:  73ef173a272735724620341d46591ff029da850c1d80fddaa1bfb7e7a8ebb2c2
Address length:  22 | Address value:  0x73ef173a272735724620
```

(Source: Own)

Smart Contracts

The Ethereum documentation states that smart contracts are special type accounts deployed on the blockchain. They are developed to automatically execute specific tasks. These simple programs can contain rules which are enforced if certain predefined conditions are met. Nick Szabo coined the term (Szabo, 1997) and compared smart contracts to vending machines which work without the presence of a vendor and offer a set of specific tasks for every case. Regarding smart contracts, it is worth mentioning the decentralised applications (dapps). These applications benefit from the above discussed concept while a frontend user interface is built on top of it. The definition may sound vague but enables the development of applications and games with more friendly user

experience. A drawback of complex blockchain applications is that the nowadays common application maintenance and update process is more complicated after deployment (Sharma & Batth, 2020; Raimundo & Rosario, 2021; Lantz & Cawrey, 2021).

Figure 6: Signing & verifying messages.

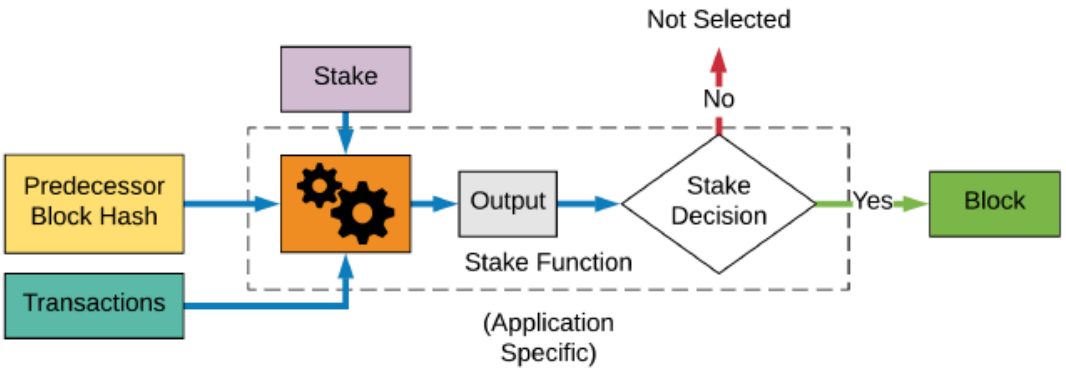
```python
message = b'disco conference 2021'
false_message = b'disco'
false_private_key = SigningKey.generate(curve = SECP256k1, hashfunc = hashlib.sha3_256)

def signature(private_key):
    return private_key.sign(message, hashfunc = hashlib.sha3_256)

def verification(message, private_key):
    try:
        public_key.verify(signature(private_key), message, hashfunc = hashlib.sha3_256)
        print('Verification successful!')
    except ecdsa.BadSignatureError:
        print('Verification failed!')

verification(message, private_key)
verification(false_message, private_key)
verification(false_message, false_private_key)
```

✓ 0.9s Python

```
Verification successful!
Verification failed!
Verification failed!
```

(Source: Own)

Figure 7: Proof of stake flowchart.



(Source: Natoli et al., 2019)

Non-Fungible Tokens

Many blockchains use some kind of token (in many cases cryptocurrencies) to reward participating users and maintain the ecosystem. These tokens are usually fungible just like real world money. To better explain, a 10€ banknote can be swapped with any other 10€, the value remains the same. However, a painting painted by a renaissance master would carry noticeably different value compared to a painting painted by the author of this paper. Although both items are paintings in essence, they cannot be swapped without loss on one side due to the unequal perceived value. The concept of NFTs tries to accomplish the digital version of collectible, unique items by reimagining them as tokens. The usage cases of NFTs range from digital art to badges which can show off different achievements. It has been suggested (Elmessiry, 2021) that NFTs have the capability to

be utilized as gamification during education. The main limitation of the conducted research is the theoretical nature. The introduced concept is engaging, but the development of such a system is resource demanding and requires further research (Al Harthy et al., 2019; Bashir 2019).

Microsoft developed a badge reward program named Azure Heroes (Microsoft, 2020) with the help of the Enjin project. Enjin resides on the Ethereum blockchain and focuses on building games and gamified solutions. The created badges represent different rarity and serve as a reward, memento for achieving specific milestones by active members of the Azure community.

BLOCKCHAIN IN HIGHER EDUCATION

The above-mentioned concepts form an important, but continuously developing list of features of the blockchain platforms. In this section we would like to discuss the possibilities and use cases, as well as highlight limitations and concerns regarding the technology.

On blockchain users could provide necessary access to details and documents for the requesting party without the need of a notary to verify the originality of the mentioned documents, thus eliminating the need for an intermediary, while maintaining high level security. Recent comprehensive reviews of the literature on the subject (Sharma & Batth, 2020; Raimundo & Rosario, 2021; Skiba, 2017) found that researchers are planning to utilize blockchain technology for higher education in several ways. The usage cases covered the blockchain based creation of certificates and diplomas, to reduce the required paperwork for exchange programs and a more streamlined accreditation system. These types of solutions rely on institutes' presence on a common blockchain platform and benefit from the high privacy and security measures. On the other hand, convincing multiple independent institutions to adapt the same digital platforms signifies the importance of educating people about blockchain technology. Other use cases involved submission, assessment and material sharing via blockchain. An argument against this type of adoption is one of the core features of the platform, the immutability of stored data. As pointed out by (Raimundo & Rosário, 2021) the extreme case of diploma revocation may be rare, but not a negligible feature from a development perspective. Gupta's (Gupta, 2017) list of different types of market friction seem to be realistic and also present in higher education. It is especially true for the institutional inertia section since education in general can be highly bureaucratic and documents often take days to process. Other key concerns to consider are the regionally different laws and regulations which may mercilessly limit the usage cases of the blockchain.

Blockchain-enabled supply chain is one of the notable use cases in the industry. These systems are designed to track and verify the assets digitally. By the help of Internet of Things (IoT) and automation every single piece's life can be traced. The process helps in failure investigations since the ledger is capable of containing detailed and precise information about the manufacturing process. In addition, customers may have the opportunity to check the genuineness of the product, therefore strengthening the consumer trust and providing a layer of interesting transparency. However, recording honest data in the blockchain depends on the participants of the supply chain. This style of usage may be applicable in research for tracking the activity of researchers, or tracking the references of research papers. In theory, every paper can be referenced and every document has one or more references. The process differs from the traditional supply

chain in that there is no specific endpoint, maximum number or records, or time limit involved. If a document is referenced in a newer publication, a new record is created about the activity. In a public blockchain every user could take care of their own work, while private and permissioned solutions may promise moderation and more structured experience. The very essence of such a concept is the possibility to share information more effectively and generate timelines, statistics of the chosen paper.

NFTs are a relatively new phenomenon on the blockchain and the research regarding this segment is scarce. We believe, with investment, it may serve as the home of the new generation of gamification. The success of NFTs greatly depends on the cooperation of educational institutes. The value of NFTs could be increased by wider adoption, like the inclusion of secondary, or even primary education. Educational progress shared on the same platform or the possibility to transfer the already acquired tokens could create the feeling of progress. This usage of NFTs is noticeably similar to the nowadays popular achievement system featured in many games. The difference lies in that educational institutes could reward students based on their learning and activity. In addition to the general, inevitable tokens (e.g.: Finish high school), it is possible to create limited, institute or event specific NFTs. However, video games have the advantage to evaluate events occurring in the digital space, therefore the process is mostly automatic. Regarding education the events may happen in real life or digitally, therefore the integration with learning management systems (LMS) may be expected (Elmessiry, 2021).

To summarise the potential use cases, blockchain technology could be a timely answer to modernize multiple processes, however implementation of the mentioned technology to a continuously operating complex system like a university holds challenges and limitations too. One of the most common concerns is the numerous new concepts and technical terms linked to the usage of the blockchain. The users' responsibility in this case is higher because they are not simply using an account which in the event of an accident can be simply retrieved by the help of a forgotten password button. Instead, they are directly communicating with a decentralised network where losing the private key may result in an uncomfortable situation. A suggested method to narrow the technical gap between the platform and its users would be a compromise: educate the target audience about blockchain technology while developers design more streamlined user experience and applications.

DISCUSSION AND CONCLUSION

The conducted research introduces important building blocks of the blockchain network with emphasis on programming and security aspects. We believe that the development of this technology is still ongoing and new concepts may further extend the possibilities. At this point higher education can certainly use the blockchain but the level of benefit is questionable. Although blockchain networks are nearly indestructible, they rely on the community using it. In case of higher education, the users are students, academics and personnel who must be prepared for the adoption. Even if the users have adequate skills to benefit from the features of the discussed technology, the fragmenting of institutes may cause unfavourable situations. As mentioned, blockchain depends on the community. If the institutes of a specific city, region, country refuse to adopt a common platform the advancement can be realised only in fraction. Another key issue identified is the lack of motivation and content. In order to create a thriving community, the platform must be filled with useful features. The implementation of blockchain in different fields is seemingly slow but the cautious attitude is understandable considering the distinct

operating principles. However, more research should be done to identify exact use cases and develop moderately timeproof solutions to improve the educational process. We would like to expand our research to contribute to the development of the blockchain for education and to observe the impact of the decentralised networks in this field.

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HOW TO TEACH PROGRAMMING IN AN INTERESTING AND MODERN WAY

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Abstract

Web and mobile application programming is an interesting human activity that needs important preparation. This article deals with the preparation of university students to learn to program using modern and interesting methods, but the conclusions are valid and broader. The main goals of our research are to increase students' motivation to learn programming, to increase the attractiveness of programming and at the same time to improve the knowledge and skills of our graduates. It turns out that the use of problem-based and collaborative teaching in conjunction with the use of Internet of Things facilities and services is a good way. We also analyze this issue in the KEGA research project, where, among other things, we propose the introduction of new or additions to the existing subjects of the study program on the issue of the Internet of Things. It is a modern and interesting issue closely connected with the daily life of students, in which they show enormous interest. The proximity of the issue increases students' ability to understand the presented theoretical material and the possibility of immediate verification of the acquired knowledge in practice using modern devices of the Internet of Things supports their motivation and interest in studying.

Keywords

Teaching programming. Problem teaching. Collaborative teaching. Motivation. Attractiveness. Knowledge and Skills. Internet of Things.

INTRODUCTION

Programming is a process involving activities from algorithm design, writing, testing and debugging the source code of a computer program (software), including subsequent maintenance. It is a creative activity of a programmer, which in fact never has to end, as algorithms, programming languages and even requirements are constantly changing. When solving a problem, several programmers will most likely get to a given goal in a different way, using different algorithms and tools. Often, time and user experience will determine which procedure was more appropriate in a given situation.

From this point of view, the teaching of programming is interesting especially with regard to the forms, methods, means and ways to achieve predetermined goals. Each teacher chooses them on the basis of their own experience and with the faith to achieve the maximum benefits for their students.

METHODOLOGY - PROBLEM DEFINITION AND OBJECTIVES

Students who come to university today are usually digitally skilled enough to take advantage of today's digital conveniences. Access to them requires considerable skills and knowledge from the teacher. Many things are a matter of course for these students, as they have

not experienced the period before the "digitization" in which their teachers or parents often grew up. Engaging these students is not easy and it is even harder to keep their attention for a long time. For this reason, many programming teachers are looking for new forms, methods, or means to make teaching more attractive and efficient.

The entry level of knowledge and skills of programming students tends to be different. From minimal experience, through partial knowledge to a good foundation in programming. However, most of the students who have completed programming subjects at our university in recent years, especially web applications, had little or almost no initial programming experience. This may not be a problem, it can often be an advantage, as such students do not have bad habits from programming or problem solving. It seems important whether the students show a real interest in this issue, or whether the teacher can properly motivate them.

As with other subjects, student motivation plays a significant role in the field of programming studies. It is not possible to expect too much motivation from the student if he does not have a clear idea of what programming actually contains, does not have a sufficient knowledge of the required programming language, and is even afraid of seeing the subsequent use of acquired knowledge and skills from programming in his later life. Sometimes it happens that such a student does not believe in this area, he has a panic fear of programming and argues that he can never do it. If such a "block" can be removed, its results can be surprisingly positive.

The goal of our efforts in recent years in teaching programming has been:

- increase students' motivation to learn to program by finding new activating forms of learning to program;
- increase the attractiveness of learning to program;
- improve the knowledge and skills of programming graduates.

Motivation of students to learn to program

"Achieve your first successes as soon as possible"

If a student is highly motivated to learn to program, it is reasonable to expect that his results in this area will be very good. Such a student follows with interest the teacher, the curriculum and tests what he has already mastered, achieves the first successes and sets higher goals himself. In this case, the student's initial knowledge and skills hardly matter at all.

On the contrary, if the student is not motivated enough, he pays little attention to mastering theoretical and practical programming procedures. This may further deepen his belief that he cannot handle this. If there are no positive results for a long time, it confirms his conviction and this vicious circle can be repeated and deepened. It is a great benefit for such students to achieve at least minor partial successes as soon as possible. Here, the role of the teacher is irreplaceable, to identify such students as soon as possible and literally "push" them to their first successes. After a few partial successes, the most artificially created "block" or the student's fear of programming is lost.

It can be said from practice that not everyone has the ability to become a good programmer, but with the right amount of effort, at least everyone can master the programming basics (Pillár, 2018).

"What about that?"

It increases students' motivation if they know why they would use the acquired knowledge and skills. In (Záhorec & Hašková, 2009) it is stated that "the most significant motivating factor

for the acquisition of relevant knowledge is the awareness of the meaningfulness and applicability of the acquired knowledge and the possibilities of their use either for their own self-realization or for practice."

Until recently, programming was commonly taught by beginning with a description of a particular programming language, its data types, and the syntax of its use. If the student was able to program something meaningful, many lessons passed. This often caused the gradual lack of interest of the student in programming, or for a more practical use of the acquired knowledge, he did not even increase the time in the grant of the subject or course. Less motivated students have only confirmed that they do not need programming in their lives. The more motivated could be disappointed as they expected more.

Not everyone immediately sees what possibilities open up for him in mastering programming in his professional application. It should be noted that a student at a university, even if he is already an adult, is still relatively young and does not understand all the context as a teacher. A young person lives mostly in the present and does not solve what will happen in decades. He does not realize that programming is not just about writing source code, but often especially about solving a problem, system thinking, or the requirements and needs of the end user of a product. The procedures and skills acquired in the study of programming are widely applicable in a wide range of human activities that are not related to programming at all. Mastering algorithmization and logical thinking is a prerequisite for a good programmer and at the same time it is a benefit for his daily life.

"Solving problems from life"

In practice, it has been shown that the inclusion of problem solving from students' daily lives increases their interest in programming and their overall motivation to learn it. Solving problems that are not close to the student does not bring the desired results. Even when solving simple problems, it is necessary for the teacher to clearly point out the use of their results in the later solution of more complex tasks, which are close to everyone. There is no need to try to solve complex problems as soon as possible, it can be counterproductive. On the contrary, the basis of success is the presentation and solution of problems of everyday life that are close to the students and encounter them on a daily basis.

"Resources used"

Increasing students' motivation to learn programming is also possible through the use of appropriate resources. Recently, the hardware and software elements of the Internet of Things have become increasingly used by such relatively easily accessible means. These are mainly microcontrollers (ESP8266, ESP32 ...) and single-board computers (Raspberry Pi ...). In connection with a wide range of sensors or Internet services, often available for free (at least in the basic version), it is a clear attractiveness of programming teaching. The student can relatively easily and quickly see the results of their work, improvement in programming, the connection of theory with his close daily practice. Today, the resources of the Internet of Things are used in the commercial sphere as well as for the personal needs of the individual, and the student currently encounters them at almost every step. With their help, it is possible to solve many problems that we encounter at work or in personal life. In addition, they can also serve to facilitate many human activities, or just for his pleasure. The Internet of Things and these tools are therefore ideal for use in teaching programming.

"Promoting competition"

Students' motivation can also be increased by using the natural competitiveness of individuals, which is especially observable at this relatively young age of university students. Students like to measure their own strengths, the acquired knowledge and skills. Everyone likes to be praised, they are happy if they solve something well and they can brag about it. So why not support it and use it in teaching programming? Our experience shows that promoting competitiveness brings better and faster learning outcomes. Competitiveness between groups in collaborative teaching brings better results than promoting competition between individuals. In the second case, there is a risk of resignation or blockage of weaker students who suffer from less self-confidence, or achieve poorer results.

The attractiveness of learning to program

Due to the above facts, we decided in our KEGA project to address the integration of the Internet of Things and its resources into the study program of university students, which we want to make it more attractive and at the same time support students' motivation to achieve the best possible results and be better prepared for practice.

A significant part of the preparation of students in the mentioned study program is currently occupied by a part of programming, especially web applications. To do this, it is necessary for the student to gradually master at least the basics of specific programming languages, development tools, programming procedures, design patterns, application design, testing, publishing and many other related areas. Many theories need to be supplemented by even more room for practical programming itself.

Today's young people usually have a pretty good relationship with new technical devices such as mobile phones, tablets, etc. These resources certainly include the resources of the Internet of Things. Since it is not possible or practical to teach a whole range of such resources, which are constantly expanding and improving, we decided to choose one candidate from the field of microcontrollers (ESP32) and one from single-board computers (Raspberry Pi). In conjunction with the appropriate sensors or services, this will create an ideal environment for the deployment of simple and more complex applications and solutions created in programming teaching. This makes teaching more attractive, and in this case programming can only act as an effective tool for solving everyday problems. The student will be forced to look at programming in a comprehensive and multidisciplinary way.

Table 1: New subjects of the study program.

Nb.	Name of the subject	Degree / Semester of study	Nb of hours / week	Nb of credits
1.	Internet of Things (IoT)	B/2	4	5
2.	IoT applications 1	B/3	4	4
3.	IoT applications 2	B/4	4	4
4.	IoT applications 3	B/5	4	4
5.	Designing IoT applications 1	M/1	5	5
6.	Designing IoT applications 2	M/2	5	5
7.	Designing IoT applications 3	M/3	5	5

(Source: Own)

At present, the best research possibilities for integrating the Internet of Things into theoretical and practical teaching are being verified within the framework of the mentioned research project. It was necessary to define new subjects that should be introduced into the study program and subjects that need to be enriched with the issue of the Internet of Things. The aim of all these changes is to make learning more attractive to programming and the entire

study program. Table 1 presents the newly proposed subjects that are directly designed for the integration of the Internet of Things into teaching.

Subject number 1 in the bachelor's study is aimed at acquainting students with the basics of the Internet of Things, devices, sensors, protocols, methods and areas of use. By completing it, students will gain knowledge and practical experience with the basic possibilities of using and communicating devices the Internet of Things in various areas of our lives. They will understand and master the basic issues of security, programming and software updates of microcontrollers and single-board computers, the use of sensors and databases. The teaching in this subject includes not only the necessary theoretical features, but also examples of the basic use of the components and services of the Internet of Things.

Subjects 2-4 are designed to gradually get acquainted with and master the use of the ESP32 microcontroller and the Raspberry Pi single-board computer for various purposes. The student thus gradually moves from solving pre-prepared exercises to solving everyday problems using devices and services of the Internet of Things.

After mastering the basic theoretical knowledge and completing the prepared exercises in subjects number 5-7 of the master's study, the student gets to solve life situations, problem tasks that we encounter in everyday personal or work life. These are tasks to improve or facilitate people's lives, streamline economic or social processes and etc. In these subjects, students will be able to show and develop their creativity, sense of problem solving, or collaborative teamwork. The result of their work will be comprehensive solutions, including the design of hardware, software, web and mobile applications.

Modifications to the content of existing subjects will mainly affect subjects such as Web Design, Programming, Artificial Intelligence and Neural Networks, Database Systems, Computer Networks etc. These modifications will bring to these subjects, from the students' point of view, easier-to-grasp topics, which will help to master the set issue and at the same time bring it closer to everyday life.

Knowledge and skills

Each programmer must master a large amount of theoretical knowledge of the programming process, including the specific programming language used. Since not every programming language is suitable for solving every task, usually the programmer has to know several languages at once, be able to orientate well in them, know their strengths and weaknesses and be able to choose the right language for a particular problem.

Thus, the knowledge that a student should acquire when learning to program does not guarantee that he will be a good programmer. Just as it is necessary to ensure that he acquires a good theoretical foundation in programming, it is also necessary to focus on the acquisition of appropriate skills for solving individual tasks and the associated use of acquired theoretical knowledge.

It turns out that these knowledge and skills should not be separated in some way and presented to students separately. Due to the currently very rapid development of programming, programming languages and techniques, the need for basing to fully master theoretical knowledge is reduced and the priority is given to improving approaches and procedures for solving practical tasks. A very good approach to teaching programming seems to be the gradual acquisition of theoretical knowledge with their continuous practical use, i.e. learning by solving simple problems. This can be achieved by using problem-based teaching combined with a collaborative approach.

In problem-based teaching, we prepare the necessary number of problems / tasks for students, which are precisely linked to the theoretical knowledge that students have to master. After a simple clarification of the knowledge (again on examples) to be mastered, followed by a gradual students solution of the teachers problems set. Here it will be clear how the given part of the theory was understood and mastered. If necessary, the teacher will explain it in more detail once again, so that the next issue is approached only after mastering the current one. Unlike traditional teaching, where the teacher passes on ready-made knowledge to students, in problematic teaching, the teacher puts the student in front of tasks.

In the teaching so far, the teacher has usually focused on the individual. Thus, the advantage was those who mastered the issue first. Gradually, they were able to build on the acquired knowledge and skills and thus gain an advantage over students who, for some reason, misunderstood, incompletely, or not at all. However, there is no guarantee that a student who masters a given issue earlier will also be a better programmer. Thus, this methodology has so far only led to a certain selection, often random, when some students appeared to be better or more suitable for the field of programming, but in fact in their practice after graduation did not confirm these assumptions.

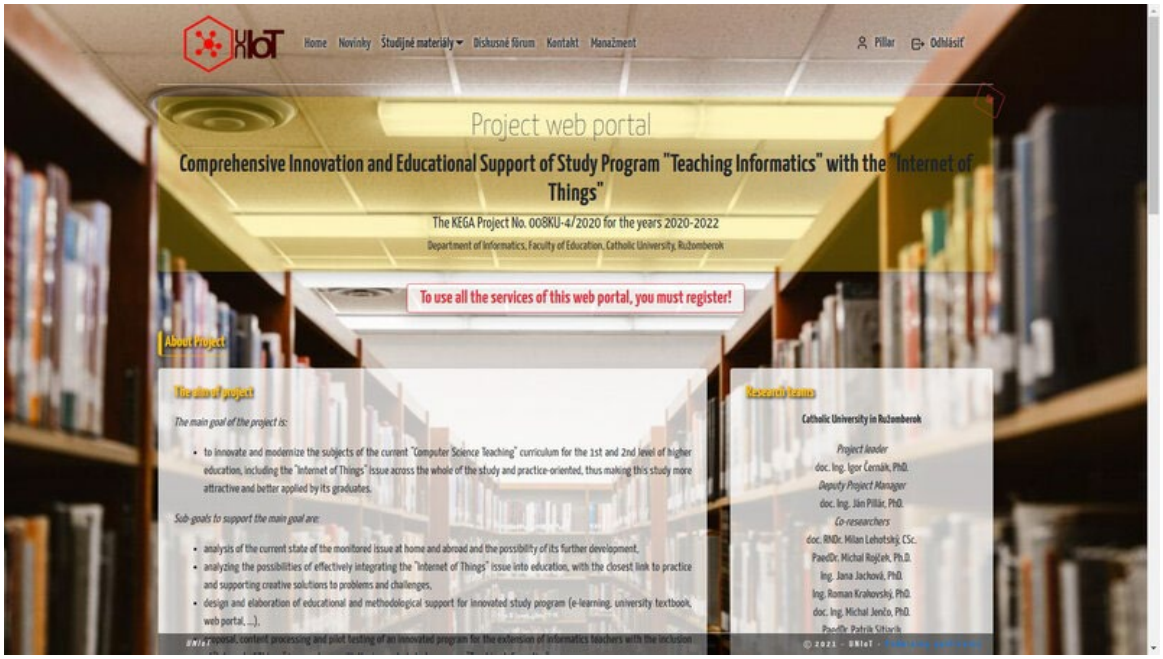
Collaborative teaching seems to be the cure for this lack of training for programming students. In this case, the student does not solve the problem tasks presented by the teacher independently but within the created study groups. This approach has proved to be effective in significantly eliminating the danger of students appearing to lag significantly behind their classmates in terms of acquired knowledge and skills. This is achieved through the practical work of each student in the team, discussion, exchange of views and experiences. "Collaborative teaching is also about developing responsibility, honesty, cooperation, tolerance, empathy. It is based on the premise that learning is a natural social event in which participants communicate and support each other“ (Černotová, 2015).

According to (Beka, 2019) „... we must create opportunities to collaborate, communicate and exchange experiences, while respecting the individuality of each in particular. It is therefore very important to understand that some of the most important skills an individual should possess are the co-operation skills by which he or she exhibits them in relation to others. This form of collaboration skills helps students in effective and creative learning. It is being used widely around the globe in different learning settings and has become a new teaching model. This bearing in mind that knowledge is understood as something shared and built a collaborative process. In this case everyone in a classroom setting helps and contributes to the classroom learning.“

Properly assembled groups of students, who then solve the assigned problems together, can significantly affect the overall results of individual groups. Here, the role of the teacher is demonstrably very important, who should ensure that the created groups will be, as far as possible, as homogeneous in terms of previous results, assumptions of mastering the presented issues, but also in terms of personality qualities, characters and the like. In well-formed groups, there is very often a synergistic effect, where students enrich each other not only with knowledge and skills, but also with the experience and quality needed for successful collaboration in a team. „... if the teacher provides opportunities to the students and at the same time helps them to work together, bridges of cooperation can be created between the students. The teacher should plan carefully and at the same time determine certain strategies and structures to motivate students to work together. Teamwork helps all students and their success will be higher. Teamwork also gives teachers greater opportunity to manage and maximize the time they have available, especially in the assessment area“ (Beka, 2019).

To support the acquisition of knowledge and skills of students, we have implemented a new special web portal within our KEGA project at https://UNIoT.sk (Figure 1), which is to serve as a central source of study information and instructions for studying Internet-related issues in the newly established also modified subjects of the study program. It provides students with theoretical articles, practical instructions, interesting links to additional study materials, or materials for direct download and subsequent study. It is also a platform for mutual discussion on related topics.

Figure 1: Web portal https://UNIoT.sk.



(Source:Own)

RESULTS - RECOMMENDED PRINCIPLES IN TEACHING PROGRAMMING

When looking for solutions to increase students' motivation to learn programming, how to increase the attractiveness of learning to program, or how to improve the knowledge and skills of programming graduates, we gradually found the most suitable ways to achieve this. According to our previous experience, it is clear **that it is not possible to educate good programmers today with the help of old methods**.

Based on the research results obtained so far in our KEGA project, we have applied the following principles to the teaching of programming:

- make maximum use of problem-oriented teaching in conjunction with a collaborative group solution of pre-prepared problems / tasks by the teacher;
- to create groups for collaborative teaching exclusively by teachers on the basis of students' thorough knowledge in terms of their knowledge, skills, character and personal qualities;
- solve teaching as a gradual, partial acquisition of the necessary theoretical knowledge and at the same time practical skills in order to achieve the earliest possible at least partial successful results of programming;

- when teaching programming, emphasize the connection with practice and prepare problem tasks so that they are focused on everyday problems of students, or problems that are close to them, or familiar from the family environment and the like;
- to support students' natural competitiveness in collaborative teaching;
- make use of the prevailing positive attitude of current students to digitization and technical means today and make maximum use of IoT devices and services in teaching programming (in our specific case, especially the ESP32 microcontroller and Raspberry Pi single-board computer), making programming more attractive and unforced approaches practice.

CONCLUSION

The implementation of the above principles in the preparation of students in the field of teaching programming requires very detailed preparation of the teacher in terms of the content of teaching, its procedures, the means used and the knowledge of the students themselves. His high commitment and professional erudition is therefore expected already in the preparation of teaching and during it. Just such little things as proper monitoring and timely guidance of students' work in solving problem tasks, giving a helping hand at the right time, or encouragement or a strong attitude at the right time can mean success or failure to set goals. In this case, many years of pedagogical experience and skills of the teacher are a great advantage and benefit for students.

Teaching at universities cannot be the same, the same for many years. We are constantly changing our society, changing the programming, programming languages and techniques. The teacher is obliged to follow all these trends and gradually introduce them into the teaching of his subjects. It follows that individual subjects also change, and even some new ones may arise, or some may lose their validity and disappear. All changes should pursue a single goal and that is to best prepare students not for the exam, but for the best possible application of the school graduate in practical life.

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WEB ANALYTICS AS AN ONLINE COURSE DESIGN TOOL: CASE STUDY OF ONLINE COURSE FOR HIGH SCHOOL STUDENTS

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Abstract

Web analytics tools (in our research, Google Analytics) allow relatively detailed monitoring of users and what they do on a website. Online courses built on content management systems without logging in (not on LMSs, such as Moodle) can, therefore, easily use these tools as a fundamental evaluation tool. The study aims to answer (based on work with specific data from an open online course – information literacy for high school students) how it is possible to use web analytics to design online courses. The study follows the content line as it analyses which pages or topics are of interest to visitors. The paper analyses the differences between students with different personal interests and how these interests are reflected in the required educational content and online study. It also focuses on formal issues, what the course may look like (UX design), what students have facilities for working with content, what devices they work with, what resolutions they have and what formats are suitable for their normal study situation. An analysis of the behaviour of five selected students offers (while maintaining anonymity) the possibility to study interaction with the content. The study aims to offer specific research evaluated data and some methodological guidance on how web analytics can help design online courses. The current literature in this area is relatively fragmentary, and although the topic is increasingly popular, more comprehensive methodological guidelines for course creators are required.

Keywords

Google Analytics. Open Online Courses. Web analytic., Design online courses.

INTRODUCTION

Web analytics is one of the traditional tools of marketing (Järvinen et al., 2015; Chaffey et al., 2012; Gour et al., 2021), but is gradually gaining ground in learning analytics (Luo et al. 2015. For a long time, it was dominated by the classic stream, focusing mainly on data from learning management systems (Mwalumbwe et al., 2017; Clow, 2013; Ochoa et al., 2017), which worked with the idea that one can track an individual student and offer them practical help through appropriate data. The underlying paradigm was action research coupled with the notion of maximising care for individual students (Siemens, 2013; Siemens et al., 2012). Traditional web analytics followed the opposite approach and tracked user behaviour, their complex characteristics and path towards a specific action, typically the purchase of goods.

Our long-term research on web analytics tracks is built on open web-based online courses, typically characterised by no login or filtering of visitors. Thus, on the one hand, they typically target a specific population. However, at the same time, it is possible to say that other users also visit the educational website (course).

We build on Mc Guckin andCrowley's (2012) research, who were one of the first to publish that Google Analytics data can be used to evaluate web-based courses. Moissa et al. (2014)

developed the AdaptWeb visualisation tool, which combines data from web analytics based on Piwik with data from local databases. Luo et al. (2015) offer the first systematic use of Google Analytics focused on learning behaviour and refer to the possibilities of designing a course according to this user-generated data. Romanowski and Konak (2016) view web analytics as a relevant, albeit challenging to interpret, tool for studying learning behaviour. Rohloff et al. (2019) focus on using web analytics in MOOCs. From a particular perspective, we could also include the study of Ali et al. (2012) in this review.

Starting in 2019, we are developing an online information literacy course aimed at secondary school students and teachers. It aims to offer individual topics in information literacy to secondary school students. However, the site is open to anyone looking for specific information literacy information, from searching or evaluating information to citing or creating a professional text.

Our study aims to show how web analytics can be used to design courses, both in terms of their form and content. The study focuses on the possibilities of working with Google Analytics (2020) in studying students' preferences, and their interest in particular topics and what types of users attend the course. Our analysis will serve as a guide for other researchers who want to use community-based open course curriculum design based on the needs of their users obtained from web analytics.

METHODOLOGY

Web courses are created in the open CMS (an open content management system) system Umbraco. The website can be visited by any user and is indexed in web search engines. Embedded in the site's code is measurement code from Google Analytics, which analyses each user's behaviour on the site. This measurement is statistical - it includes visits by bots and can become inaccurate when using VPNs, Proxies and other means to anonymise or change the location from which users work. Despite these inaccuracies, Google Analytics offers a reasonably good overview of the essential characteristics of users who are on the Web

For our analysis, we worked with the entire period of the website's operation, i.e. the time from 1st March 2020 to 3rd June 2021, when we processed the data from this research. We worked with two basic categories of users - non-immediate users, who are typically real users of the site as a whole, and all users. The latter is harder to analyse, but we can infer from the data that they are primarily bots, casual users, and primarily those looking for a specific piece of information on the Web (e.g., how to cite a book).

We aimed to answer the following research questions:

1) What are the essential characteristics of the site visitors?

2) What topics are visitors interested in? Can this information be used for course curriculum design?

3) Is it possible to trace any typology of users that would be useful for website design?

RESULTS: MACROSCOPIC VIEW OF THE COURSE

In terms of basic demographics, we worked with a sample of 9649 total users, with 2604 without immediate abandonment. While the number of sessions per user is 1.55 for the former group, it is 1.75 for the latter, indicating a specific return rate. The number of pages viewed per session for all users is 2.55 with an average time of 2:40, while for the second group, it is 6.10

with an average time of 8:45. The overall immediate abandonment rate is 69, 54%. The data shows that the 8:45 time per session is similar, though slightly shorter, to students taking university online courses created in Umbraco (other university online courses taught by me have these average times of 11:22 and 10:57 and 9:40). Other characteristics studied also show that the study behaviour of high school students on the Web is shorter and less comprehensive than that of university students. However, at the same time, it retains some standard features. The difference is due, among other things, to the fact that the texts on the Web being studied are significantly shorter, so study time is likely to correlate with the length of the texts presented.

In terms of demographics, according to Google, men make up the majority in both samples (approx.) 65%, women 35%, with the most significant number of users coming from the 18-34 age group (the system cannot analyse younger users) - 54% of the total population, 52% for the other group. In terms of when the website is visited, most periods are Monday to Thursday, from 9 am to 9 pm. On Fridays, there is substantial traffic in the morning, and on Sunday in the afternoon. At the same time, we have to say that the weekend is not much weaker than weekdays in terms of time (for example, there is no difference between Friday afternoon and Saturday). It appears that students prefer to shift their studies to the afternoon or evening and that attendance in the morning is relatively lower and can be attributed to other influences than students' interests.

As for the interests of users, we list them in the following tables. The analysis of interests is very important for design. This is a population that is interested in pop culture and is generally culturally oriented. For example, exemplars from literature, movies or online series should be positively received and easily understood. Similarly, we could also think about music or even sports. Although this is not somehow a large segment (overall, the interests of 37% and 9.63% (second group) of users are analysed - a reasonably representative sample), it turns out that this can be important information for the choice of tone of voice.

Table 1: All visitors.

Percentage of visitors	**Interest**
3,50 %	Arts & Entertainment/TV & Video/Online Video
3,47 %	Reference/General Reference/Dictionaries & Encyclopedias
2,88 %	Arts & Entertainment/Movies/Movie Reference
1,96 %	Arts & Entertainment/Music & Audio/Pop Music
1,88 %	Sports/Team Sports/Soccer
1,87 %	Arts & Entertainment/Celebrities & Entertainment News
1,87 %	Food & Drink/Cooking & Recipes
1,45 %	[Life Events] Moving/Recently Moved
1,42 %	Arts & Entertainment/TV & Video/TV Networks & Stations
1,39 %	Arts & Entertainment/Music & Audio/Music Videos

(Source: Own)

Table 2: Visitors without immediate exit.

Percentage of visitors	Interest
4,07 %	Arts & Entertainment/Movies/Movie Reference
4,07 %	Reference/General Reference/Dictionaries & Encyclopaedias
3,90 %	Arts & Entertainment/TV & Video/Online Video
2,88 %	Arts & Entertainment/Celebrities & Entertainment News
2,56 %	Arts & Entertainment/Music & Audio/Pop Music
2,36 %	Food & Drink/Cooking & Recipes
2,25 %	Sports/Team Sports/Soccer
1,79 %	[Life Events] Moving/Recently Moved
1,68 %	Arts & Entertainment/Music & Audio/Music Videos
1,65 %	Food & Drink/Cooking & Recipes/Desserts

(Source:Own)

More exciting data offer insight into which user segments spend the most time on the Web. We know that there is a correlation between time spent on a page and performance on a knowledge test from our previous measurements. Next, we focus only on users without immediate abandonment. A substantial segment of computer game players spends between 19:16 and 14:42 per session on the Web, which is very high. Whether the site directly offers any information relevant to gamers or whether there is some more complex causal structure. Relatively high numbers are achieved by music listeners (15:08), whom we have catered to by placing podcasts on the site. The last major category is travellers (14:45 and 13:30), which we also tried to accommodate, especially in the chapters on information retrieval.

In terms of the site's actual design, it can be said that the key is the desktop share of 77.07. However, in the design of the site, it is also necessary to think about mobile phones (21.24), which show a shorter visit time (5:13 vs 9:20) and the number of pages viewed (4.34 vs 6.38) per session. These numbers show that the time per content page is also decreasing. Among mobile devices, Apple significantly dominates with 35.34%, followed by Xiaomi with 18.93% and Samsung with 18.09%. Thus, it is not possible to focus on one platform or one device in design.

It can be added that Chrome is the most used web browser by 65.55% of users, followed by Safari 10.79% and Firefox 7.64%. If we filter out the differences between mobile and desktop users, there are no visible differences in study habits in this area. This means that, on the one hand, we have to account for multiple platforms and browsers in web design. However, in terms of information architecture, we do not see any measurable differences. The comparison between Windows (9:10) and Mac OS X (9:53), which are very comparable numbers concerning user numbers, turns out similarly for iOS (5:50) and Android (5:17). The only outlier is Linux (15:07), but this is probably due to the small number of users (0.61%), a statistical outlier.

Only 3.8% of users run applications in Java, which leads us to use JavaScript or HTML5 consistently. 90% of users have only a 24-bit screen, 9% have a 32-bit screen. Higher image quality is not to be reckoned with in the design. If we focus on desktop only, the most common screen resolutions are 1536x864 (26%) 1920x1080 (20%), 1366x768 (18%), 1280x720 (10%)

and 1440x900 (8.5%). This diversity is design-unfriendly; we have to build the Web for very small resolutions, both 1280x720 and almost double 1920x1080. On the other hand, the positive side is that we can count on a fixed aspect ratio corresponding to a classic widescreen monitor.

Now we can look at what users are interested in in terms of content while working with the site. We will have to change the scope of our research because the site has undergone some redesign, so we will be looking at data from 1st October 2020 to 3rd June 2021. If we focus on users without immediate abandonment, we will get a table with the following preferences.

Table 3: The table shows the essential characteristics of the user's approach to each topic.

Topic		**Page view**	**Unique page views**	**Average time per page**	**Percentage of departures**
1.	**Working with literature and citation**	1 601(23,95 %)	855(19,55 %)	0:02:42	33,48 %
2.	**Internet search**	1 576(23,57 %)	1 034(23,64 %)	0:02:41	23,35 %
3.	**Security**	659(9,86 %)	380(8,69 %)	0:02:21	18,06 %
4.	**Evaluation of information**	561(8,39 %)	413(9,44 %)	0:02:49	23,89 %
5.	**Memory institutions**	342(5,12 %)	217(4,96 %)	0:02:52	20,47 %
6.	**Writing professional text**	329(4,92 %)	267(6,10 %)	0:01:37	19,15 %
7.	**Work with documents**	316(4,73 %)	262(5,99 %)	0:01:44	21,20 %
8.	**Personal learning environment**	304(4,55 %)	220(5,03 %)	0:01:25	14,80 %
9.	**Cooperation and feedback**	259(3,87 %)	202(4,62 %)	0:02:07	12,36 %
10.	**Research planning**	235(3,51 %)	187(4,28 %)	0:01:55	11,91 %
11.	**Media and Citizenship**	125(1,87 %)	97(2,22 %)	0:01:17	16,80 %
12.	**Explore**	92(1,38 %)	79(1,81 %)	0:02:07	27,17 %

(Source:Own)

Analysing the 12 topics in the table offers some results that we must point out. There is a relatively small variance in time per page was visited (1:17-2:52), especially if we filter out the outliers (2:49 and 1:37). However, other data are interesting. The most visited category is Work with Literature and Citation, but it has an extreme exit rate of 33.48% - that is, users go to a given page to get specific information and then leave the site. So, it is not about education in general in the area of information literacy, but rather the ability to cite a specific source properly. The standard topics of information literacy are in a strong position, having been profiled in the Czech environment in the last twenty years - information retrieval, information evaluation, memory institutions, writing professional text, and working with documents complemented by Internet safety. Conversely, topics that are emphasised by modern information literacy frameworks, whether media literacy or competencies for learning and research, are marginalised by users. It appears that even though we are trying to work with community-based curriculum design, we have so far failed to offer these topics in a sufficiently comprehensible and structured form. On the other hand, all of them (except exploration, which is an unfinished topic) have in common that they rely on low drop-out rates, i.e., if users work with them, they are more deeply and firmly integrated into the course.

RESULTS: EXAMPLES OF SPECIFIC USER BEHAVIOUR

For the analysis, we selected five users who were ranked 14th-19th in Google Analytics traffic. The higher ranks were likely (according to the behavioural analysis) associated with the IP addresses of the course creators, so they were not a representative sample of behaviour. We must point out two important facts - what Google Analytics refers to as a user is likely to be one person, but it does not mean that it captures all their activity. The system stores him as two users if he connects from two IP addresses, deletes cookies, or something similar. The second comment relates to anonymity. There are few ways to identify a particular user, so this kind of analysis does not involve any ethical risk or invasion of student privacy. All the users analysed used a desktop to browse the Web.

User 1 has a total of 48 visits with a duration of 2:18:18. The first visit is on 4th October 2020, the last on 21st May 2021, so he is a regular user. This user is attractive because he does not follow one topic, and his behaviour is difficult to identify. For example, on 20th October 2020, he visited research topics and digital libraries, library catalogues, hoax, media literacy, and information filtering; on 20th May, he visited information about searching, professional text, media literacy, and security. They also visit the website regularly twice a day.

User 2 has a total of 38 visits between 19th April 2021 - 30th May 2021. He has spent a total of 4:07:34 on the site. Most visits are associated with the days of 10th May. The afternoon (from 13:30) focused on information retrieval topics. He spent 32:06 on this activity. He visited the site in the evening when he studied topics related to writing professional text and research. He spent 42:53 on this activity. During May, he returned to the Web to search for information on how to cite, but his study was more like tracking the individual topics he needed to create a professional text. This was not his first contact with the Web – in April, he repeatedly focused (between 19-27 April) on information security, which he studied quite systematically, over four sessions. In contrast, in May, his activity was much more systematic.

User 3 has a total of 38 visits and a session length of 4:02:55. The visits took place between 29th May 2020 and 12th May 2021. However, the main activity was concentrated in November and December 2020, when we record 8 interactions, repeatedly longer. He also focused systematically on the topic of search (35:24). The second systematic visit for a long time was on 9th December 2020 and focused on citation (56:40). He returned briefly to the topic again on 17th December.

User 4 has 34 visits and a session time of 1:08:52. Visits begin on 18th April 2021 and end on 1st June 2021. The user is specific because, in 34 visits, he has never explored a page other than the one focused on IMRAD.

User 5 has 32 visits and is similar in many ways to User 4. The visitor only viewed the Learning Plan and Time and Task Management pages, usually opening both simultaneously. This user is known to be from Dubí High School and accessed the pages through links in the school information system. The visits are spread over the period between 27th January - 18th February. They correspond well to the clear focus of school use.

Table 4: User characteristics.

ID	ID in Google Analytics	Number of sessions	Time spent on the Web	User characteristics
User 1	998648638.1566984615	48	2:18:18	Wide range, frequent visits.
User 2	895042322.1611658367	38	4:07:34	One topic, working with a specific information need.
User 3	927672992.1568811638	38	4:02:55	Broad interest in the course itself, working with one topic.
User 4	892730683.1618704737	34	1:08:52	Interest in a single, sharply defined topic.
User 5	144656302.1611746361	32	2:14:01	Interest in a single, sharply defined topic.

(Source: Own)

DISCUSSION

If we focus on the data that we have labelled as the "macroscopic view", perhaps the most significant finding is content analysis. There is a strong preference for the core topics (information retrieval, citation, information evaluation), and conversely, topics associated with the concepts referred to as "scientific literacy" or "learning competencies" seem to be on the periphery. These data lead us to two design-relevant conclusions:

We will continue to deepen and broaden the "core" topics - citations, information retrieval and evaluation - as these are of great interest to users. The project focuses on developing information literacy, which, although narrowly defined, is essential for users.

It needs to find a new mode of communication to deal with topics that have been marginalised but which, in terms of user behaviour and literature, are an integral part of the knowledge profile of regular learners.

In terms of other data, we can say that design can focus on cultural or sporting topics. This is a very relevant finding for choosing examples, tone of voice, working with images or pop culture references. These references are - according to our data - exciting and beneficial for students. We need to look for ways to bring them even more into the actual course content.

In terms of technical parameters, the dominance of desktop browsing is vital - it seems that either the site is poorly designed for mobile devices (but this is not entirely likely given other data) or users prefer desktop now they are studying. This is an important finding as it leads to the possibility of more work and interactivity on individual pages. For example, it is possible to work with chatbots or interactive elements directly on the page, which is effectively not possible on a mobile device.

Even though most users use a desktop, there is an excellent variety in screen resolutions and display settings. For this reason, web design needs to be consistent concerning replicable behaviour. As mentioned above, multimedia, i.e., working with podcasts, videos, or other forms of non-textual media, seems to be an appropriate way of adding content, especially given the interest in music (audio) and movies from users. This is again important about the desktop, which allows for broader multimedia possibilities regardless of the data stream.

Another interesting observation is the one about time - it seems that users' time preferences are so different than working with some synchronous form of education (webinars, online meetings) would not be effective. Users take the opportunity to work with the Web when they have the time and space themselves. This is also evident in a closer analysis of the behaviour

of the five selected users and the times with web access in each session, which does not create any stable structure.

Classification of users into different groups has a tradition in information science. The most well-known classification is offered by Palmer (1991a, 1991b). He argues that users can be divided into several groups (five) with certain specific behavioural traits: Non-seekers, Lone wolves, Unsatisfied insecure seekers, Self-confident gatherers, Hunters.

However, as Bawden and Robinson (2015) point out, this is not an entirely relevant typology, as we will always be looking at some partial features of user behaviour, making typologies fun but not very valid. In our research probe on five users, we can say that users with a relatively narrow and clearly delineated interest need to learn about one topic and focus on it, or they may return when they need some more data. In Palmer's (1991) definition, these would probably be hunters or confident gatherers. In terms of course design, these users need to be thought of in several ways:

- SEO (Ledford, 2015) and overall search engine optimisation should be handled appropriately. It is about users coming from Google or returning because they have bookmarked the page.
- The content must be atomic, clearly addressing one specific problem that the user can work with.
- Module or topic names should be descriptive so that relevance to the user can be easily assessed.
- The focus should be on an easy to understand design and will not require any further explanation or schooling.
- Content design must focus on a specific, narrowly defined and named a problem, for which other available resources (templates, tools etc.) can be used.
- The design of themes can be based on data from Google Analytics.

In the practical design of the course, we work with these users so that the individual topics are loosely related to each other, are genuinely atomic, and focus on one problem or skill. Also, browser optimisation is essential for us because 67% of our users come from Google.

On the other hand, however, some users are borderline between confident collectors and dissatisfied insecure searchers, i.e., users who prefer a wide range of a particular contextual framework to work with. This includes users (approximately 4%) who access the Web through school education systems. Interestingly, they spend a relatively large amount of time on the site and have a higher-than-average number of page views than other traffic sources. For them, course design considerations include:

- The individual themes must form a broader whole, they must build on each other.
- A broad understanding of the topic - this is more important than personal knowledge or skills.
- Topics that may combine knowledge, competence, and value modules.
- Integrated tasks that lead from fragmentation to overall competence.
- A course design that should be created with specific thematic and competency frameworks in mind.

For the course design, we decided to combine the individual topics into a broader thematic unit. Not all topics need to be frequently visited, but together they must form a functional whole. After completing one module's topics, the user must take away a coherent, intentionally constructed competency. The course must allow for systematic learning. We perceive as a topic not yet mastered is the work with complex tasks at the end of each module.

CONCLUSION

Our study has shown that Google Analytics can make changes to both the visual aspect of a course and its information architecture. A good understanding of what devices users are using is essential for innovating this area of design. The data can also be used to effectively determine students' interests and preferences outside of the learning area, making the tone of voice and example work extremely important.

Visitor data that shown interest in particular topics is also important to us. It shows that a narrow understanding of information literacy prevails in schools, which leads us to be motivated to strengthen these topics further and look for ways to popularise other areas such as competences for learning, collaboration, media, and scientific literacy. It turns out that Google Analytics can also be used for curriculum design.

The last question concerns the typology of users used. In the case of our course, we still have a relatively limited amount of data. However, a small case study of five users shows that our course does not have a single user typology. However, different users have needs that can be reflected by an appropriate design of the information architecture and the content of the whole site.

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DEVELOPMENT OF PERSONALIZED INTERACTIVE DIGITAL TEXTBOOKS

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Abstract

In this work, the authors outline the results of certain theoretical aspects and practical implementation of e-textbooks for pre-university education. The authors discuss the necessity of developing digital textbooks under Moldovan education policies and describe the conditions of the implementation of digital textbooks organized through "the MDIRConstructor" software (Digital Textbook Builder). The MDIRConstructor allows the construction of digital textbooks based on the pdf file, which teachers complete with personalized teaching resources (audio, video, learning activities, tests, etc.).

There is a strong tendency towards integrating digital textbooks in education. The development of digital textbooks is one of the actual concerns to update education in Moldova, aiming to promote an innovative educational environment. From the quality perspective, the practice shows that digital textbooks are flexible and multimodal. The authors assert that the international progress of digital educational systems influences the qualitative changes regarding the technological form of educational materials, and the diversity of electronic devices allows the presentation of learning resources in different formats, with emphasis on interactivity and the function of personalization of learning resources. In this context, as a result, the authors identify a real solution - the renewal of the didactic process of pre-university education through developing e-textbooks. The paper contributes to the understanding that there is a need to select digital tools for better results regarding digital textbooks development.

Keywords

Digital Textbook / e-Textbook. Digital Textbook Builder. Personalized editable components. Educational resource.

INTRODUCTION

The progress of digital systems implies qualitative changes in the structural form of the educational materials, and the diversity of electronic devices allows to access different formats of learning resources, with emphasis on interactivity and personalization. Today, the societal and strategic modifications and improvements of the Moldovan education system are performing and developing in a series of projects, researches, innovation programs, and state policies. The supported reforms particularly aim towards the development of an innovative educational environment, thus speeding up the transition of the educational system to a new technological and qualitative level.

The elaboration and sharing of digital educational resources remains one of the main tendencies of the digitization of education in the Republic of Moldova. Today, among many electronic learning materials, digital textbooks or e-textbooks become essential in the teaching and learning process, which could be used both by the teachers and students in the classroom.

A digital textbook is a novel approach to implementing the ICT component in the teaching activity in our country. According to the National Strategy for the Development of the Information Society "Digital Moldova 2020", Pillar II "Digital Content and Electronic Services" (2013), the use of electronic textbooks in pre-university education is the means to improve digital education and digital literacy. The Concept of the digital textbook, issued by the Ministry of Education, Culture, and Research of RM (2015), highlights that implementing digital textbooks for education is necessary: "to ensure the access of all actors of the educational system to a large volume of modern, interactive digital educational contents, given in several formats, adaptable to the needs of each student, and elaborated in conformity with the didactics, curriculum design, psychology, and technology standards". In this relation, there is an increasing demand for the development of digital textbooks covering the educational factors, tools, and directions for their practical use at the national level.

Within the framework of this study, we analyze some theoretical features, drawing new understandings about digital textbooks, and we introduce the possibility of the elaboration of personalized digital textbooks for pre-university education. To meet this goal, we use a textbook builder called *MDIRConstructor 2.0* (Balmuș, 2020). This software goes for the development of e-textbooks based on the pdf file of a printed textbook. Such pdf e-textbooks, enhanced through *MDIRConstructor*, could be completed with personalized teaching materials (audios, videos, interactive exercises, tests, etc.), elaborated by the schoolteachers themselves. This research is being carried out under the national project "Development and implementation of interactive digital textbooks in pre-universitary education" (The State Program 2020-2023, Republic of Moldova, nr. 20.80009.0807.25).

CONCEPTS AND LITERATURE REVIEW

As stated by Golshani (2008), "the concept of "digital textbook" is best described as the use of any digital content to enhance student learning". Flores, Ramos and Escola (2015) noted that a digital textbook is an interactive book that allows access to large quantities of information in multimedia format, and the use of hypertext that creates a collaborative culture. According to Harman (2020), a digital textbook is "a digital rendition of the print book with more features", and the digital version of the textbook may contain videos, animations and audios, which will aid the student's learning process.

Further analysis of publications associated with "e-textbook/digital textbook" background led us to the concept of "enhanced e-textbooks" and that of "collaborative Digital Text Books". As presented by Dobler (2015), "an enhanced e-textbook presents content through various media (print, video, podcasts, live hyperlinks) and may include social networking capabilities". Kempe & Grönlund (2019) specified that "collaborative Digital Text Books (cDTB) refers to coherent professionally produced educational material and learning activities covering content of entire courses in the Swedish national curriculum and with tools for communication and cooperation". The cDTB also incorporates tools to support students in their learning: exercises, navigation mechanisms, text annotations, explanations of notions, serious games, tools for communication like chatrooms, wikis, tools for documentation, teacher feedback from exercises, and others (ibid).

In particular cases, the rudimentary forms of e-textbooks are the digitized versions of traditional printed textbooks that do not include interactive tools and multimedia

extents. In a broad sense, a digital textbook is a set of teaching, learning, and assessment materials placed on a digital device that has the potential to be interactive and engaging. Mostly, digital textbooks hold various additional learning materials, like audios, videos, podcasts, interactive exercises, hyperlinks, and simulations.

The interactive feature of digital textbooks is one of the most important qualities of e-textbooks. A digital textbook is helpful not only through its content but also because of the possibility to explore multimedia technologies and devices. Likewise, using digital textbooks influences the teaching methods and the work style of the teacher, since the interactivity and the personalization of digital textbooks allow the individualization of the learning process and the independent acquisition of knowledge by students.

Digital textbooks may vary in form due to the infrastructure and technological know-how developments. There are currently at least 3 categories of e-textbooks analyzed by Lee et al. (2012), namely *web-based systems*, *reading software*, and *dedicated devices*. Here, the authors speak about the accessibility and usability of e-textbooks, and their availability to all teachers and students, and how easy to use and friendly textbooks are.

Golshani (2008), mentioned the digital content ranges from the digital form of traditional print textbooks to *computer-based* and *web-based materials*. Ahn & Han (2017) remark the following forms of digital textbooks: *read-on-demand computer-based textbooks*, *print-on-demand e-textbook*, and *curriculum-based electronic textbooks*.

At present, according to Eurydice Report (2019), many European Countries have definite commitments to invest in schools' digital education and infrastructure as part of their `digital society` programs. Several countries (Hungary, Bulgaria, Poland, Romania) have adopted the transition to electronic textbooks for all subjects and include actions on the creation of digital textbooks. There are also several portals (Turkey, Norway, Denmark, Croatia, etc.) that allow teachers to develop their learning resources (ibid). We would like to mention the Romanian Ministry of Education and the National Center for Policy and Evaluation in Education have succeeded a lot in producing digital textbooks for primary and secondary educations (https://manuale.edu.ro/). We consider that these digital learning materials will influence the teacher’s ability to incorporate electronic textbooks and other resources into the curriculum.

The findings of the literature suggest that digital textbooks provide an alternative to traditional print textbooks and that they are more attractive. Multimedia options, links, activities, and assessments incorporated into a digital textbook give the possibility of providing support for students to become independent learners, capable of analyzing, understanding, and applying their knowledge in given situations. We consider that the electronic forms of textbooks will gradually replace printed textbooks in the school curriculum, since technology has become increasingly popular.

AIMS AND METHODS

The main focus of this study is to investigate the development of digital textbooks from the perspective of “personalization”. Speaking here about personalized interactive e-textbooks, we mean digital textbooks that comprise different learning materials for students, created and incorporated by teachers themselves.

We promote the idea that implementing digital textbooks should focus on the elaboration of various learning activities and materials to improve students' commitment and motivation. In this context it is significant to have a dynamic digital textbook builder.

For this purpose we use the incorporated tools of the textbook builder *MDIRConstructor 2.0* (Balmuș, 2020). As mentioned, this software comprises tools through which a user/teacher can build original teaching material on the base of a subject school textbook. Furthermore, we present some prototypes of learning objects for several school subjects, developed through *MDIRConstructor 2.0.*

The lack of resources and interactive digital textbooks in the national curricula determined us to carry out an approach focused on the praxiology of the elaboration of interactive digital textbooks. Referring to international and national experiences, we present an analysis regarding the elaboration of personalized digital textbooks. In this context, we raise the following questions:

- What pedagogical needs can be distinguished in the process of designing digital textbooks?
- What differences can be noticed between digital textbooks of different subjects?
- What possibilities can a textbook builder offer the teachers to help them develop personalized resources?

To answer our research questions, we will analyse these factors in the context of the Theoretical Framework and Rezults sections.

THEORETICAL FRAMEWORK

Digital Textbook Pedagogical Approach

An interactive digital textbook represents a container/box that may integrate texts, graphics, audio, videos, images, links, simulations, animations, interactive exercises, and assessments. It can operate on different electronic devices or a computer network. We can use a digital textbook both in the classroom educational process and individually.

Learning by using digital textbooks uses skills concerning the integration of interdisciplinary knowledge and represents the way of learning through digital resources included in the textbook. The e-textbook capabilities referring to the organization and explanation of the educational materials ensure a high-quality perception and awareness of the content by the students. We could increase students' cognitive activity using teaching principles and their self-learning efforts based on workload optimization, individualization of learning. The most important benefit of including the digital textbook in the lesson is the increase of the dynamic factors that determine students' interest and motivation for learning.

The advantages of personalized digital textbooks stand in the fact that they can include didactic materials prepared by the subject teacher, aimed at the formation of students' creative thinking skills, the ability to find and apply information, and a better way of using and getting new knowledge. Applying interactive strategies, such as collaborative project creation, learning by doing and problem-based learning should complement the extended use of various learning resources within a digital textbook and contribute to their practical use.

In the process of developing prototypes of digital textbooks, we identified that the presentation of the educational content and materials should be characteristic to different fields, disciplines, topics, and levels of education. Therefore, according to the specified requirements of the curriculum, the structure of a digital textbook must correspond to its

primary educational purpose. In this consolidation, a digital textbook should include coherent learnings materials covering curriculums and satisfy mainly the following pedagogical needs (Chiriac, 2020):

- the understanding of the main content of the discipline/subject;
- the support of creative activity;
- the facilitation of the ability of students to implement individual educational trajectories, which may be available due to additional materials and links, resources, and other online components;
- the providing of opportunities to view/listen/shape learning materials;
- the providing of active cognitive activities supported by the possibility of information retrieval, training, and knowledge control;
- the providing of the optimal conditions for students to interact with educational content both during class lessons and during independent work.

Implementing digital textbooks in education means adjusting the educational system to innovation and optimization in the context of digital pedagogy and further on promoting the digitization of teaching materials.

Tools to create digital textbooks

We stated the Web abounds in many book builders that users can apply to create digital textbooks. A simple google search gives us results like *Kitaboo* cloud-based digital publishing platform, *Book Creator* application, *Pressbooks* Authoring & Editing Platform, *ActiveTextbook* P latform, and others.

To better understand how useful one or another digital textbook maker/builder can be, we should take into consideration the following suggestions to design personalized learning resources within an e-textbook: the importing of different types of data; the importing of multimedia; navigation and links; the developing/editing of learning objects; the assessment of teaching/learning objectives and processes; easy access and use of teaching materials and technologies; interactivity; complexity; the quality of the final output.

We examined two digital textbook builders for our applicative researches: *Flip PDF* and *MDIRConstructor 2.0*.

(I) *Flip PDF* applications help users to create flip e-books (e-magazines) from any pdf document. The reason for choosing this application is that it has quite a simple and friendly interface and can incorporate a wide range of multimedia options useful to the teaching/learning process (audios, video clips, bookmarks, texts, shapes, photo albums, flash applications, links, and others). Furthermore, its output files can be wiewed, shared and uploaded on web, on a personal computer and on mobile devices in the folowing formats: html, exe, zip, Mac app, mobile version, CD. Flip PDF is a commercial series of applications and can be accesed from the offical site https://www.flipbuilder.com/. This company has a long history of textbook production and, in our opinion, choosing one application from the given Flip PFD series offers a representative tool to elaborate a comprehensive interactive e-book.

(II) The *MDIRConstructor 2.0* is a computer program registered by the State Agency of Intellectual Property of Moldova as intellectual property (the author Nicolae Balmuș, registration number 6765, 27.11.2020). The *MDIRConstructor 2.0* is designed and

implemented in the Delphi 10 Seattle Visual Programming Environment. It was tested on PC computers equipped with Windows 8, 1.7 GHz processor, 4GB RAM.

MDIRConstructor allows user to create a digital textbook by uploading the pdf file of a printed textbook. The builder automatically will generate the background of the uploaded pdf file and export specific content in a folder, which includes all produced learning resources by a teacher (including the output e-textbook for students). As a result, the teacher gets the raw material (subject textbook) in the builder's background, on which he/she will work on developing learning materials. The pdf versions of school textbooks are officially published by the Ministry of Education, Culture, and Research of RM (http://ctice.gov.md/manuale-scolare/). The builder includes several incorporated tools to create interactive exercises, namely: choose the correct option, complete the gaps, sentence formation, model word transformation, matching, true/false, electronic dictations, exercises with vocal content (reading, interpretation of poems/songs), word order, etc. Additionally, the builder can import the following formats of files: audio, video, images (any format recognized by default); documents (pdf, doc, docx, rtf); presentations (ppt, pps, pptx, ppsx); HotPotatoes tests (created in HotPotatoes application); online tests (elaborated in Testmoz application), links to online resources elaborated through web services 2.0 (e.g. learningapps), and others.

MDIRConstructor is widely spread at national seminars, workshops organized within the mentioned project, and applied at the master course “Technologies of developing digital textbooks”. These practices are intended to improve the training of the teachers regarding the digital textbook implementation in education. Providing these possibilities for additional professional development can be a useful policy tool to motivate teachers to elaborate original digital textbooks.

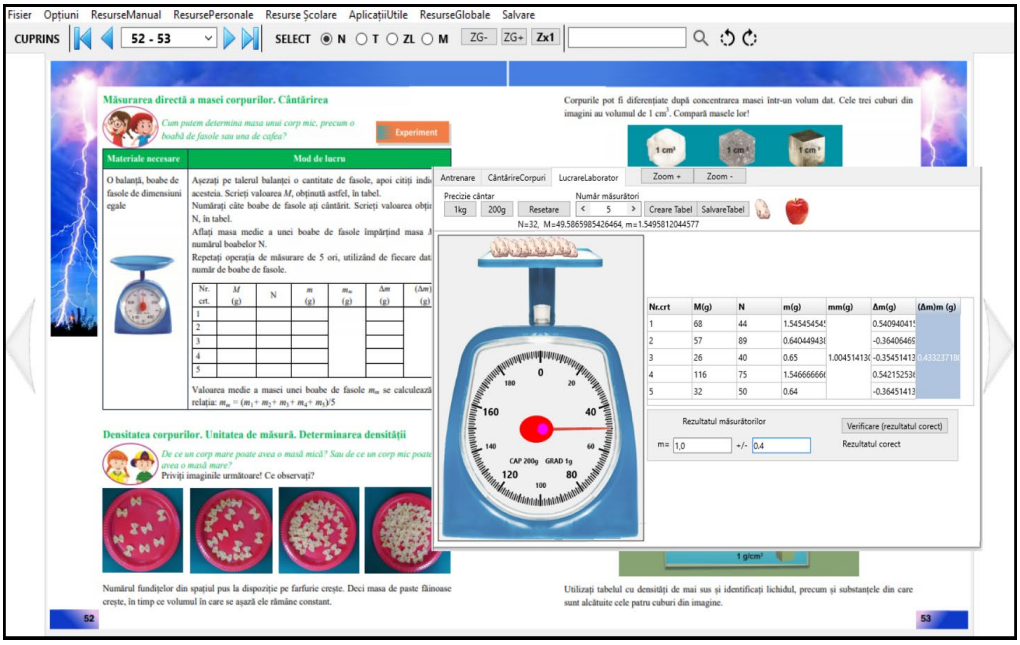
RESULTS

Considering the perspective of the incorporated tools of the *MDIRConstructor* we present below some examples of personalized learning materials and objects manipulated within digital textbooks of Maths, Physics, Music, and French.

We notice differences between the digital textbooks of different courses. For example, a language course uses various learning exercises on grammar, listening, understanding and communication. Other disciplines (e.g. Chemistry, Physics) should be explained with the help of experiments, measurements, mathematical analysis, and a set of practices that encompass elements of natural sciences. For this reason, digital textbooks have the possibility of multimodal representation of knowledge, differentiated instructions, and varying learning activities.

The digital textbook of Physics includes simulation activities of some phenomena, experiments, laboratory works, and problem generators. Figure 1 shows a sequence of the application that simulates the laboratory activity described in the 6th grade physics textbook, “Direct measurement of body mass”, page 52. The goal of this experiment is to measure the mass of several beans, and to calculate the average mass of a bean and the measurement error. Virtual instruments of this simulation contain options for automatic calculation (average value, individual errors, average error).

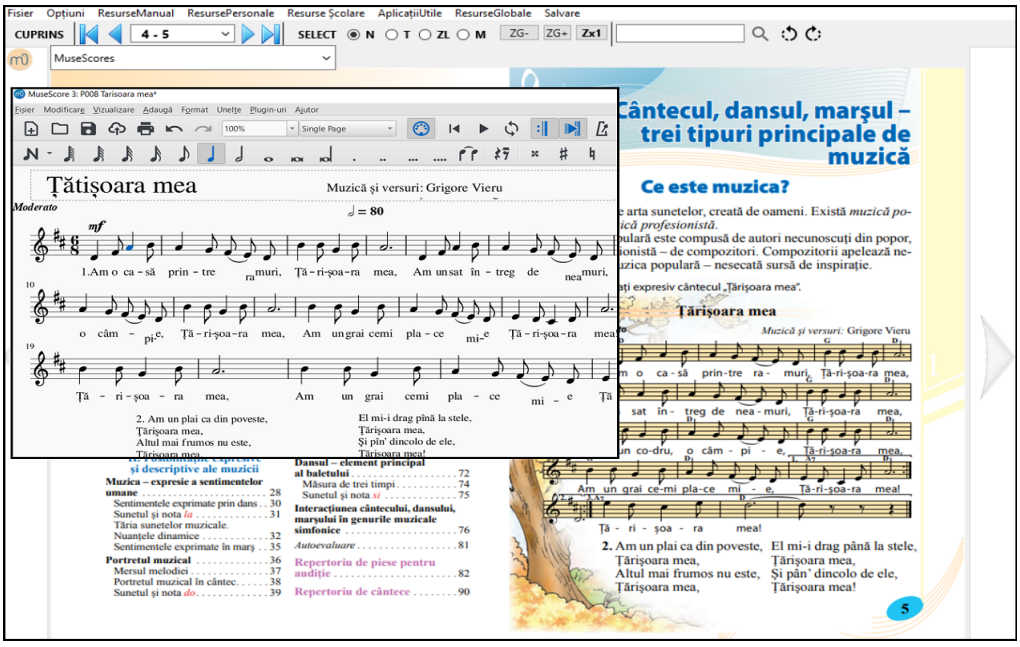
Figure 1: Example of virtual laboratory work incorporated in the 6th grade Physics digital textbook.



(Source: Physics digital textbook / Own)

The next example (Figure 2) presents a capture of a Music digital textbook. The key feature of music textbooks is the sheet music of songs. In that case, to simulate musical notes, the Music digital book includes options to create sheet music with *MuseScore* software. Figure 2 presents an example of *MuseScore* activity incorporated in the 2nd grade Music digital textbook.

Figure 2: Example of MuseScore activity incorporated in the 2nd grade Music digital textbook.

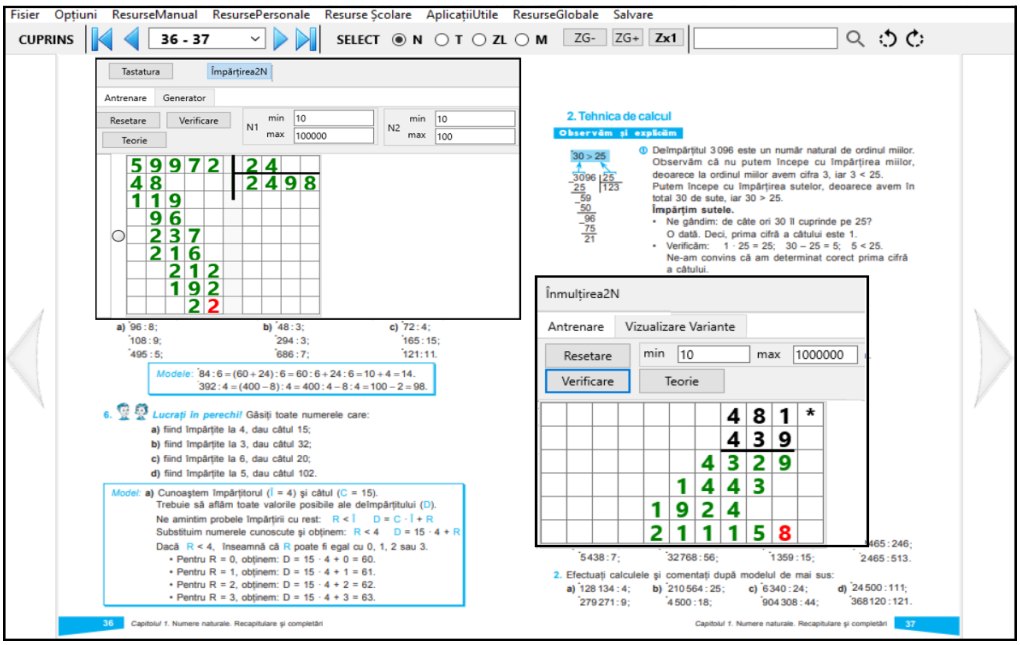


(Source: Music digital textbook / Own)

Exercises for completing tables, performing calculations in columns, calculating areas and perimeters, performing operations with vectors, and other calculations are

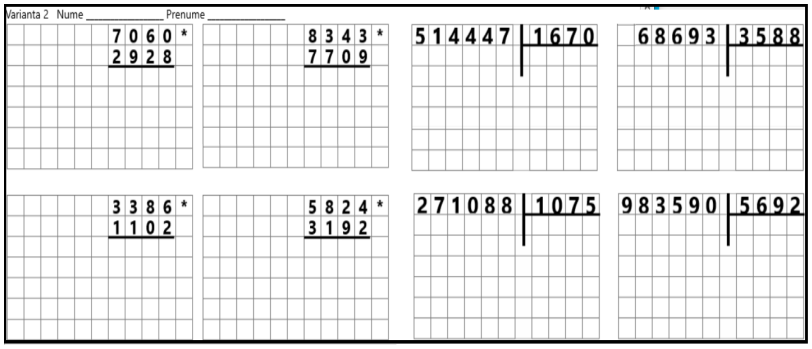
implemented in mathematics textbooks. Figure 3 shows a sequence of options to generate and solve math exercises.

Figure 3: Examples of interactive activities elaborated on the pages of the 5th grade Math digital textbook.



(Source: Math digital textbook / Own)

The teacher's Math digital book also contains tools to create the personalized formative assessment sheets for one or several researched topics that can be printed. Figure 4 presents an example of a test sheet on multiplication and long division of natural numbers.



(Source: Math digital textbook / Own)

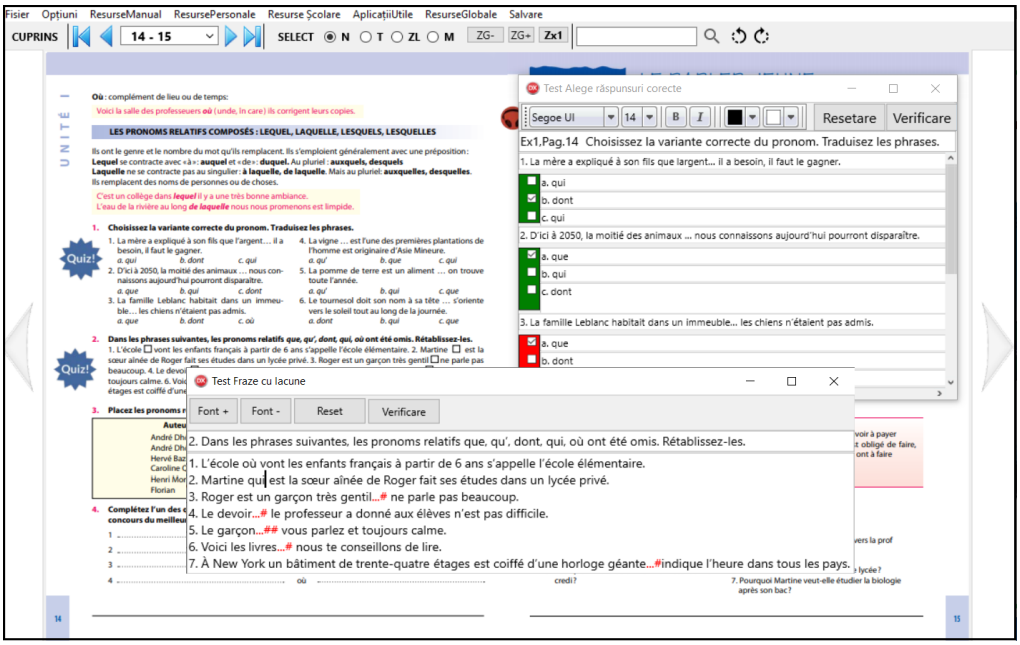
The last example (see Figure 5) represents an example of personalized interactive exercises elaborated in the 8th grade French digital textbook.

The range of tools available to help teachers to elaborate on various language reflections and resources within a language digital textbook is impressive, namely: vocabulary and grammar exercises, authentic audio/video materials, listening comprehension activities, news broadcasts, interviews personalized language learning exercises, and many others.

As mentioned before, there are important differences suggesting unique activities for teachers in developing subject digital textbooks. On the other hand, there are tasks where the students are required to find or complete the correct answers by applying their knowledge, which is typical for all disciplines. However, the development of the

personalized digital textbooks has great value both for a modern educational environment and for teacher competence development.

Figure 5: Example of interactive exercises elaborated in the 8th grade French digital textbook.



(Source: French digital textbook / Own)

DISCUSSION AND CONCLUSION

To increase the interactivity and usefulness of digital textbooks in education, a teacher should design and integrate different personalized learning materials (texts, audio, videos, images, links, interactive exercises, assessments, etc.). One of the most important things is to have a proper digital textbook builder. In this article, we discussed the functionality of the *MDIRConstructor* software that allows the designing of digital textbooks based on the pdf files of the printed textbooks. We analyzed some pedagogical principles of digital textbooks for education and presented some examples of learning resources available in already elaborated digital textbooks (Maths, Physics, Music, French).

ACKNOWLEDGEMENT

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DEVELOPING A SERIOUS GAME FOR TEACHING HISTORY IN SECONDARY SCHOOLS

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Abstract

In 2019 the emergence of the SARS-CoV-2 virus significantly changed our lives. Several measures have been taken into action in various areas of life in order to protect the citizens. Such was the transition of schools to online teaching for students, which raised many new problems and possible solutions. In times like this, it is challenging to grab and hold the students' attention during online teaching, and teachers around the world realized that finding new ways of teaching in the online space is necessary. One of these new options could be the use of serious games. According to Abt (1970), the original use of the term "serious game" also applied to non-digital games, which must have an "explicit and carefully thought-out education purpose." Using the term for digital games in today's sense can lead back to 2002. Sawyer was the first who called to use videogame technologies in order to improve game-based simulations. (2002) Since then, several researchers in various fields have investigated the topic of serious games.

This paper aims to introduce the findings and experiences designing and testing the videogame titled "1848 – The videogame" in relation to the needs and attitudes of secondary-school teachers. The game has already had its pilot testing phase with positive outcomes. However, the new situation caused by the coronavirus made it impossible to conduct the original research in a classroom environment, and many aspects of the original game were re-designed to better adapt to the current situation. In addition, a brand-new webpage was created to complement the existing program and assist the teachers and students during gameplay.

Furthermore, a survey was conducted among high-school teachers to determine whether they plan to use an educational video game during their lessons, and if not, why. The results showed that 55% of the teachers plan to use serious games during their lessons in the future. Most of these teachers said they would like to use a serious game to motivate their students better, make the lesson more interesting, or grab and hold their students' attention more successfully. On the other hand, the most common reason for not using or planning to use a videogame was the lack of knowledge about said games and the lack of time. Considering the above, "1848" was modified to better tailored to teachers' needs and be easier to learn and use.

Keywords

Serious Games, Education, High-school, Gamification, Design, Teacher attitude

INTRODUCTION

At this point, it is safe to say that the SARS-CoV-2, widely known as the coronavirus, changed our life probably forever. During the pandemic, many sectors got into a difficult situation with education amongst them. In many countries, the educational sector was forced to continue their work online, which often resulted in using various technologies as a teaching instrument (e.g., Zoom, Microsoft Teams, Youtube, Discord). This sudden change challenged all educational institutions to perform their educational / service function (Bokor, 2020). From the other side of a computer, it was really hard for teachers

to grab and hold the students' attention successfully. It became clear that the traditional teaching techniques are not efficient enough in a digital environment. This study argues that one of the possible solutions to this problem could be gamification and serious games. This paper will cover the area of serious games in the domain of secondary-school education.

In defining *gamification,* one can find many approaches. According to the most common definition, gamification is *"the use of game design elements in non-game contexts"* (Deterding et al., 2011). This means that gamification is not about creating games (Dichev et al., 2015) instead using only the building blocks, mechanics, and dynamics of such activities in order to better motivate people and raise the level of engagement (Zichermann and Cunningham, 2011; Huotari and Hamari, 2012; Kapp, 2012; Werbach and Hunter, 2012; Zichermann and Linder, 2013; Burke, 2014; Robson *et al.*, 2015; Chou, 2016). According to Garrett and Young (2019), the most commonly used mechanics are the PBL system (*points, badges, leaderboards),* social interaction, progress tracking, levels and immediate feedback. However, many gamification system uses only the extrinsic motivational aspects of the game (e.g., rewards and scores) and forget about the player experience, motivation and *gamefulness* (Deterding et al., 2011; Chou, 2016; Tondello, 2017). According to Tondello, a gamification system can be designed from the designers perspective which lead to a gamefied activity focusing solely on the desired goals. On the other side, there is what Chou (2016) called the *human-focused design*, which puts the players' feelings and motivations in focus. Both methods can be effective, only the intention of the designer is different. Gamification can be successful even without a gameful experience (Tondello, 2017).

Regarding *serious games*, it is essential to have a gameful context and the appropriate gameplay experience. At first glance, one can say that the topic of serious games is a new phenomenon. However, according to Djaouti (2011), the terminology of serious games can lead back to the renaissance, where the term "*serio ludere*" meant using humor to deal with serious matters. Even the US military used such games to better train their soldiers since 1948 (Connable et al., 2014). The first modern definition of such games came from Abt (1970), who states that serious games "*have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement."* The first use of the term linking it with digital games came from Sawyer (2002), who founded the Serious Games Initiative. He later defined serious games as *"any meaningful use of computerized game/game industry resources whose chief mission is not entertainment"*(Sawyer, 2007).

To this day, many fields of science study the domain of serious games (e.g., healthcare, military, education, politics, art). However, each of them emphasizes other aspects of these games, and it is rather challenging to reach a proper consensus and contextualize the various technologies, environments, and usage methods (Poplin, 2011; Wang and Sun, 2011; Coovert et al., 2017). Nowadays, most of the accessible definitions state that serious games are digital or non-digital games whose primary purpose is education, and they are meant to be challenging and fun (Stokes, 2005; Zyda, 2005; Bergeron, 2006; Michael, 2006; Alvarez and Laurent, 2008).

In order to shed some light on serious games, Djaouti et al. (2011) created the so-called G/P/S model, whose purpose was to give three criteria to identify these games. The (1) *gameplay* term refers to the mechanics and the structure the games are using. (2) *Purpose* means one of the three possible main goals of the game: broadcasting a message, train or exchange data. In the first category, *edugames and advergames* are the most commonly used serious game types. While edugame refers to games with educational

purposes only, advergames focus on transferring knowledge about consumer goods or services. Djaouti highlights that the broadcasting nature of these games can also be applied to *news games, political games, business games, etc.* At *training* games like *Pulse*, the purpose of the game is to *"improve the player's cognitive and/or motor skills for precise tasks or applications."* Serious games like *Foldit* create the third category of possible purposes where the main goal is to support exchanging data, collecting information, and encourage players to cooperate. (3) Scope refers to the domain where the serious game will be used, containing items like *State and Government, Military and Defense, Healthcare, Education, etc.*

Last year at Disco Conference, a *digital serious game* was presented for in-class history education, called *"1848"* (Péter-Szabó, 2020). As it was introduced in the previous paper, *1848* covered the fundamental concepts of the Hungarian revolution on the 15th of March, 1848. This day is a National Day in Hungary, and the revolution is a part of the general basic education. As the results of the pilot study showed, the game has the potential of becoming an appealing, simple, and fun educational tool and could help the students learn about the events covered by "*1848"*. However, the students who played the game indicated that several gameplay changes need to be considered. On the other hand, the effect of the coronavirus pandemic prevented the game from further testing in a classroom environment. Therefore, it was clear that the game needed to adapt to the new situation. Furthermore, a questionnaire survey was conducted to reveal the teachers' attitudes toward serious games. This paper introduces the findings of the research regarding teacher attitudes and the changes made in *"1848."*

METHOD

The pilot study of *1848* (Péter-Szabó, 2020) revealed that the vast majority of the students (83%) enjoyed playing the game. However, the students' feedback indicated that further developments were needed regarding the game's difficulty, graphic design, and feedback system.

In order to re-design *1848* to meet the expectations of students and teachers as well, a questionnaire was created to reveal the attitudes of secondary-school educators. For this purpose, a questionnaire was delivered via e-mail for 1127 secondary-school. This number covers most of Hungary's secondary schools, resulting in a potential of 40 617 answers from the teachers (*Educational data, 2020/2021*, 2021). The questionnaire contained three major parts: (1) gaming habits of educators, (2) educational habits and attitudes regarding serious games, (3) demographical questions. The e-mail sent for the school also provided the link and a brief introduction to *1848.*

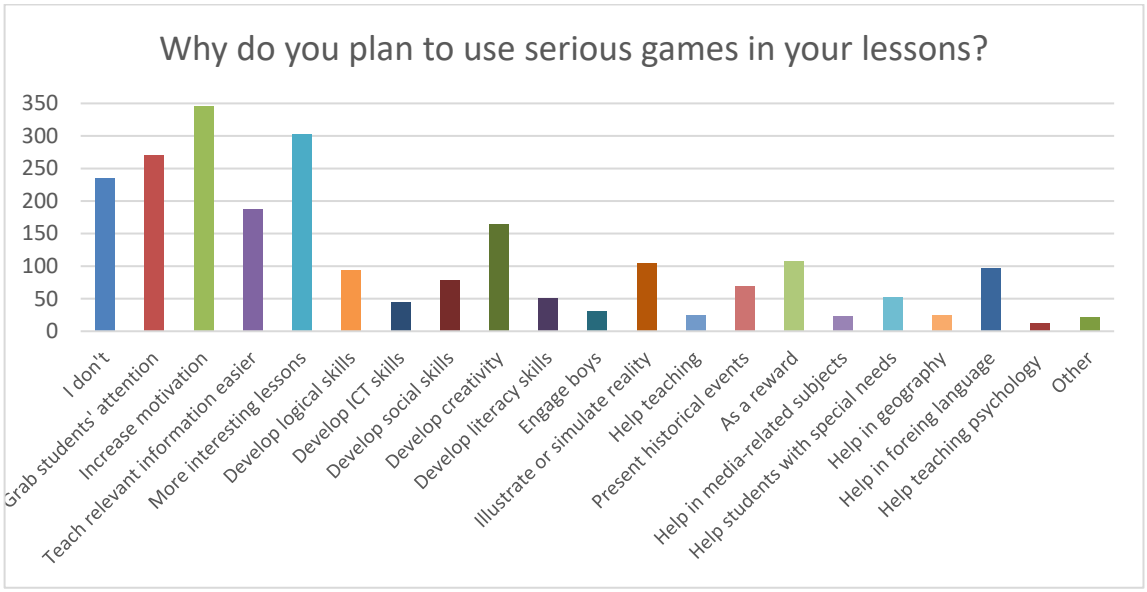
After receiving and evaluating the results, *1848* was re-designed to meet expectations.

RESULTS

Seven hundred ten responses were received to the questionnaires sent out, resulting in a 1,7% participation rate. Most of the teachers aged between 45-54 years old (43%) more than half (54,3%) never played videogames before. Regarding educational habits, it can be stated that 84,5% of the teachers in secondary schools never used any

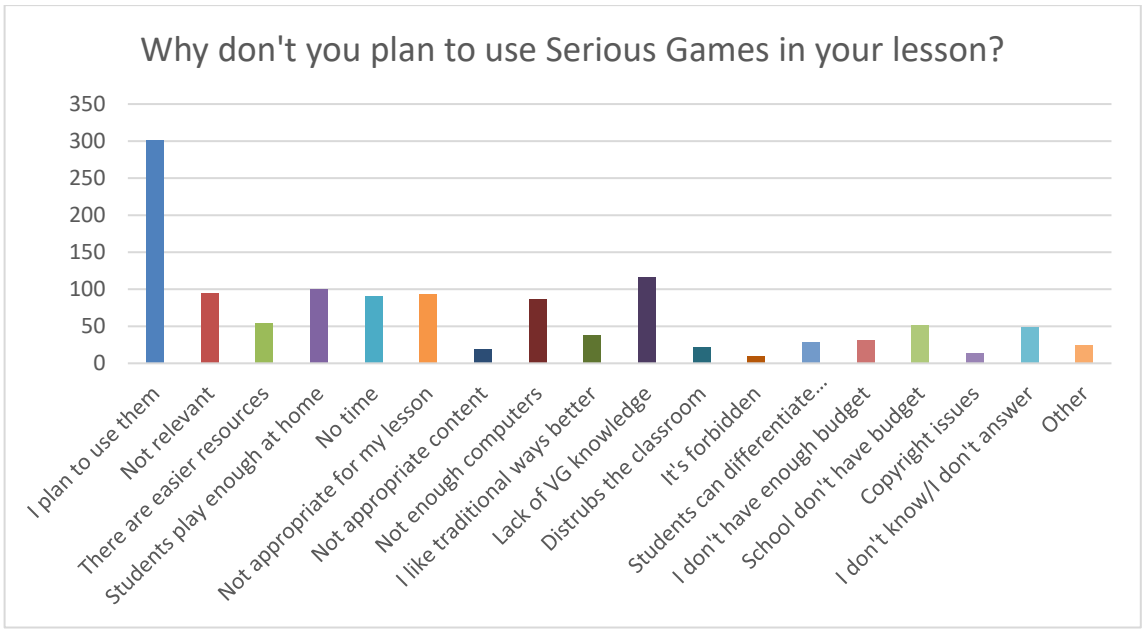
commercial video games during their lessons, and only 35,3% used serious games. However, more than 55% of educators plan to use them in the future.

1: Figure - Reasons to use serious games.



(Source: Own)

2. Figure: Reasons not to use Serious Games-



(Source: Own)

As shown in Figure 1, there are multiple reasons why to use serious games. The most common answers were *"to increase motivation,"* with 72,4%. *Creating a more exciting lesson* (63,7%) and *grab students' attention* (56,8%) were also amongst the top answers.

However, the answers presented in Figure 2 provide the basis for re-designing *1848* from the teachers' point of view. Most secondary-school educators think they simply don't know enough about video games (28,1%). Others stated that the students play enough at home (24,2%) and the content provided by accessible serious games is not relevant (23,2%) to their subjects.

In the case of using a serious game, there are still some difficulties to consider. First of all, about half (49,4%) of the teacher states, that the institutional and classroom environment is not sufficient to play such a game during their lessons. Furthermore, they think that serious games are expensive, hard to get, and they do not have time to prepare using them properly.

DISCUSSION

To address these issues and built upon the feedback from the students, the following changes were made to "*1848".* First of all, a *supporting webpage* was created for the students and teachers as well. This webpage can be accessed with the same registration data necessary for playing the game and provides extra content about the 15th of March, 1848. Students can create their own profiles and read the educational materials provided for the game, with the possibility of earning badges. Moreover, they can see leaderboards about the results of fellow students or even the country, and they can receive further help.

For educators, the website provides helpful information about the game and their students. Most importantly, a full walkthrough is accessible with the correct answers for the game, and they have information about the maximum number of achievable points and their own students' statistics which are available only for them. Teachers also can find a test should they would like to test their students' knowledge.

Regarding "*1848"* itself, the game went through numerous changes. Unlike the previous version, the game now provides instant feedback about the decisions the player makes. They still have to continue the story with their choice (wrong or not), but now they immediately know what they should have done to course their action in a historically correct way. In addition to this, after they finished the game, they can put together the historically correct events regardless of their choices, resulting in extra points. Also, based on the pilot study's results, some graphical improvements and a timer function were added to the puzzle elements of the game. If the player finds a puzzle too difficult, they can now skip it after one minute of trying.

By conducting a pilot study and sending out a questionnaire to secondary school teachers, the goal was to improve the gameplay experience of *1848* and provide further help for teachers to use the program. The educator's concerns were addressed with the newly created website, significantly reducing the amount of time required to use the game in a classroom environment. Moreover, the technology behind *1848* allows to convert the game in such manner, that it can be played in a web-environment or on mobile phones. Regarding the students' feedback, numerous suggestions were implemented in the game. However, the demand for a 3D version of *1848* and multiple endings were not met for financial reasons. *1848* was developed with zero budget, and in order to provide it for the teachers and schools for free, it should stay at this level.

With the implementation of the website for *1848,* a unique mixture was created between gamification concepts and serious games. While *1848* itself is considered a serious game, the webpage gamifies the learning process with badges, leaderboards, extra content, and social aspects.

CONCLUSION

There are numerous researches from western countries about using video games or serious games in an educational context (Sandford et al., 2006; Williamson, 2009; Kennedy-Clark, 2011; Ruggiero, 2013). During the Covid-19 epidemic, teachers faced a new set of challenges regarding their ways of teaching. The new situation resulted in a call for new methods in the educational field. This paper argues that one of the possible solutions can be the use of serious games.

Developing a serious game means a higher level of incorporating the game design of commercially successful videogames. An efficient serious game should be entertaining and be a game on its own but must be carefully designed in a perfect balance between being fun and educational. Creating such games needs skilled personnel in various domains (e.g., game designers, artists, animators, programmers, educators, and teachers), and one must not forget that most of the students are familiar with video games (resulting in comparison between commercial and serious games). (Nadolski et al., 2008; Farrington, 2011; Khaled and Ingram, 2012; Tsekleves, Cosmas and Aggoun, 2016). The creators of such games must consider the available resources and decide on the amount of emphasis on educational effectiveness and entertainment (Gentile et al., 2014).

1848 had already proven that it is an effective educational tool, and with the new changes and additional website, it can be a powerful educational tool. It was re-designed in a way that provides support for teachers as well. In the case of this particular game, lacking any knowledge about video games is not an issue, and *1848* does not need any powerful high-end computers either. The text-adventure nature of the game, the supporting website, and the Unity Engine used in the development process enable it to be used easily without prior knowledge.

The example of *1848* proves that creating an efficient, serious game does not have to be as expensive as Cain and Piascik (2015) suggested. Most of the students appreciate when the teacher approaches their lesson in a new way. Studies around the world suggest that serious games can be a powerful educational tool, and there is a demand from both teachers and students. Also, on a global scale, there are some significant initiatives regarding educational video games, like the Assassin's Creed game's discovery mode. The US government supports creating serious games for the military for a long time now (Cruz-Cunha, 2012). The question now remains only this: why don't we support and use them in education?

LIMITATIONS

The pilot study has its limitations in the sample distribution. Only 1,7% of the teachers answered our questionnaire, and the study of *1848* and teacher attitudes was conducted only in Hungary, not a Central-European scale. As stated in the previous paper, additional limitations resulted from the available resources creating *1848.* In order the achieve the maximum impact serious games can achieve on learning and motivation, scholars need to design a game, which is of the same quality as commercially successful video games but with the focus on the educational purpose.

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ARTIFICIAL INTELLIGENCE IN PUBLIC EDUCATION

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Abstract

Artificial Intelligence (AI) gradually infiltrates even more areas of social communication. This paper is aimed at one of the most important concerns of the future of education: the narratives of teachers and students about the future role of AI in public education.

According to a report of the Congressional Research Service (2018), there are four different areas where AI can be particularly used for educational purposes. 1) Tutoring by Intelligent Tutoring Systems. 2) Personalisation of learning by tailoring the learning material, pace, sequence, and difficulty level. 3) Testing with computer adaptive assessments that adjust the difficulty of successive questions based on the accuracy of the student's answers. 4) Automating tasks like taking attendance, grading assignments, and generating test questions.

To systematically map up the narratives and the opinions about applying AI in the above-mentioned areas, a questionnaire among Hungarian secondary school students with more than 600 respondents was conducted and amended with 10 semi-structured interviews with pedagogues from the same school level. As the results showed, the predominant narrative of teachers is the irreplaceability of persons in teaching, which also appears in student narratives to some extent. Meanwhile, students are more open to proliferating technologies and stand at a higher level of awareness towards the potentials of AI comparing to their teachers. Most importantly, students regard AI as part of their everyday life while they do not report their schools being institutionally ready to involve these developments.

Consequently, crucial policy decisions must be made when it comes to the systematic implementation of AI in public education, bridging the gap between the reality of students and the schools, involving this issue into the teacher education as well.

Keywords

Artificial Intelligence. Public Education. Narrative analysis. Media awareness. Future of education.

INTRODUCTION AND LITERATURE REVIEW

Since various technologies based on artificial intelligence (AI) have started their proliferation, the impacts and the future of these phenomena became highlighted not only in IT but in social sciences as well. The inquiry of the potentials of AI transformed the ways of thinking about computer science, economy, transportation, the job market – and education, among others. This paper aims to concentrate on one of the most important concerns of the latter area, namely on the observation of teachers' and students' attitudes about the future of AI application in public education. Naming it a highlighted question is not an understatement, for not only the improvement of upcoming technologies influence their success but the actual reception of decision-makers and users as well.

Taking a closer look at the focus of the studies about AI, researchers seemingly cannot find a stable and sound framework of how and what to observe.

Firstly, AI itself is a misty notion to define: the range of this concept covers automation (automated computing), robotics (in terms of physical and software-based machines as well) and software with self-learning abilities. Secondly, the educational purposes and potentials of AI depend on the strength of the abilities of AI. "Strong" or "thick" AI as depicted by Kurzweil (2005) has not arrived yet, while "weak" or "thin" AI agents (like deep learning algorithms and AI applications of smartphones) are present and help in many areas of everyday life by now.

Secondly and therefore, researchers can study both the present and the future potentials, but with different focuses: *status quo* depicts the actual potentials in practical AI application while the future of AI requires foresight research and, perforce, involve predictive movements into the research.

Thirdly, observation of the relation of education and AI can be expanded to the enhancement of education, to the increasement of the teaching and learning effectiveness, and to the psychological outcomes of the changing human-computer relation etc. Consequently, crucial operational decisions must be made when it comes to the research of the relation of AI and education, by sorting out the possible concerns of the field.

Beyond other options, studies about the relation of AI and education can be divided into two main groups: one is present-oriented that aims to provide a step-by-step set of guidelines for educators, develop games or application to predict student success or to improve skills (Akman & Çakır, 2020; Alyahyan & Düştegör, 2020; Chiu & Chai, 2020; Dai et al., 2020; Farr, Yuill & Hinske, 2012). The other group is rather future-oriented: some research offer an analytical approach based on a theoretical survey of previous literature to answer study questions regarding the future potentials of AI. The results of such papers refer to a set of intelligent applications as well as areas of artificial intelligence (Al-Zyoud, 2020; Bonami & Piazentini & Dala-Possa, 2020; Bozkurt et al., 2021; Cope, Kalantzis, & Duane Searsmith, 2021).

According to Lu & Harris (2018), there are four main areas where AI can be used for educational purposes. 1) Tutoring by Intelligent Tutoring Systems (ITS) or adaptive tutors that engage students in a dialogue. 2) Personalisation of learning by tailoring the learning material, pace, sequence, and difficulty level to each student's individual needs. 3) Testing with computer adaptive assessments that adjust the difficulty of successive questions based on the accuracy of the student's answers, identifying the mastery level precisely. 4) Automating tasks like taking attendance, grading assignments, and generating test questions. Most of the papers aimed at the above-mentioned wide topic can be ordered directly to these specific areas. In the followings, we only provide some examples of the most significant resources.

Krechetov & Romanenko (2020) investigate exploitation of adaptive learning technology and techniques by ITS. Soualah-Alila, Mendes & Nicolle (2013) examine an adaptive system based on the semantic modeling of the learning content and the learning context. A study from Ghosh & Ghosh (2021) thrives on intelligent data analysis from CCTV-camera enabled classrooms, suggesting that the model is designed for school education system, therefore it can easily be extended for higher education systems. The research of Wang et al. (2020) examined the determinants of the willingness of faculty to use ITS.

The study of Kim et al. (2020) investigated students' perceptions about AI teaching assistants in higher education. According to the study of Lawson et al. (2021), positivity principle suggests that learners should learn better from virtual instructors (animated pedagogical agents) with positive emotions compared to those with negative emotions. Lippert et al. (2019) analyze designs that use multiple conversational agents within the framework of ITS.

Noorbehbahani & Kardan (2011) offer a new method for assessing the free text answers of students based on the BLEU algorithm. They modify the algorithm so that it is suitable for assessing free text answers. Novak, Joy & Kermek (2019) focus on plagiarism detection and presents a detailed systematic review of the field of source-code plagiarism detection in academia. The study of Xu et al. (2020) examines how an automated conversational agent can read stories to children via a smart speaker while asking questions and providing contingent feedback.

Among the various types of papers regarding the topic, one can find performance analysis on computer-assisted assessment that help teachers carry out the grading more effectively (He, Hui & Quan, 2009). The word cloud technique observed by Jayashankar & Sridaran (2016) has mainly been designed to reduce the burden on teachers for a speedy and fair evaluation.

Besides the practical use of AI in education, various studies reveal the acceptance of robots in education (Reich-Stiebert, Eyssel & Hohnemann, 2018). User involvement and its measurement is also in focus: Henrie, Halverson & Graham identify strengths and limitations of existing measures and outline potential approaches to improve the measurement of student engagement.

Luttrell et al. (2020) provide an opening for further discussion to the broader social and digital media research community about addressing AI in communication education, Hohenstein & Jung (2020) approaches the ethical concerns of AI in education, proving that in human interactions with intelligent systems, misattribution is common and trust is developed and handled differently than in interactions between humans.

Having overviewed a vast number of papers from the field, our study has been aimed at the observation of the opinions of secondary school students and teachers concerning the four main educational areas detailed above. What do these specific groups think about the potentials of AI in education? What image they depict about the cooperation of people and machine in the school? How do they regard this phenomenon, what narratives they create about it?

METHODS

During one of the pandemic waves, we have chosen online survey and online interviews as our research methods to directly reach the group of students and teachers. These methods were the most relevant to us in view of the closures of the coronavirus.

Regarding the student survey, our target group was able to answer questions with a mix of 20 choice, multiple choice, scaling, and short text answers quickly and easily via Microsoft Forms. The basic number of our questionnaires in secondary education institutions was from 5th grade students to graduates. We have chosen them because, although most AI research measure the university age group, this technology affects the employment opportunities of students who are getting out of public education, so it is already essential for them to be informed about AI.

The test sample consisted of 604 respondents from Hungary. The questionnaire was launched on 15 March 2021, and it was available until 7 April. Most of the answers came from the capital city, Budapest, and its surroundings (Budakeszi, Solymár, Budaörs, Szentendre and Vác). We also thought it is worthwhile to ask about the type of secondary education institution, because there are several types of schools in Hungary, where students encounter different systems and mindsets. Our target group was secondary school students, they are 87% of all respondents (528). Secondary education gives the most comprehensive learning knowledge in the Hungarian school system, from this reason we decided to narrow down the sample only to their group.

In Hungary, we can distinguish between eight-grade, six-grade, five-grade, and four-grade grammar schools. The relevant participants in the target group are students who are studying in four- or five-grade grammar schools because they will step out to the labor market in 1 to 5 years. In this spirit, we have narrowed our target group from 604 to 463. The gender distribution of the target student group was 273 female (59%) and 190 male (41%), showing the classic character of social scientific research (where female respondents usually show a higher level of acceptance to participate in volunteer surveys).

As a supplementary part of the methodology, besides the above presented questionnaire, 10 semi-structured interviews with pedagogues from the same school level were conducted. This kind of combined methodology – namely the mixture of qualitative and quantitative methods was necessary due to the nature of the investigated topic. However, qualitative methods sometimes still do not deserve the recognition of the scientific world, when investigating a current and "fluid" phenomenon, they do provide a deep and diversified context. In this study, the in-depth interviews were primarily used as a basis for *narrative analysis.* The literature of narrative analysis traces back long, and as an interdisciplinary method it is often used by sociology, communication, psychology and other social sciences. While conducting the narrative analysis, we relied on Kohler-Riessmann's approach (2008). Narratives achieved popularity first in research interviews and medical consultations. In sociology, a personal narrative involves a "long section of talk talk—extended accounts of lives in context that develop over the course of single or multiple research interviews or therapeutic conversations" claims Kohler-Riessmann (2008:18). Through the analysis of these conversation units, researchers are more able to observe the motivations and thoughts of the stakeholders.

Overall, ten interviews were conducted during the period of March-May 2021. The minimum duration of a discussion was twenty-five minutes, while the longest interview took even forty-five minutes. There were overall fifteen interview questions divided into four main sections as follows:

- General information on the pedagogue (for example gender, age, school where he/she teaches, the classes he/she teaches);
- Introduction part – Association game (how he/she would define *artificial intelligence* etc.);
- Practical questions regarding AI (for example to what extend a teacher is open enough to learn more about artificial intelligence etc.).
- The future and AI (Does he/she fear for the spread of new technologies?).

As for the participants, four of them were women while the remaining six participants were men. Except two of them, who work in the countryside, the majority is currently working in a high school in the capital – Budapest – and is teaching a social science or the art of humanities (literature, music, English as a foreign language, history etc.). Due

to the COVID-19 regulations, the interviews were carried out online by using the Zoom platform or via telephone (two of the ten interviews). Each of them was recorded and then adapted into manuscripts. The language of the interviews is Hungarian.

RESULTS

In this section, the main opinions and narratives on artificial intelligence of Hungarian secondary school students and pedagogues are presented. For a better traceability these narratives are divided into tree thematical chapters (*I. Preparedness, extant knowledge and willingness for progress; II. Openness for cooperation with AI* and *III. The Future of AI*). In each chapter the high-school students' narratives appear first and are followed by the pedagogues' viewpoint.

I. Preparedness, extant knowledge and willingness for progress

When talking about how AI could and should be integrated into – in this case secondary school – education it is essential to estimate to which extend stakeholders are prepared for the not just for the appearance bur for the use of new technologies on their daily basis. Therefore, participants were asked on which kind of *digital competence areas* are most important to them. The majority mentioned the independent and confident use of computers and programmes so as the online education platforms (Teams, Google Classroom, Redmenta). Besides the technological knowledge, the attitude and openness for gaining new knowledge is regarded as a crucial aspect.

"*I am open for AI and would allow it to be present on my classes, however what interests me most is to see how exactly it could replace me in my literature classes."* (35 years old women, teaching Hungarian literature in the countryside)

From the pedagogues' side it stands out that the COVID-19 pandemic had a huge impact on their attitudes towards learning new technologies. Without exception, pedagogues claimed that they had no choice in migrating to online platforms from one day to the next. This situation thought them how important it is to be up-to-date and ready for a technological boom regardless of age. Many of them reported even though they favor the personal presence on their classes that their extant technological knowledge massively improved during the lockdown and online learning. All the ten interviewees stated that they would willingly take part in a course or training in the future to improve their skills and gain a basic understanding of how to use and adapt AI into education.

It is vital that future workers and young society are properly prepared and informed about automation, market opportunities and safety threats, thereby increasing their career opportunities and competitiveness of workers (Dietz, 2020). According to McKinsey's research (2018), effective communication with machines in adulthood requires among other things, programming, data analysis, digital skills learning, and in adult education, both theoretical and practical training should be developed together with large companies. The online survey contained three open-questions about what students mean by AI, robots and algorithms. Answers showed that digital natives knew these terms and were mostly able to give examples from their own lives.

The labor market is developing on a large scale and it is beginning to take advantage of technological developments. However, this social development must also be reflected on the teaching methodology, since the digital natives and the alpha generation already speak the language of the digital world, whereas the system and expected curriculum that still operates today are in many ways an imprint of an era before the digital age (Prensky,

2001). Practical solutions for more modern, more fun education can be supported by innovative AI technology.

II. Openness for cooperation with AI

The openness for cooperation with artificial intelligence and the related narratives were revealed through concrete and practical situational questions. Members of the target group had given answers to Likert-scale-type questions with seven answer opportunities. In the first of these questions, students had to imagine situations and decide how well they could imagine these situations.

1. The mathematics class is held by a computer algorithm.
2. The foreign language class is held by a computer algorithm.
3. A computer or "robot" speaks with you in a foreign language.
4. You will contact the AI for help and advice if you get stuck in your study matters.
5. You will contact the AI if you need to deal with study matters.
6. The Hungarian literature lesson is held by a computer algorithm.

In the case of math's classes 24.7% of respondents can imagine that a computer algorithm held the class, but 25.3% of participants indicated that it is difficult to imagen that. The difference between the two answers is the gender distribution, female students have responded that they find it more difficult to imagine.

Chen and Lee 's study (2011) found that embedded human emotion recognition systems can be useful for speaking a foreign language to reduce anxiety, thereby wondering how much they agree with the following statements: promoting the effectiveness of education in English lessons. What happens if we not only give the teacher an aid, but the teacher himself is an AI who constantly adjusts the tasks to the student, thereby reducing the feeling of anxiety in the student? According to the Hungarian students who completed the research, this is inconceivable, and they would not rather talk to an AI in a foreign language than with a person.

The next two questions in the group were about how much students could imagine contact to an artificial intelligence if they need help or advice. 59.2% of fillers can imagine contacting an AI for help and advice. The answer is not surprising, since we already must talk to chatbots for various everyday services, this could even be imagined with virtual assistants for academic administration activities. Acceptance was even higher than the question of study matters: a total of 76% of respondents could imagine this possibility in varying degrees.

There were skeptical answers to the question about the Hungarian literature class. 77.8% of respondents cannot or can very hardly or hardly imagine a literature lesson being headed by a computer algorithm at all.

It turned out from the previous chapter that teachers would even be willing to take part in an AI-course, however, when it comes to the areas that AI could replace in teaching, the opinions are different. Even though the majority (8 out of 10) could imagine that he/she held a class with the cooperation of AI, none of them could imagine how would it look like in real life. Only one of them could imagine that AI all alone would give a mark for the students since they do not think that it could be as fair as a person. Even though, all of them would consign the administrative and mechanical tasks for AI.

"I do not think that a historical essay could be corrected fairly by AI technology. Only a teacher can see the progress of a student and know his/her circumstances and skills." - states a history teacher (man, 33 years old).

From the four main educational purposes that are mentioned by the Congressional Research Service, the *automating tasks like attendance, grading assignments, and generating test questions* are the most popular by pedagogues. It is a common opinion that most of the time and efforts of the teachers goes for administrative tasks that they would rather spend on students with special needs or students who are outstandingly talented.

III. The Future and AI

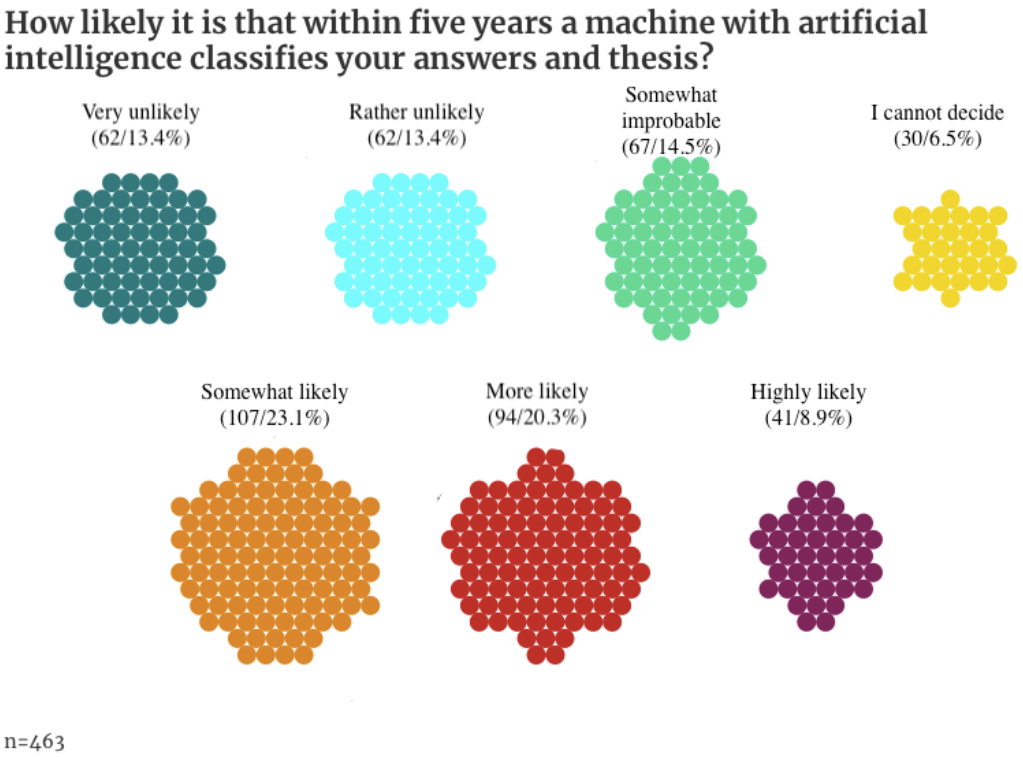
In another set of question respondents had 7 other choices. The options for reply were as follows: very unlikely, rather unlikely, somewhat improbable, I cannot decide, somewhat likely, more likely, and highly likely.

The section was about how likely it is, that within five years a machine with artificial intelligence...

1. ... takes the lesson?
2. ... tutoring in a class?
3. ... classifies the answer, thesis?
4. ..."tells" the answer during the lesson?
5. ... examine you?
6. ... recruits you?
7. ... solve specific tasks?

To the first question 56.5% of participants answered by highly and rather unlikely. About AI tutoring they had the same opinion 50.3% of participants commented, that it is highly and rather unlikely. Question three has already shifted in the likely direction. To some extent, participants (52.5%) considered it is likely that an AI would be able to classifies their answers and their thesis.

Figure 1: How likely it is within five year a machine with AI…



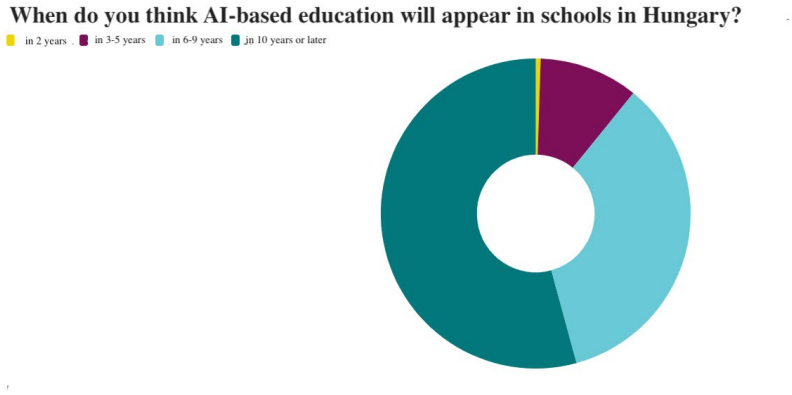
(Source: Own)

The question of examination is rather improbable (20.5%) and highly unlikely (24.4%) for them. Answers can be surprising, but we cannot forget the idea that the thesis is a written genre, while when we talk about examinations we associate it with the examiner, who, based on the answers, makes difficult for students to imagine that it is an AI and not a real person. We met the same difficulty on the sixth question. 70.1% of students consider very, rather unlikely, and somewhat improbable to accept an AI as a recruiter. 70% of respondents, who had given somewhat likely, more likely, and highly likely answers, prefer that an AI will solve specific tasks instead of them.

How likely it is within five year a machine with AI…

More than half of the secondary students who complete the questionnaire, 54.2%, can only imagine the emergence of AI in 10 years or later. They are followed by 36.7% of those who think it is conceivable in six to nine years. In summary, 90.9% of fillers are at least 6 years, but instead they can only imagine AI-based education in Hungarian educational institutions after 10 years or later.

Figure 2: When do you think AI-based education will appear in schools in Hungary?



(Source: Own)

The questionnaire is examined student's fear of changing labour market and the lack of employment opportunities because of AI. The claim that the spread of AI may not have a job has divided fillers. 20.3% of respondents chose the slightly agree option. 16.2% said they would rather agree. 14% of respondents were unable to form an opinion on this issue, but 46% of the students surveyed fear that AI may take away their work in adulthood.

For those questions how the future of education will look like, when will AI be organic part of public education and whether they fear for AI, they gave quite miscellaneous answers. Participants could be divided into two main groups: while one half suppose that it is impossible in Hungary that AI would be integrated into public education within the next 5-10 years, others think that this technological boom is closer than we could expect. However, it should be underlined that *none* of them think – regardless of the scientific field – that a teacher could be fully replaced by AI. The main reason for this is not that AI would not be able to perform the same tasks, but that personal relations are crucial for both students and teachers. This was one of the main lessons that the pandemic situation showed for both sides.

DISCUSSION

The rapid development of science offers us every day an opportunity that can fundamentally change our lives and thinking. Students who are now studying at secondary level or who enter the Hungarian education system after them, face completely different social problems than the generation before them. New jobs are being created, some professions are changing and disappearing, as digitalization and robotization can trigger a significant amount of human work. This presents new challenges for our educational institutions, which are no longer only responsible for the transfer of general literacy and curriculum, but also to develop competences for the new generation that will be able to work in a future that is often unexpected.

It should be underlined how that the COVID-19 and online learning changed the mindset of the pedagogues - turns out from the narrative analysis. As a positive impact, their openness and willingness for learning new technologies at the user level is crucial as a similar situation can come every time. However, let it be any advanced technology, the generational gap between high school students and their teachers is smaller in this sense than we thought. Personal relations, emotions and common experience cannot be

replaced by AI. Students do rely on their teachers and teachers need their students as well. When it comes to the systematic implementation of AI in public education in Hungary, the following aspects should be taken into consideration: to find the way for bringing personality and "intimacy" into online learning and prepare public schools with the appropriate technological equipment.

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Reflections of digitalization of learning process

CRITICAL POINTS OF USING THE BYOD STRATEGY AT PRIMARY SCHOOLS

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Abstract

The strategy of Bring your own devices (BYOD) is called Přines si své vlastní zařízení in Czech. It has been widely discussed recently. It means that students work with their own mobile devices, which they have brought themselves, during the lessons. The importance of mobile devices in teaching has been confirmed during the CoVid-19 pandemic situation. Pupils at Czech primary schools have been learning distantly for almost a year now. A smartphone or a tablet are often their main educational tools. Nevertheless, there are many questions about the BYOD strategy and it is not always considered to be useful by teachers.

In this article, we present the result of a questionnaire survey that dealt with the use of this strategy at primary schools in Pilsen. We asked 200 respondents, 49 % of whom answered they had heard of the BYOD strategy for the first time in this questionnaire. Only 27 % of respondents actually use the strategy in their classes. We were interested in the obstacles, or why the strategy is not used more often. Insufficient teacher competencies, concerns about cybersecurity, the quality of school network, the lack of facilities, etc. appeared most often among the answers. Based on this information, we identified 6 critical points that could help involve the BYOD strategy in teaching. Subsequently, an infographic was created to help teachers overcome possible obstacles in the BYOD strategy integration in the classes. 32 % of the teachers, who have not used the strategy yet, would like to start using it. The CoVid-19 pandemic and the closure of schools certainly play a role. This situation has compelled pupils and teachers to use modern technologies more often, and also to master work with educational and communication applications relatively fast. In our questionnaire, teachers admit that they would like to work with some of the online tools they learnt using at the time of distance learning, also when they are back to school. We would like to support these teachers with the infographics mentioned above.

Keywords

BYOD. Mobile Technology in Education. Secondary School. Research.

INTRODUCTION

We've been hearing about using modern technologies in schools in the Czech Republic for the last couple of years, however lately, mainly because of the CoVid-19 pandemic, shutting schools down and practising distance learning, situation has changed dramatically. Research of ČŠI (2020) showed that Czech teachers were not ready to start proper online distance learning. Mainly in the first wave of the pandemic in spring 2020 it was obvious, that differences across the republic were significant. Schools often didn't have the software, which they could use to communicate with students or to practice the curriculum. It also became evident, that there was not enough appropriate hardware, both on the student's and the teacher's side. Even though using ICT technologies in schools in 2020 (or 2021) is not anything ground-breaking, the presence of the device itself is not enough. The device needs to be used in combination with the right software (Vaníček

2009). That is where BYOD strategy comes in place. BYOD enables the students to work in classes or to prepare for classes using their own device. Although the strategy seems very attractive it is necessary to realize the negatives as well as the positives. Neumajer (2016) says, that equipping schools with sufficient number of mobile devices is demanding. However, last year (due to the pandemic) MŠMT provided schools financial resources exactly for that purpose (MŠMT 2020). ČŠI report, which evaluates distance learning in 2020/2021, says, that according to teachers, schools are now equipped sufficiently, not only thanks to MŠMT, but also thanks to other projects which enabled schools to purchase these, often not cheap, devices. Attewell (2015) says, that the fact that students can work with their own device, know its user interface, can continue to educate even outside of school, is the main advantage of BYOD. He also points out different social and financial background of individual students. Not every family can afford mobile device, mostly cell phones or tablets. Even if students own a mobile device it cannot be guaranteed that they will always have it charged and with them, with all updates and ready for work. Because of this, using a combination of school devices as well as student's devices seems to be an appropriate compromise. Cetin (2018) and Prieto (2019) agree, that involving mobile devices with suitable blank apps in lessons may be a significant motivational factor for students, however without substantial impact on study results. Students enjoy working with tablets and suitable apps. The motivation for students is the presence of these devices itself, but significant improvements in study results have not been found. The BYOD (Bring Your Own Device) strategy can be an effective approach as it fosters a sense of responsibility among children towards their devices, encouraging them to develop a certain attachment and take better care of them. A well-prepared lesson in which modern technologies are used helps to absorb knowledge and to keep it for a longer time (Kar 2015). We also have to mention some of the difficulties that come with this approach. For example, you need a very good and stable school network. Unstable network leads to disruption of the learning process and it may discourage teachers from further use of mobile devices in lessons (Neumajer 2016). It is also important to provide some kind of protection for the network and it may be wise to consider blocking access to inappropriate content on the web (Šupicová 2019).

As is evident from the previous text, BYOD strategy seems very attractive, but there are also some obstacles. In our research we tried to discover these critical points which may occur while using the strategy in schools. We used a questionnaire for teachers on elementary schools in Pilsen-city county to find out, whether or not teachers know and use this strategy, alternatively what is the main obstacle for using it in lessons.

METHODOLOGY

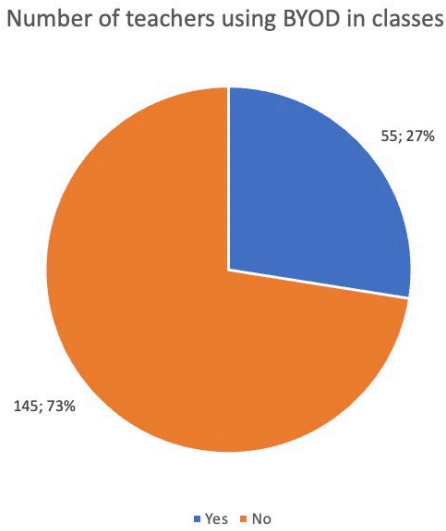
In our research study we used a questionnaire as a research method. The main goal of the study was to determine critical points in BYOD strategy while incorporating it in elementary schools in Pilsen-city county. In the process we also tried to find out whether or not teachers in Pilsen-city county know about the BYOD strategy and use it or not. Prior to the creation of the questionnaire, we conducted half-structured interview with an employee of the company which manages the networks on more than half of the schools we approached. Thanks to the interview we were able to create a picture on how sufficient the network coverage really is on these schools, whether there is Wi-Fi coverage or not and so on. The questionnaire was divided into three sections. In the first one, we tried to find out teacher's attitude to modern technologies in schools. The second part was specifically designed for those teachers, who stated, that they have experience with

BYOD strategy and use it in lessons. We were interested in the manner in which they implement modern technologies in lessons, what apps do they use and whether or not their students are sufficiently equipped to use them. The last part of the questionnaire was designed for those teachers, who do not use BYOD in lessons. Here, our focus was to find out what the obstruction for using these technologies really is. The questionnaire contained 38 questions (items) including closed and opened ones. We assumed easy quantitative evaluation for closed questions. Opened questions were integrated because of word-for-word opinions of teachers in approached schools. We used Google Forms to create our questionnaire. It was anonymous and it was spread via email messages. For maximum returnability of the questionnaire, we sent it not only to the teachers, but also to the headmasters with appeal to give the info to their employees. Respondents had 15 days to fill in the questionnaire. In addition, we also sent a reminder one week after the first message. It helped to get additional answers. In total we approached 50 schools. We always contacted the headmaster and then, if possible, we contacted individual teachers using their contact on the school's webpage. Altogether we sent 1243 emails with the questionnaire.

RESULTS

In this chapter we will introduce the results of our questionnaire. As mentioned before, we approached 50 schools in Pilsen-city county with our questionnaire (Google Forms), which we sent via email. 42 of them took part in our research, that is 84%. The number of teachers, who filled our questionnaire was different on each school, however in total it was 200 respondents. 37 of them were men, 163 were women. The ratio corresponds with data from Czech Statistical Office which say, there are 84,3 % of female teachers and only 15,7 % of male ones in Czech elementary schools (ČSÚ 2020). In our research it was 82 % of women and 18 % of men.

Figure 1: Number of teachers using BYOD in classes.

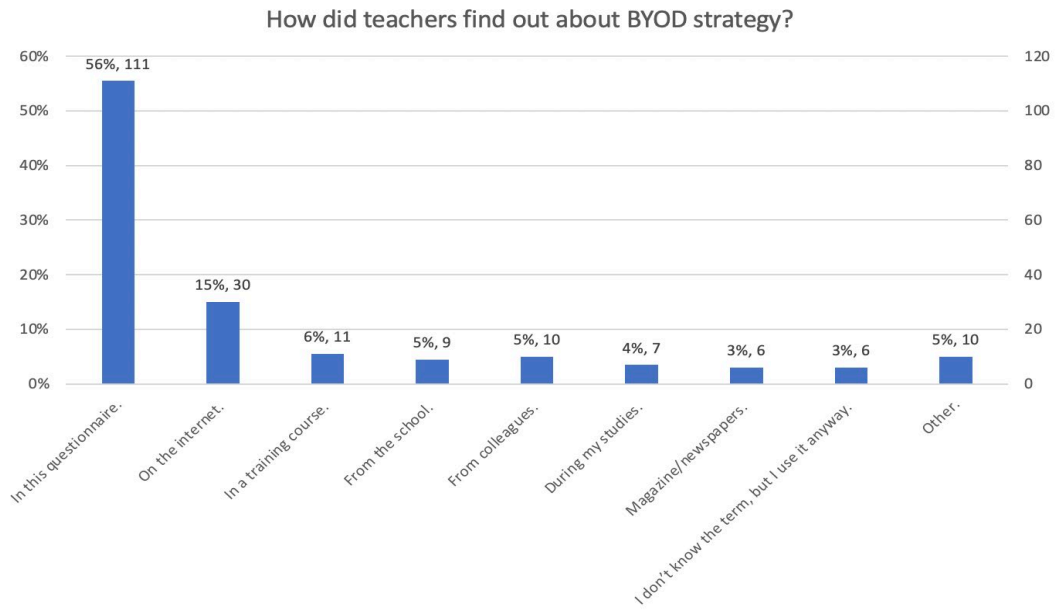


(Source: Own)

The crucial question was whether the teachers use BYOD strategy in their lessons. Almost three quarters of respondents (145; 73 %) said, that they don't. Only 55 teachers (27 %) use BYOD strategy (Figure 1).

Interesting is, that 111 teachers (56 %) said, that they heard of BYOD strategy for the first time in connection with our research (Figure 2).

Figure 2: How did teachers find out about BYOD strategy?



(Source: Own)

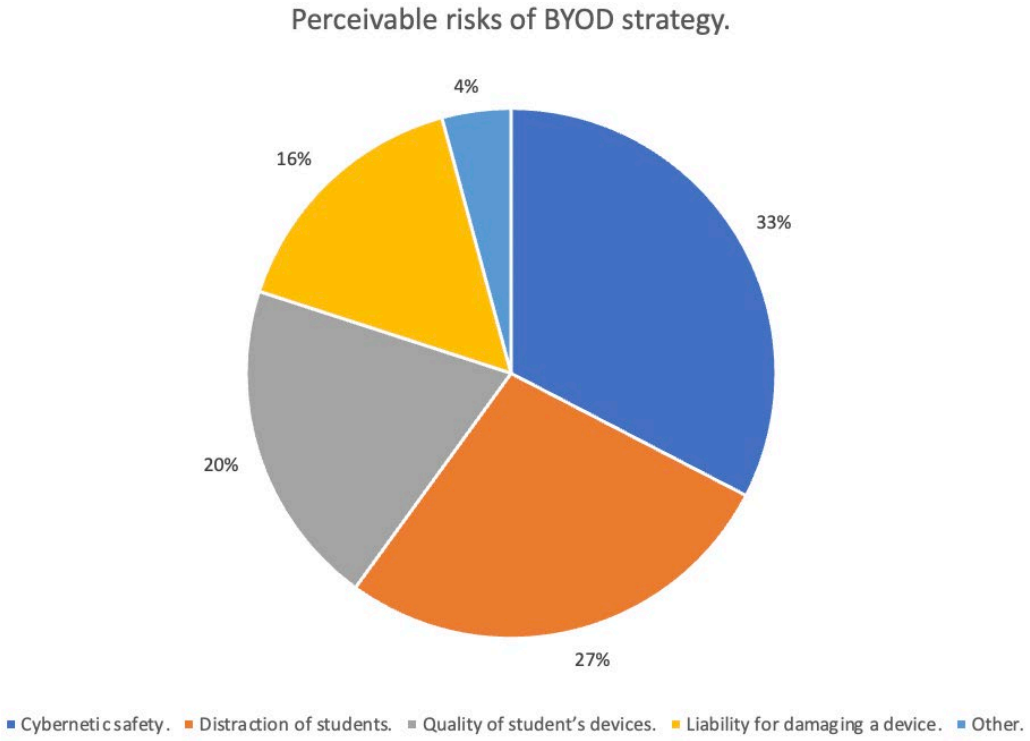
In the research we also tried to find out, whether students are allowed to use their own devices in lessons. As can be seen on the graph, 70 teachers (35 %) stated, that students at their schools are not allowed to used mobile devices in school. 41 teachers (20,5 %) said, that their students can only use these devices during breaks. 80 teachers (40 %) confirmed, that students are allowed to use mobile devices even in classes. Based on these findings we came to a conclusion, that most schools are afraid to use mobile devices not only in classes but at school in general. In the case where students are allowed to bring their own device, 84 teachers (42 %) think, that these devices are not suitable for BYOD implementation. Only 47 teachers (23,5 %) think, that their devices are suitable, the rest of the teachers don't know. At least the fact, that 160 respondents stated, that their schools have enough mobile devices for students to use, is positive.

For successful implementation of researched strategy, it is necessary for the student not only to own a mobile device, but also for the school to have good and stable internet connection. 39 teachers (19,5 %) said, that their net is without problems, 47 respondents (23,5 %) admitted occasional dropouts. The rest of our respondents (114, 57 %) admitted frequent dropouts.

Further, we tried to find out experience of those, who really use BYOD strategy in lessons. In addition to network problems, there is also the risk of inappropriate use of the mobile devices. 16 teachers (30 %) admitted, that their students sometimes don't use the devices in a way they should be used. 29 respondents (52 %) weren't sure. We were interested in a solution to this problem. In this question (item) teachers could choose from multiple options. 48 respondents said, that they admonish the student and focus on him or her more. In "others" category (13 respondents), we found an opinion, that after multiple reprimands the student must work offline or do the exercise at home. Often teachers see cybernetic safety as the biggest risk of BYOD strategy (32 %). Then, there is the fear of distraction (27 %), fear concerning the quality of student's devices (20 %)

and almost 16 % of respondents fear, that the devices might be damaged, both student's and school ones (Figure 3).

Figure 3: Perceivable risks of BYOD strategy.



(Source: Own)

Now to the means of BYOD application. If you want to use a mobile device in school, you need to have a suitable software. Among apps that are being used there was Google Translator 30 times, Kahoot! App (28), Google Maps (27), other Google tools (Disc, Documents, Clasroom, 23). Some respondents also mentioned Quizlet, Microsoft tools, Mentimeter or various webs for teaching. In our opened question (item) we tried to find out specific activities teachers involve in lessons. These findings can be summarized in several categories:

- Searching for information and multimedia.
- Curriculum fixation using quizzes.
- Finding places on maps.
- Translating.

Our research took place during CoVid-19 pandemic when schools were closed. Both teachers and students were forced to use modern technologies to perform distance learning, both synchronic and asynchronic as well. Thus, we asked the teachers, whether or not they think the approach to BYOD strategy might change because of this exceptional situation. This question was an opened one, to gather as much information as possible. In general, most of the teachers realize the efficiency of BYOD strategy and would like to use it in presence learning. In table 1 below you can see some word-for-word opinions.

Table 1: Teacher's opinions on the change of BYOD strategy perception after the end of distance learning.

Teacher's opinions on the change of BYOD strategy perception after the end of distance learning.
„Tools and apps for distance learning (MS Teams, Kahoot and others) showed to be a very good addition to standard learning. I can definitely imagine using these tools in presence learning. "
„In future I plan to give homework only through MS Teams (easier to control and good feedback). I will also use other tools (automated tests in MS Forms, activities in 3rd party apps, info graphics) in future years. BYOD is necessary in this situation. "
„I will use Google Forms to create tests – it is easier to correct. For homework I will continue to use Google Classroom. I want to use interactive, digital work papers more."
„I think that even teachers, who feared digital technologies because they weren't able to use them properly, will now involve them in classes – they won't have the fear anymore."
„I will support group work more (in couples) using modern technologies. With bigger groups I will prefer personal approach."

(Source: Own)

Many teachers involved in our research said, that they don't use BYOD strategy. We were curious, whether they want to change that or not. 32% of teachers stated, that they would like to include BYOD strategy in their lessons, only 14 % disagreed. Half of those who still don't use the strategy (52 %) said that they don't know. We asked them what obstructs them in using BYOD in their lessons. They mentioned these problems:

- Social differences between students.
- Students not having Wi-Fi access.
- They didn't test the strategy at their school yet.
- Teachers don't have enough experience to use the strategy.
- Not sufficient quality of student's devices.

DISCUSSION AND CONCLUSION

In our research we tried to find out the situation about using BYOD strategy on elementary schools in Pilsen-city county. We used a questionnaire to help us to identify critical points in the process of implementing this strategy. After evaluating the results of our questionnaire, we established following critical points.

- Social differences between students and the quality of their devices.
- Insufficient technical equipment of schools.
- Limited student access to Wi-Fi.
- Insufficient experience with BYOD.
- Fears for cybernetic safety.
- Possible distraction of students.

Critical points and fears established in our research correspond with similar research that deal with implementing BYOD strategy. Attewell (2015) sums up 15 important points on how to implement BYOD without problems. Also, Gajzlerová, Neumajer and Rohlíková introduced 10 tips for BYOD implementation in 2016. Based on all of these researches with respect to critical points introduced by us, we formed a set of 7 recommendations for BYOD implementation:

- Support each other.
- Do only little steps.
- Involve your students.
- Don't overdo it with technologies.
- Lower the differences between your students.
- Set some ground rules.
- Create a suitable environment (Wi-Fi, cloud).

These recommendations are processed as infographics in bachelor thesis of Alois Glazer (2021).

Even though BYOD strategy is nothing new, our research showed us, that it still isn't very widespread. Current situation in schools (CoVid-19 pandemic) showed not only how important it is to use modern technologies in schools, but also that teachers are not competent enough to use them (ČSI 2020b). The presence of the technology itself is not enough, it is necessary to know how to use it effectively (Clark, Luckin 2013). Nuangchalerm (2020) says that teachers often lack ideas and inspiration. They also miss much needed creativity. It should be a part of teacher's education to know, how to effectively use modern technologies in classes and also to know how to select appropriate software. The essence of m-learning is not the presence of the device itself; it is the ability of the teacher to create a suitable activity in which the student will use the device effectively and actively (Montrieux et al. 2015). Results of our research correspond with these statements. Teachers are not confident about their experience with mobile devices enough, so they cannot implement the BYOD strategy. Some teachers feel, that the strategy might not be beneficial, that students are overwhelmed with technologies or that it is not suitable for their subject.

As the current (and even last) school year showed us, using modern technologies is very effective and sometimes it might be the only way how to educate a student. Thanks to the need for distance learning teacher's experience with digital technologies improved significantly (ČŠI 2021). Many students worked at home with their own devices, thus they basically implemented BYOD strategy. Although BYOD strategy has its difficulties, there are several indisputable positive facts (Neumajer 2016). We believe, that our research helped to spread this strategy among other teachers and might be the impulse some of them need.

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HATE SPEECH DETECTION IN MASS MEDIA: IT-BASED AND PSYCHOLINGUISTIC INTERDISCIPLINARY APPROACH

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Abstract

In the research, I examine the issue of the influence of the mass media on a person's consciousness from a psycholinguistic perspective. The core focus of my current research is hate speech in print media. The work was performed within an international project «Free voices: Promoting Independent Media in the Target Region» featuring the Crimean Human Rights Group. This paper presents an intermediate study of hate speech in the texts of online publications dated November 2020. To receive data I combined the author's method of psycholinguistic analysis with a help of a software bot. Our research consists of four stages. During the first stage, a team of journalists and volunteers with the help of a software bot carried out search query mining to find negative information. Later, applying the author's method of psycholinguistic analysis of the text, we scrutinized the material obtained to identify the type of hate speech, its techniques of influencing consciousness.

The examples of hate speech were split into three types based on the use of specific linguistic and graphic tools: #1 direct hate speech; #2 indirect (hidden) hate speech; #3 manipulative hate speech. The evidence from this study intimates that the media tend to use examples of hate speech of the second and third types and avoid direct discrimination. In addition, there were mixed types: the combination of the second and third types and the combination of the first with the third or second type. I assumed the third and mixed#2-3 types of hate speech to be the methods of psycholinguistic manipulation. I have obtained comprehensive results proving that the majority of selected texts (75.7%) widely exploit methods of psycholinguistic manipulation. The results of this study will be used for a project report as well as to develop training for pre-journalist students and human rights defenders.

Keywords

Media. Hate speech. Manipulation. Text. Types of hate speech. Psycholinguistic perspective.

INTRODUCTION

The exponential growth of information and communication technologies and mass access to sources of information greatly influenced media's impact on society. In this context, manipulation, fake news, and propaganda can represent a perfect setting for the spread of violence, xenophobia, and hatred. For example, Donald Trump's incorrect comments on social media during the 2020 election in the United States provoked his supporters to storm the Capitol

that cost several persons their lives (Donald Trump was a linchpin behind Capitol riots, 2021). Another striking example is the brutal decapitation of Samuel Paty, a French schoolteacher, after a hate campaign against him on social media (Samuel Paty: French schoolgirl admits lying about the murdered teacher, 2021).

The dark side of the media is mentioned in the 2017 annual report of the Council of Europe. It highlights the danger of the dissemination and amplification of poor-quality information that originates online. The authorities identified three different types of information disorder: mis-, dis-, and mal-information, which are differed based on the dimensions of harm and falseness: mis-information is when false information is shared, but no harm is meant; dis-information is when false information is knowingly shared to cause harm, and mal-information is when genuine information is shared to cause harm. The authors consider hate speech as mal-information that is used to cause harm and discriminate against a group of people on religion, race, and other grounds:«…people are often targeted because of their personal history or affiliations. While the information can sometimes be based on reality (for example targeting someone based on their religion) the information is being used strategically to cause harm (Wardle & Derakhshan, 2017: 20-21).

In recent years, there has been considerable interest in issues of the negative influence of mass media in humanities (psychology, linguistics, sociology, etc.), IT, and Computational linguistics.

A growing body of literature in psychology has examined the media's influence on an individual's consciousness (Leontiev, 2004; Strong, 1922; Giles, 2003, 2016, and others). For instance, Leontiev (2004) focuses on mass media advertising, whose words, images, meanings, and associations stimulate positive consumers' attitudes toward products or brands and induce them into highly advertisement engagement.

In linguistics, much work on the potential of speech propaganda and manipulation has been carried out by Bulyigina & Shmelev A.(1997), Elswah & Howard (2020), Aronson & McGlone (2009), Rizun, Nepyivoda & Kornieiev (2005), Arutyunova (1990), etc. Numerous studies have been published on the distortion of the meaning of concepts in media texts (McGlone, Beck & Pfiester (2006), Shmelev D. (2008), Keith & Burridge (1991), and others).

There is a vast amount of literature on specific features of media representations of war and military conflicts (Pocheptsov (2001, 2019), Pack (2009), Kamalipour (2004), Galtung (1987), Dawes (2005)). Kamalipour (2004: 87-94) points out that since speech shapes our perception of reality, the age of information can be called the age of manipulation.

Chomsky & Herman (2002), Moscovici (1985), Browne & Keeley (2018), and others discuss the peculiarities of media propaganda as a mass media phenomenon. For example, Browne & Keeley (2018) draw attention to the rhetoric of propaganda speech, which ignores logical connections and does not provide empirical evidence for misleading information presented as factual. It ultimately leads to speech ambiguity and overload as well as makes speech difficult to analyze.

Chomsky & Herman (1998) developed a «propaganda model», which describes several filters applied to make news look like "fit to print". As commented by Chomsky (1998: 2), media information for broad audiences is in line with the interests of government and big organizations and is published to "marginalize the dissent."

In computational linguistics, the study and detection of hate speech explore by using natural language processing. For example, Schmidt and Wiegand (2017) studied the ways of the automatic detection of hate speech. All surveyed methods include common features that are usually used in the computer program to identify hate speech, such as a set of negative words

or expressions, using various complex features using ("dependency parse information", "features modeling specific linguistic constructs", "meta-information" and so on). At the same time the authors stressed that in most cases, computer program results can't be considered as full, because "they are only evaluated on individual data sets most of which are not publicly available" (Schmidt and Wiegand, 2017: 8-9). Taking into consideration the weak features of computer analysis of hate speech, we think that the best result researchers can receive if they combine computer and human inspection.

IT actively develops software to analyze text arrays, which parses text from unformatted content and unstructured data from social media, news reports, surveys, etc. to provide practical information like the mentioning frequency of a certain brand, person event, or counting particular words in the texts (e.g., programs for sentiment analysis and content analysis Semantrum, TABARI, Wordstat, JFreq etc.). However, some of these programs are paid ones, so they cannot be used in our study. Besides, each program is designed to perform certain tasks (monitoring posts with keywords, examining publication resonance, etc.), while this study is a report on hate speech on modern media that requires specific software, which will be discussed in the next section.

Considering hate speech as a product of media activity, we have paid special attention to the definition of the given concept. It is worth noting that there seems to be no general definition of hate speech for many reasons (Bartl et al, 2014, Benesh 2015, Saleem et al, 2017). Actually, the definition of hate speech depends on the legislation of each country, viewpoints on the issue, etc. (Howard, 2019: 96). Our study follows the definition of the Cambridge Dictionary, which interprets hate speech as "public speech that expresses hate or encourages violence towards a person or group based on something such as race, religion, sex, or sexual orientation" ("hatespeech". dictionary.cambridge.org.). In terms of media communication, hate speech is potentially dangerous as well since it frequently provokes acts of violence and hate crimes. For instance, notoriously famous the Rwandan genocide during the Rwandan Civil War in 1994 was preceded by anti-Tutsi propaganda in the local media (Yanagizawa-Drott, 2014; Melvern, 2004).

The increasing number of studies on this subject in Political and Social Sciences (Howard, 2019; Paasch-Colbergetal., 2021 and others), Legal Science (Waldron, 2012; Ghanea, 2012; Howard, 2019 and others), Media Communication (Bahador and Kerchner, 2019; Bahador, 2020 and others) are beneficial to both scholars and practitioners.

Freedom of expression is the core of human individuality, that's why hate speech issues have close relations with freedom of the press and legal aspects. In his recent research, Howard (2019: 93-94) shows much concern about distinguishing between freedom of expression and hate speech begin. The author notes that despite its relevance, this issue is not addressed at the legislative level in many countries, including the United States.

As indicated by Professor of law and philosophy Waldron (2012), each state should take appropriate measures to protect a person's dignity from hate speech by adopting special laws.

On 31 May 2016, the European Union cooperated with Facebook, Twitter, YouTube, and Microsoft to launch an online "code of conduct" aimed at fighting spreading xenophobia and racism across Europe. Věra Jourová, the EU commissioner for justice, consumers, and gender equality said that "The recent terror attacks have reminded us of the urgent need to address illegal online hate speech. This agreement is an important step forward to ensure that the internet remains a place of free and democratic expression, where European values and laws are respected." (Hern, 31 May 2016).

Based on the relevance of this issue, researchers explore the features of hate speech in comments and posts on social networks (Chen, 2011; Paasch-Colbergetal, 2021; Schmidt and Wiegand, 2017, etc.).

At the same time, media texts can contain indirect hate speech without making direct calls to violence and insults. Badak Bahador (2020) suggested a hate-speech intensity scale grounded on the in-group and out-group member criteria. He identified three strategies of hate speech, which characterizes the attribution of a person to either in-group or out-group member: 1) Dehumanization and demonization; 2) Violence and incitement; 3) Early warning. The first and second strategies imply the use of negative and offensive words and direct incitement to violence, while the third one is seen as the initial stage of dehumanization, which walks hand in hand with the demonstration of superiority. We are convinced that the study of the third category should gain more attention since at this stage it is more likely to prevent the spread of intolerance and calls for violence.

In January 2019, Bahador and Kerchner analyzed the USA media landscape and introduced a 6-point color-coded hate speech intensity scale. The researchers say about "variations of intensity are distinguishable of hate speech". The scale varies from basic level "disagreement" to the highest level "that provokes "violence" and "death" (Bahador and Kerchner, 2019: 5-8). This research demonstrated words and topics that are used in USA media. At the same time, the problem of hate speech in media should be thoroughly studied in other countries as well as in general. It is important to find common tools and methods of hate speech spreading.

Thus, hate speech was a subject of study, but we consider this phenomenon as interdisciplinary research at the intersection of psychology, linguistics, and IT technology. Our work aimed to widen current knowledge of hate speech in written media texts.

In this paper, we consider hate speech as a way of psycholinguistic manipulation of consciousness, to detect which we designed a special artificial intelligence-based bot.

The work was performed within an international project "Media freedom" featuring The Crimean Human Rights Group, where the author is involved as an expert in psycholinguistics.

In order to analyze the impact of hate speech on an individual's consciousness, we combined a computer bot program and the author's method of psycholinguistic analysis.

Aim. The present paper aims to examine hate speech in digital media, identify its type and methods of influencing an individual's consciousness by the author's method of psycholinguistic analysis and AI-based bot.

Hypothesis. It is hypothesized that the psycholinguistic approach combined with the software bot optimizes the search for hate speech and helps to avoid wasting time on routine work when selecting texts. In our opinion, this innovative approach gives experts more time to analyze information, as well as increases the efficiency of work. Moreover, our approach will be useful in advanced media literacy courses for journalists and pre-journalist students.

METHODS

Since looking through the texts on the Internet is time-consuming and labor-intensive, we decided to develop artificial intelligence software for selecting texts that are likely to contain hate speech. The bot optimizes the expert's work by surveying a large array of information to find a pool of texts that can incite xenophobia and hatred.

Thus, it was decided that the best procedure for this investigation is to join the author's psycholinguistic method of textual analysis and ICT, namely artificial intelligence-based bot

for selecting texts following the given parameters. The bot performs lexical analysis of content. Keyword selection strategy was based on the semantic meaning of the words in phrases and the entire publication with a negative tone.

Psycholinguistic analysis of the text is the author's methodology developed by Yu.M. Krylova-Grek. Now it is being registered in the patent office. Since our study is carried out within a long-term international project, the paper presents its intermediate results, which outlines the main approaches and opportunities for interdisciplinary interaction of humanities and computer sciences.

I. Setting up an AI-based software bot.

The major search parameters are as follows:

1. Online resource name. We specified the names of news agencies that specialize in current news. The initial cohort includes the nine most popular online media, whose traffic ranges from 1 million to 15 million visitors monthly.

2. Keywords. We entered words that usually accompany texts with hate speech. To single out keywords, we developed Hate dictionary based on the careful analysis of publications in selected media. Monitoring and word selection took place in 2017-2018. The dictionary includes 400 words. It should be noted the dictionary is constantly supplemented and changed due to the emergence of new narratives, concepts, and words.

3. Search period. We set the time interval: date and year. We strongly believe that a month is the most appropriate search period that can provide us with the required amount of data. Later, we plan to combine, compare and correlate the results obtained with the media-covered events.

II. *Psycholinguistic analysis of texts*. Text selection was followed by a psycholinguistic analysis of the data to determine and justify the presence of hate speech in these media. The analysis is a part of an innovative author's methodology, which assists in identifying both direct and manipulative hate speech that does not contain direct insults and calls for gender, racial or religious intolerance, but forms a negative attitude towards certain groups and individuals.

To conduct the foregoing textual analysis, hate speech was divided into three types, which are characterized by the use of specific linguistic and graphic tools:

Type #1direct hate speech;

Type # 2 indirect (hidden) hate speech;

Type # 3 manipulative hate speech

III. *Case study.* The present paper describes an interim study of hate speech found in the texts of nine online media in November 2020. We were looking for hate speech directed against certain national and religious groups living in Ukraine.

There were four stages. На першому етапі a team of journalists and volunteers with the help of a software bot carried out search query mining to find negative information according to key words.

Next (second stage), we looked through an array of texts to find articles that did not contain hate speech, but factual retrospectives of military events in the last century. We considered them as error deviation and did not consider in further work.

During the third stage, with applying the author's method of psycholinguistic analysis of the text, we scrutinized the material obtained to identify the type of hatespeech, its methods and techniques of influencing the consciousness.

At the fourth stage, we drew conclusions, which will be used in our further studies.

The texts that consist hate speech we split into three types based on the use of specific linguistic and graphic tools:

#1 direct hate speech: incitement to hatred through the use of obscenities, direct insults, calls to action on discrimination and violence, etc.;

#2 indirect (hidden) hate speech: opponents' dehumanization and marginalization, demonstration of disrespect, contempt for another ethnic group, culture, religion, distortion of historical facts.

#3 manipulative hate speech: employing means of influencing the individual's emotional state, whipping up negativity, opinions of biased "experts", amplification of information by non-linguistic means (for example, a photo that no relation to the event), misleading narratives.

RESULTS

The initial sample was composed of 306 texts. Approximately 70 % of the sample (215 texts) was selected for further analysis, while 91 texts were classified as an error because they did not contain any signs of hate speech. Hence, the efficiency of the bot was equal to 70.3%. It is a rather high value of software efficiency and effectiveness in finding hate speech in online media.

So, the third stage implies the textual analysis of 215 texts with hate speech. The psycholinguistic analysis made it possible to process all the texts and categorize them into three groups depending on the type of hate speech.

The array of texts for the specified period was lacking texts of # 1 type. At the same time, the results demonstrated that in most cases, media contained hate speech that belonged to the second and third types and avoided direct insults and discriminatory statements. Thus, contemporary media tend to keep distance from direct hate speech, but widely employ hate speech of the second (18.3%) and the third type (57.3%).

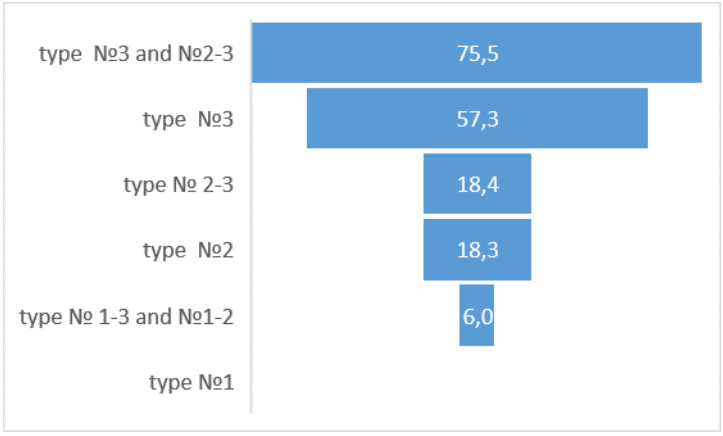
To spread the second type of hate speech, modern media predominantly exploit contempt, ridicule, and arrogance as well as opposing, deliberate exaggeration, or bracketing, which gives the word a figurative meaning "so-called", affirmative forms to elucidate events and refer to historical facts, etc.

As for the third type of hate speech, contemporary media mostly use tools and techniques aimed at affecting the individual's emotions, creating strong associations, and forming negative attitudes that the reader will consider a self-formed thought. In particular, such texts compile negatives information, references to non-professionals under the guise of experts who comment on the event without appropriate background, education, and experience in this field, distribution of fact-like fakes, and use photos that actually have nothing to do with the event. To validate the photo, we employed special photo verification programs (Krylova-Grek, 2019a; Krylova-Grek, 2019b).

Besides, modern media demonstrate a tendency to use hate speech of a mixed type. For instance, slightly under a fifth of the sample (18.4%) was represented by type #2-3 (a combination of the second and third types). This type provokes negative attitudes towards a certain group of people with the help of indirect. Less common (6 %) are #1-3 and #1-2 mixed types (combination of the first with the third and second type, respectively). These types drive a negative word-characteristic to an absolute axiom, which influences the content of the whole text (Figure 1).

Since the third and mixed types of hate speech have an indirect and hidden impact on the individual's consciousness, we consider #3 and #2-3 types as the methods of psycholinguistic manipulation.

Figure 1: Percentage (%) distribution of hate speech in the media in November 2020



(Source: Own)

DISCUSSION AND CONCLUSION

The interdisciplinary approach proved the effectiveness of combining artificial intelligence-based software with psycholinguistic research. Since bot efficiency exceeded 70 %, it was a powerful tool for optimizing journalists' and experts' analysis of hate speech.

The evidence from this study has revealed the techniques that are currently used by online news outlets to discriminate against certain social groups based on nationality and religion. The analysis of the largest Ukrainian online media has shown that hate speech is mainly presented by indirect influence and manipulation. The selected array of texts for November 2020 contained 75.7% texts (57.3% + 18.4%) that used diverse methods of psycholinguistic manipulation. Taken together, these findings implicate an important role of media in shaping negative public opinion.

On the other hand, our investigations into this area are still ongoing, thus the results presented in the paper are interim.

However, considerable progress has been made in manifesting media trends and novel ways of influencing public opinion in the context of marginalization and hatred of certain groups in society.

The strong point of our study lies in specifying common methods and techniques of affecting audiences' consciousness.

The results of this study will be used for a project report as well as to develop training for pre-journalist students and human rights defenders.

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THE SYNCHRONOUS ONLINE FLIPPED LEARNING APPROACH (SOFLA): CRITICAL POINTS IN STUDENTS ' LEARNING, A STUDENT AND TEACHER PERSPECTIVE

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Abstract

Educators world-wide have experienced very demanding times over the past year as they have had to shift their classes into an online setting. This shift has proven quite difficult as online classes cannot be taught the same way as face-to-face classes. One of the approaches educators have begun incorporating into their classes is flipped learning, where students are exposed to course concepts prior to class in the form of educational videos and/or online interactive materials. Class time can thus be dedicated to deepening students' understanding of the new subject matter. In an online setting, flipped learning involves both synchronous and asynchronous components (Stöhr et al., 2020). In 2017, Helaine Marshall introduced the Synchronous Online Flipped Learning Approach (SOFLA) (Marshall, 2017; Marshall and Rodriguez-Buitrago, 2017; Marshall and Kostka, 2020), which consists of eight steps designed to provide effective online learning rooted in flipped learning principles. These include: (1) pre-work; (2) sign-in activity; (3) whole group application; (4) breakouts; (5) share-out; (6) preview and discovery; (7) assignment instructions; and (8) reflection.

The aim of this paper is to describe the elements of SOFLA and identify its critical points from both the students` and teachers` perspectives. The paper reports the findings of two qualitative research studies that involved students' learning in an online flipped environment. One study provides findings on students' perceptions of learning in two TESOL courses at Long Island University in the United States of America. The other study reports on the perspectives of two university teachers. Conclusions will be drawn as to the potential for SOFLA to serve as a model for best practices in online flipped learning for the populations studied. Implications for further research will also be considered.

Keywords

Flipped learning. SOFLA. Synchronous online learning. Active learning. Case studies.

INTRODUCTION

Educators world-wide have experienced very demanding times over the past year as they have had to shift their classes into an online setting. This shift has proven quite difficult as online classes cannot be taught the same way as face-to-face classes. It can be helpful to frame this shift in terms of its affordances and not only its challenges. Moving online does require

limitations and there may be specific activities that cannot be implemented except in a shared physical space. However, there are also three other lenses through which to view teaching online classes: equivalencies, advantages, and innovations. (Rosen, 2020). Many learning activities can be replicated with very little modification, such as class discussions, small group work, and student presentations. Other activities can even be enhanced through spontaneous sharing of materials from one's location, the ability to freely move about while participating in class, or participation in a chat alongside that does not interrupt the flow of the main activity. Finally, the opportunity presents itself for innovations in instruction that can be the result of having to make this major change.

THE SOFLA FRAMEWORK

One of the innovative approaches that educators have begun incorporating into their classes is flipped learning, or the flipped classroom. Flipped learning has its origins in the attempt to maximize and active learning during class time by exposing students to course concepts prior to class in the form of educational videos and/or online interactive material (Bergmann and Sams, 2012; Flipped Learning Network, 2014). This approach can now be applied to online settings, where the out-of-class work is the asynchronous component and the in-class work is the synchronous component (Stöhr et al., 2020). In this paper, the authors describe a model of online flipped learning, the Synchronous Online Flipped Learning Approach, or SOFLA, (Marshall, 2017; Marshall and Rodriguez-Buitrago, 2017; Marshall and Kostka, 2020) and present initial findings from studies of both teacher and student perspectives on the use of this model.

SOFLA consists of eight steps designed to provide effective online learning rooted in flipped learning principles. These include: (1) pre-work; (2) sign-in activity; (3) whole group application; (4) breakouts; (5) share-out; (6) preview and discovery; (7) assignment instructions; and (8) reflection. Aligned with the Community of Inquiry (CoI) framework (Garrison et al., 2000), the sequence of steps in SOFLA is intended to create online spaces where both teaching presence and social presence co-exist with the cognitive presence that is the focus of instruction. Teaching presence is evident in the intentional content selected for each step and in the feedback provided to students as they complete each step in the cycle (See: Marshall and Kostka, 2020 for a discussion of teaching presence in SOFLA). Social presence, as will be discussed in detail here, exists in student interactions during the pre-work and breakouts steps and, in addition, the optional peer instruction component.

The steps can best be understood when divided into three instructional segments: Step 1; Steps 2-5; and Steps 6-8. The first segment, Step 1: Pre-Work, requires students to complete structured activities on their own, at their own pace, and with supports as needed that include the teacher's new subject matter along with embedded questions or prompts for which there is immediate feedback. The second segment, Steps 2-5, provide a variety of ways for the students, guided by the teacher, to deepen their understanding of the new subject matter. Step 2: Sign-In Activity generally draws from the pre-work but asks an open-ended question to which each student can respond differently. Step 3: Whole Group Application focuses on a point of confusion and/or applies key concepts to a specific context. In this step, students work together as a class through discussion, co-construction of online documents, and/or chat options. Step 4: Breakouts sends students to smaller rooms to complete a task independently as a group. For Step 5: Share-Out, students share their products from the group work and the other students give them feedback. This concludes the synchronous segment based on the prior pre-work.

The third and last segment, Steps 6-8 prepares students for their next pre-work and asks the student to reflect back on the lesson. Step 6: Preview and Discovery is the teacher's all-important opportunity to promote the next pre-work, motivating students, as well as pre-teaching key terms and concepts. Step 7: Assignment Instructions explicitly states what students will be doing and where and how to access the necessary materials and submit their work. Finally, Step 8: Reflection, tasks students with a one or two sentences take-away from the synchronous class session, noting what resonated most with them. This concludes the eight-step SOFLA learning cycle.

While SOFLA provides a structured template for online flipped learning, it also enables teachers to be creative and intentional in what they choose to include in each step of the cycle. Thus, each step creates a space for teachers within which they have the freedom to design instruction tailored to their specific subject matter and their current students. The purpose of an instructional design can be seen as to provide freedom within structure or to *create fertile spaces* for teachers to then plan their lessons. In the case of SOFLA, these spaces are the eight steps, each of which plays a role in assisting the students in their work towards mastery of the material. In analyzing the implementation of SOFLA, perspectives of both teachers and students can be valuable lenses. This paper discusses two qualitative research studies that involved students' learning through SOFLA, one from each of these viewpoints. One study provides findings on students' perceptions of learning in graduate courses at a large private university in the U.S. The other study reports on the experiences of university teachers, from the Czech Republic and the U.S. For each study, the authors identify the critical points in SOFLA that emerge from the data.

SOCIAL PRESENCE AND THE SOFLA MODEL

Previous studies of SOFLA (Marshall 2017; Marshall and Kostka, 2020) looked at teaching presence and the role of the instructor throughout the steps of the approach. The focus for the data reported on from this research will be the extent to which the SOFLA design for instruction creates fertile spaces for social presence. Being socially present while in online or blended classroom contexts can pose a major challenge to both educators and their students. Yet, it is this social presence that most serves the need to engage meaningfully in accessing, developing, and mastering new course concepts and materials.

As understood in the CoI framework (Garrison et al., 2000), social presence is the ability to project one's personal identity in the online community so that she or he is perceived as a 'real 'person and/or as progressing through the phases (1) acquiring a social identity, (2) having purposeful communication, and (3) building relationships. To measure the level of social presence a content analysis was implemented (Kreijns, Van Acker, Vermeulen, and Van Buuren, 2014) and three elements of social presence that describe behaviour of the stakeholders were identified: group cohesion (collaboration and creating a sense of community), open communication (meaningful and purposeful communication) and affective expression (responding to others to form relationships).

With respect to social presence in online settings, technology can undoubtedly foster and enhance social presence, including all three components mentioned above. As Bodemer and Dehler (2011) state, social presence occurs in computer - supported collaborative learning (CLCL) when group members are involved in social interaction.

RESEARCH DESIGN

The focus of this paper is to identify critical points in SOFLA from the experiences and perceptions of students undertaking two TESOL courses at Long Island University in the United States and two teachers from the United States and The Czech Republic. The study will look specifically at interview data through the lens of the CoI (Garrison et al., 2000). Educational experiences and learning outcomes can be enhanced or inhibited by each of the three presences (Garrison et al., 2000). Although they are interdependent, the focus for the data reported here will be the extent to which the SOFLA design for instruction creates fertile spaces for social presence. Social presence exists throughout SOFLA, but the two studies discussed in this paper focus on two of the SOFLA steps where social presence plays a key role in making students feel comfortable and motivated in an online setting: SOFLA Step 1 - Pre-work and Step 4 - Breakouts.

Table 1: Categories, Definitions and Indicators for Social Presence in the CoI Framework.

Categories	***Definition***	***Indicators (examples)***
Emotional Expression	The ability and confidence of participants to express their feelings.	Emotional expression emoticons, autobiographical narratives
Open Communication	Participants displaying reciprocal and respectful exchanges.	Acknowledging others, risk-free expression, being encouraging
Group Cohesion	A sense of group commitment, focused collaborative communication in which participation and empathy is built.	Encouraging collaboration, helping, and supporting

(Source: Adapted from Garrison et al. 2000)

COMMUNITY OF INQUIRY FRAMEWORK AND THIS STUDY

Garrison et al. (2000) Community of Inquiry Framework describes social presence in the context of text-based interactions. This study looks at the experiences and perceptions of students in both a text-based asynchronous and a synchronous online learning environment. The Pre-work step used the Perusall platform https://perusall.com/ for social annotation and communicating via text chats and the Breakouts step used online synchronous video conferencing communications in breakout rooms. Perusall is a platform that provides students with the opportunity to participate in a shared reading experience through annotations similar to Facebook. This study identified social presence themes in the Pre-work and Breakouts steps. Themes in the social presence category of Open Communication were identified in the Pre-work step and of Group Cohesion in the Breakouts step. There was no evidence of the Emotional Expression category obtained in this study as there was no analysis of students 'text-based messages for that purpose, nor was there any evidence of emotional expression noted in the semi-structured interviews.

The Pre-Work Step

The interviewed students were required to undertake pre-class activities in the asynchronous learning environment engaging in the Playposit and Perusall platforms. Playposit https://go.playposit.com/ is an interactive video platform that can be used in asynchronous learning environments. The teacher can develop personalized content including quiz questions

allowing students to progress when they are ready to do so. In the student study, Playposit involved students watching a teacher-created instructional video that included interactive quiz questions embedded within the video. Students also accessed their online textbook and an interactive chat function within the Perusall platform. Students, while reading the textbook, could also see other students ’comments to the right of the texts in the chat. This aligned with the specific sections of the textbook chapter, so students could interact with that particular section of the textbook.

The two interviewed teachers implemented LMS systems Canvas and Google Classroom into their classes. Their students used chats and forums on these platforms. In addition, one of the teachers used EdPuzzle, an app where students watch videos and answer embedded questions. Edpuzzle (https://edpuzzle.com/) is a web-based app for modifying educational videos for students, like Playposit mentioned earlier. Teachers can curate existing videos by downloading them from YouTube, National Geographic, or Khan Academy or they can create their own videos. Then teachers can embed questions into the videos. When teachers assign videos to their classes, the EdPuzzle app collects information on how well the students perform and allows teachers to see and reply to student responses.

The Breakouts Step

This is step four of the synchronous online flipped classes where students work in small groups. Students are required to work in their group breakout rooms and undertake particular group activities. As the interviewed teachers confirmed, all the breakout activities are designed in order to deepen students` knowledge from the pre-work and the whole group activities. It is a time for students not only to work together to complete a task but also for them to get to know each other better and to engage in meaningful interaction. In short, it is a time to provide a space for social presence. In designing breakouts students should be given sufficient time in order to foster social presence (Patel, 2021).

METHODS

Semi-structured interviews were conducted with eleven students undertaking studies in TESOL courses at Long Island University in the United States in 2020. In order to obtain teachers` perspectives on SOFLA, one of the authors used semi-structured interviews to speak with two teachers from different cultural backgrounds who have been implementing the SOFLA model into their classes. The first instructor, is from Northeastern University in the United States, has been implementing SOFLA in ESL classes since September 2020 and had been integrating the flipped learning model into her classes for 5 years prior. Given this background, it can be assumed that this instructor is a veteran flipped educator. The second instructor, from the West Bohemia University in the Czech Republic, has been integrating SOFLA into her online classes only recently, since January 2021, and was implementing the flipped learning approach for the first time. Interviewing both a novice and an experienced flipped learning instructor provided two different teacher perspectives on SOFLA.

RESULTS

Guided by two of the social presence categories outlined in Garrison et al. (2000) Community of Inquiry Framework, namely Open Communication and Group Cohesion, themes were identified from the semi-structured interviews. These have been presented in Table 2. Themes will be discussed in terms of the Pre-work step first followed by the Breakouts step.

Table 2: Community of Inquiry: Social Presence Themes.

Themes	Categories *S=student interviews, T=teacher interviews		
	Open Communication (Pre-work)	Group Cohesion (Breakouts)	Other
Prepares for in-class participation	T		S
Helping with understanding	S, T	S, T	
Helpful seeing others ideas/comments	S, T	T	
Teacher's presence helps encourage social presence	S, T	T	
Time constraints	S, T		
Breakouts expressing enjoyment/satisfaction		S, T	
Seeking help from their peers	S, T	S, T	

(Source:own)

STEP 1: PRE-WORK – COI OPEN COMMUNICATION

Prepares for in-class participation

In this part of the SOFLA lesson students described the importance they placed on completing the pre-work in preparation for the in-class group work. It is evident from some of the students 'comments that they were motivated to perform in the pre-work so they could contribute to their group in the breakout rooms.

S7*" I want to be able to contribute to my group rather than just sit there and not have anything to say I think that's important to be like an active group member an active team member so that's one of the biggest things that like I think about when I'm getting my work done."*

S8 "The feeling of not being included in the actual class, it's it's a big motivation … because you don't want to be left out."

Student S9 reflects back on her performance and suggests next time she will be better prepared.

"*I know that I personally can do a lot better and I am working on getting every task done before class. That way I'm better prepared for my breakout rooms and my discussions with my classmates."*

These comments show a commitment from the students towards what Garrison et al. (2000) categorise as social presence - group cohesion, a commitment to their group.

Both teachers found this part of SOFLA the key element of the model. Both of the teachers confirmed that in the asynchronous part students need to know that the teacher is there for them

if they need any help. One teacher said that in her class she uses Google Classroom chats for clearing up any doubts or questions from the pre-work. Students can also add any comments or thoughts about the pre-work. This possibility makes the students feel that they are not on their own and if they have any questions the teacher or their peers are there to help. Teaching presence is important in the pre-work stage to prepare students for the synchronous class and support the cultivation of students 'social presence, as this teacher states:

Teacher 1 "*For the social presence it is important that they are learning from me, I show my face, I make my own slides, they see me and I can make it really specific to the course. They feel that they are learning from me - they hear my voice, they see my face, it is my material."*

The findings from the student and teacher interviews show that pre-work is a crucial part of the SOFLA model and helps students feel more confident and ready for the group activity during the online classes. As the students stated, when they prepare in advance, they can contribute more to class discussions and play an active role in a group activity. Social presence is encouraged by teachers who choose tools for the pre-work that enable them to communicate with their students continuously and support their students` learning in the asynchronous part of the lesson. It is also important to note that in order to support learning and social presence in the pre-work part, teachers should choose carefully the material they give to their students. The material should not only be tailored to each class`s needs but also the students need to have the impression from the material that their teacher is with them. They need to see the teacher's face, hear the teacher`s voice and have the possibility to reach out to the teacher in case they have any questions or doubts.

Helping with understanding

The interviewed students described how they used the chat function in Perusall to help with their understanding. One student pointed out the value to students being able to highlight text and make comments about it to others. Another described the value of being able to agree with someone else's annotation and then being able to share additional thoughts. Another student S2 explained strategies that she used to help with her understanding, reaching out to other students and the teacher in a number of ways.

S2 "If I don't understand something, I'll ask a question in the textbook and I will sometimes ask it to the professor and sometimes ask it to the student. Or if I don't understand a comment that has been made by you know, a classmate or my professor I'll put a question mark and ask them."

From the perspective of the interviewed teachers, students have robust options for open communication because they can openly chat in Canvas or Google Classroom about the pre-work. However, one of the teachers admitted that her students did not use the chat very often. They preferred to email her or to seek help from other peers. The same teacher said that her students seek help from each other using a Facebook page.

Teacher 2 *"I know that my students have set up a Facebook group where they discuss the pre-work material. In that way they feel that they can ask questions about the material and find out how the other students understand the material or not.*

In contrast, most students in the student study used Perusall as this was built into the course as one of the pre-work requirements.

As stated, open communication is one of the aspects of social presence that needs to be fulfilled to deliver effective online learning. The findings of these research studies demonstrated that it is vital to provide students with effective tools during the pre-work that allow them to communicate with their peers and also with their teachers. In that way students feel supported

in the asynchronous part of the lesson. What is more, they learn how to ask for help not only from their teachers but also from their peers. Again, these tools enhance communication and thus students can feel a part of a class, almost as if the learning took place in a physical classroom. The findings of these studies also raise questions about the learning design of the pre-work asynchronous environment. Teachers may need to consider whether to allow students to openly communicate outside the learning environment as was the case in the teacher study or require the chat platform whatever that may be to be used to encourage social presence.

Helpful seeing others ideas/comments

Students described how helpful it was reading other students' comments in Perusall. The shared reading experience allowed students to read other students 'annotations and gain insights into other students 'ideas and thinking. Comments by students in the interviews show the open communication component of social presence whereby students acknowledged the work of others.

S1 "I think it's helpful that there's like discussions from other people, and so you can see what other people are kind of thinking as you're reading it."

S6 "So you kind of get to see the peoples others ideas and in the textbook and what they're thinking then you get different ideas from that. I think that that one is pretty cool."

In the teacher interviews, both teachers stated that their students have the opportunity to chat, either on the LMS platforms or Facebook, and this was important for them to feel they are working on the same material.

Teacher 1: *"The pre-work helps them to be part of the community, some students might be shy - it is important to have students share everything all the time. They learn from each other, they feel that they are working on the same document, and share each other's perspectives."*

To summarize, what students and teachers need to emphasize during the asynchronous part of the lesson is encouraging class spirit. Although students work independently on their own during the pre-work part of the lesson, they need to feel that they are part of a class. What can assist to create a sense of a belonging to a class, even in the asynchronous part of the lesson, is the fact that they know they can all work on the same material, and that they have tools that allow them to communicate with each other, so they know what their peers` opinions of the pre-work material are. The possibility of communicating with peers helps students not only learn from each other but also foster a class or community spirit. In addition, even if lean communication media are used (e.g., a text-based asynchronous discussion board) it is still possible to achieve a high degree of social presence through these media (Kreijns et al., 2014).

Teacher's presence helps encourage social presence: Pre-work

The pre-class chat and video platforms also provided an avenue for the teacher to communicate with students and encourage social presence.

Kreijns et al. (2014) note that teacher presence can influence social presence "…teacher factors, such as the pedagogical techniques they use and how they cultivate social presence amongst the group members, play a role…"(pp. 6-7). The comment by S2 below shows the teacher in the Perusall chat cultivated social presence.

S2 If we're writing in the chat and we get something wrong, she'll [the teacher] have somebody explain it or go over it, or write the correct answer in the chat.

The PlayPosit video lesson creates the impression that the teacher is present. Similarly, the Perusall reading exercises include the annotating/chat activity where the teacher is there to guide students and to support their understanding.

For S6 and S7, PlayPosit provides an insight and understanding about the Perusall exercise including what the reading will be covering and helping students 'understanding.

S6 "If you do the PlayPosit it gives you an insight into what the reading is going to be about."

S7 "So the videos help to understand what it is that we're reading in the chapters."

For S8 the video provides a feeling of validation from the teacher that you are doing the right thing.

S8 "A good feeling of validation that you know what you just heard or what you read in the chapter right? And you need that. That feeling of validation that you're doing it right."

The interviewed teachers also mentioned that a teacher's presence is very important for fostering social presence. One teacher explained that the app she uses for the videos called EdPuzzle enables her to react to students' replies to the questions and to write feedback, comments or additional information. This makes her students feel that they are not just working with a computer that evaluates their responses. The second teacher highlighted the importance of staying in close contact with her students and replying to their emails as soon as she can in order for them to feel the teacher is here for them.

Teacher 1 *"I try to always show that I am always there behind them. I make announcement videos with pictures, I email them, I post announcements, checking my email more and respond as soon as I can so they know I am behind the computer."*

During the pre-work stage it is important for students to feel that their teacher is still there for them. Both the students and the teachers agreed that for strengthening open communication the pre-work stage is not only about the new material for self-study but about searching for ways to foster communication between students and their teacher. As the interviewed teachers and students stated, the tools that are implemented in the pre-work stage should enable students to see teachers` comments and ideas. These comments help students learn and better understand the material they should cover on their own at home. Teachers need to pay close attention to the frequency of communication with their students in the pre-work stage and ensure that it is sufficient.

Time constraints

Time was a factor that limited some students 'exposure to social interactions in the chat facility. S1 would have liked to revisit what others had posted while S4 found it difficult to get through all of the postings.

S1 "So I keep meaning to go back through Perusall after and like to revisit what people have said, but I haven't had the chance to yet."

S4 "I can't keep up with the postings. I do look at some of the comments from the other students, but I don't. I can't keep up with all of them cause I just looked and there were 200 unread comments that I missed."

In this asynchronous environment the shared reading feature, although valued by students, required students to manage their time well. In addition, reading, answering pre-class questions from the online textbook and interacting with others in the chat facility, students also needed to engage with PlayPosit. The teacher made it very clear there was a considerable amount of work

required to be undertaken by students in the pre-work stage. This environment led to a rich learning experience for students.

In contrast, the interviewed teachers reported that their pre-work activities were not as demanding on the students 'time. Both teachers kept the assignments short to allow students time to prepare well for the classes and to go over the parts they did not understand.

Teacher 1: "*I do try to make the pre-work relevant. I space it out, keep it short."*

As identified in these studies there are a number of approaches teachers can take to facilitate social presence in the pre-work stage. In the student study, teacher presence by way of regular email reminders and presence in the synchronous class made it clear to students what was expected, what the workload entailed. There was an expectation that students complete all of the activities before coming to class, including engaging with Perusall, the shared reading platform. This was not a requirement of the other asynchronous environments, although encouraged. When designing the pre-work asynchronous part of the class teachers need to be mindful of the amount of material students are required to cover. Dedicating some time for students to watch instructional videos, answer quiz questions, read and engage in chat forums. The teacher needs to consider what the right balance is for assessments and activities. Also for consideration is the extent to which the teacher intervenes in the pre-work stage to encourage participation and facilitate social presence.

Critical Point Step 4: Breakouts – CoI Group Cohesion

Expressing enjoyment/satisfaction

The breakouts provided students with the opportunity to come together with their peers to work on specific group activities. Comments by S2 and S5 are examples of what students thought about the breakouts, showing how it cultivated social presence.

S2 I feel like it's great, you know I enjoy it. I really enjoy the break out activities. That's one of my favourite parts of the night. Just because you know, there are familiar faces we all feel comfortable with each other, so I enjoy it a lot.

S5 You get to know different people and also work with different people and everybody is super friendly which is really nice.

Although most students described their experiences in the breakouts as positive, this was not the case for all students. S1 for example expressed some dissatisfaction with her group, indicating that not all students communicated to her liking in the breakout activity.

S1 "Sometimes I feel like other people don't want to talk or just don't talk and so then I talk a lot."

Leaving students in the breakouts on their own does not necessarily lead to student satisfaction and a cohesive group. The teacher exhibiting teaching presence may be required to step in and try to help facilitate social presence at times and attempt to encourage a sense of group commitment.

The teachers agreed that the breakout parts of the SOFLA are very vital spaces for social presence. It is the part of the class where students can talk to each other freely not only about the assignments but about personal matters. One of the teachers said that her students enjoy group work because they feel that they can get to know each other better and can reinforce that they are part of the same classroom. Both teachers added that the students are having fun in their groups and enjoying completing the assignment together.

Teacher 2: *"When I enter the breakouts to check on my students' work, I can hear that they are having fun working on the assignment. What I have also noticed is that when I compare the SOFLA students with the students I teach according to the traditional model, I see that the conversation of the SOFLA students is more spontaneous and that might be due to the fact that the students feel more prepared for the group work from the pre-work part."*

The Breakouts are a key component of any synchronous online lessons. This is no less true of SOFLA. Students not only can deepen their knowledge of the new material by working together in small groups, but they can also socialize with their peers, creating new relationships and strengthening bonds. This is the part of the class students enjoy the most because even though they are focused on a structured task, they are having fun in the process, and they feel that they are part of a community. Akcaoglu and Lee (2016) found that students feel higher social presence and group cohesion when working in small groups, claiming that social presence relates to how other people feel about each other and how the members of groups work together. Their findings also indicate that smaller group discussions stimulate more positive feelings of social presence.

Seeking help from their peers

In the student interviews, students commented on how they looked forward to the breakouts and how they sought help from their peers.

S10 "I really like how with that theory like students get to learn from each other because they work in groups."

S5 When we were in our group, we had the Perusall chapter open and we found a section where it talked about it and it was a chart. So that was helpful. Yeah, I guess from the other students.

This student described the breakout room and collaborative activity of sharing solutions to a specific problem and how this helped clarify the concept.

S6 I definitely like the whiteboard aspect of it. I got to read a few things that I actually didn't think about so they did a good job filling me in.

The teachers said that they noticed that students help each other in the breakouts while working together to complete an assignment. One of the teachers said that she also decides before creating the groups how to divide the students, so the groups work well. The teacher explained that sometimes she divides them according to language proficiency and sometimes she lets the same configuration of students work on a project for a longer period of time (i.e. over several breakout sessions) so they can get to know each other better and feel more comfortable helping each other.

The breakouts serve not only to provide an opportunity for students to talk to their peers but also to lay the foundation for students to learn directly from each other. Especially when some students are shy or introverted and do not feel comfortable talking or asking for clarification in front of the whole class, a breakout room becomes a place where such students can ask for clarification, explanation or just an opinion from their peers. Again, tools such as Perusall or Whiteboard make it easier for students to work efficiently in the breakouts. The tools selected by the instructor can influence the extent of the social aspect in online learning and can stimulate students to generate robust interactions (cf. Gao et al., 2010; Laffey et al., 2006). Yen and Tu (2011) note that technology tools facilitate interaction among students, which leads to establishing and maintaining relationships. Teachers can also influence the dynamics of each group by selecting students for each group before each lesson, grouping their

students according to their level of English so that they can seek help from each other when necessary.

Helping with understanding

Comments from the student interviews show how the breakouts are valued as a way to help with their understanding. Although the teacher remains the ultimate authority, within the structure of SOFLA, the students serve in this role as well when interacting with peers. They expressed their appreciation for being able to meet with their peers for help and support. One of the students, for example, described how she could both seek support from a peer and also provide support in return.

S4 "Just being able to talk about what I was confused with and then have another peer help me with that, and then vice versa. That way we talk about it and it makes it a little bit more understandable."

A similar point was made by another student, who said you may not want to ask the teacher something or bring it up with the whole class. The breakouts appear to be a safe space to help with students 'understanding.

S2 "So if you don't understand something, perhaps you don't want to, you know bring it up in front of the entire class or to the professor so you can bring it up in that group and you know work it out with one another and just, you know, just by speaking to one another you might be able to understand something better."

The following comments show students appreciate being with other peers, knowing that when they enter the breakout room, they will be able to rely on their peers for support to help with their understanding.

S9 "Until I get into the room, like into our virtual room, that's when it starts to click when I'm having other input from classmates and my professor, and that's when the activities make sense to me."

S4 "It's a lot easier for me to understand by having more people talk to me … instead of just reading it in a textbook."

S1 "I think like going over and discussing the activities that actually practice activities and being able to see and discuss with other people, like if there's like different answers like why are they different?"

S2 explains that all members of the group can work together to support their understanding.*" So if we don't understand something we'll tell each other and then we'll work with one another so we all have the same opportunities to speak or go over something."*

The teachers pointed out that the breakout activity provides an opportunity for students to clarify some parts of the pre-work they might not have understood. They also said that the breakouts are the part of the lesson where students enhance not only the understanding of the new subject matter but also, they deepen their understanding of course concepts more broadly and enhance their critical thinking skills.

Teacher 1: *"Critical thinking talking - talking through a reading they reach deeper understanding.*"

The link between higher-order thinking skills and smaller groups is confirmed by Hamann et al. (2012), who suggest that smaller groups mean more space and more opportunities to engage in discussions.

As described above, the breakouts are also a part of the lesson where students deepen their understanding of the new subject matter. As confirmed by one of the teachers, students in the breakouts talk over the new subject matter and they enhance their critical thinking skills. Also, some students feel more comfortable working in small groups where they do not feel the pressure of the whole class and they feel more at ease.

Teacher's presence helps encourage social presence: Breakouts

It is evident from comments made by students that the teacher's presence helped encourage social presence and cognitive presence in the breakout rooms. The first comment by S2 shows the teacher checking in to ensure group members understand, and the second comment shows the teacher going further to encourage cognitive presence.

S2 "I think she is a big you know supporter. She hopped in and out of our groups to make sure that you understand what you're expected to do and what you should be doing."

S2 "She'll come in and she'll actually work with us and break it down for us and she'll motivate us to work with one another and basically provide each other with feedback in order to get the work done."

The interviewed teachers stated that they try to check on their students in the breakouts at the very beginning of the activity to make sure they understand what to do. One teacher added that a major limitation of the breakout for her is that she can only be with one group at any one time:

Teacher 1: *"One challenge is that I can be only in one room at the same time whereas in the classroom I can hear everything and just see who is working and who is not working."*

One of the teachers also noted that the SOFLA teaching experience assisted her to dramatically improve her skills in giving instructions. She pointed out that clear instructions are important for the students to feel the presence and support of the teacher when working in groups. The other teacher agreed that the instructions have to be crystal clear in order for the students to complete the activity well. Giving well-structured and clear instructions can enhance social presence within online learning. According to Kreijns et al. (2014), when students know what to do and the roles in a group are distributed, there is a space for open communication.

Teaching presence in the breakout activity is important to facilitate both social presence and cognitive presence. This includes providing students with clear instructions before students enter the breakout rooms and when in the breakout rooms supporting students to both collaborate and work through the assigned task. Also, the presence of a teacher and the interaction with him/her enables social presence in all aspects of online learning (Akcaoglu and Lee, 2016).

DISCUSSION AND CONCLUSION

The SOFLA model is a structured model for online learning which is based on the flipped learning approach. The two studies reported here looked at the SOFLA model through the lens of social presence as defined in the CoI framework and the extent to which the SOFLA design for instruction creates fertile spaces online for social presence to develop. The SOFLA model supports social presence most prominently during Step 1 Pre-work and Step 4 Breakouts. The findings of this research have shown that SOFLA, in these two key steps, students to help one another and seek support from both their peers and teacher when needed.

The SOFLA model used in the online classrooms examined here provided tools for students to communicate openly with their teacher and peers, namely, the video and chat platforms in the pre-class asynchronous component and the breakout rooms in the synchronous component. Teacher presence has also been an important ingredient in fostering social presence in the pre-work, in both the video lesson, the chat platform and in the breakout rooms where the teacher encourages collaboration and supports understanding.

This research has identified some design considerations that may influence the extent to which social presence is created. In the pre-work stage teachers should carefully choose the material they give to their students to cultivate social presence, including the amount of material students are required to engage with (getting the balance right) and the quality of that material. Do the materials provide students with the impression that the teacher is present, for example, in the design of the videos? Does the teacher provide sufficient support in the chat facilities to support social presence? Are students required to engage in the course chat facilities or will the teacher allow students the flexibility to communicate within and outside these facilities to cultivate social presence? In the breakouts, to what extent does the teacher organize the groups? How often and to what extent does the teacher need to step into the breakouts to foster social presence?

Future research could include a study of different courses using SOFLA, focusing on the design of the pre-work and breakouts and the impact of these in cultivating social presence. Other research could include an international comparative student study focusing on SOFLA and social presence to examine cultural differences in implementing SOFLA.

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EXPERIENCES WITH MANDATORY (SCHOOL) SUBJECT PROFESSIONAL COMMUNICATION AND NONVIOLENT SELF-PROTECTION AT THE MEDICAL COLLEGE IN PRAGUE

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Abstract

Paramedics are frequently exposed to the consequences of aggression and are among the most endangered professionals. The Czech Republic in not an exception. This is a descriptive study aiming to compare an intervention group of paramedics participating in a training session to a control group not participating in a similar training session. Medical College in Prague has prepared a five-semester mandatory course for paramedic students. The focus is on training in communication, simulation scenarios with actors and real patients, and training for prevention of violence in their professional practice after graduation. The goal was to compare this group with those who did not attend this course. We did 20 semi-structured in-depth interviews with paramedics two years after their graduation. This group was compared with a matched control group (age, department, level of education and practice experience) who did not attend the communication course. During the qualitative analysis, the data was repeatedly coded, moving from concrete passages to more abstract levels of coding, from codes to categories and finally to three overarching themes. In this study is tested whether the control group would show improved perception and management of violent patients when compared to an intervention group. The educated group more often thinks about causes of violence from patients than the group without mandatory education. The intervention group tried to prevent every conflict and take care of violent patients despite their threats or verbal abuse.

Keywords

Communication. Paramedic. Prevention. Violence. Students. Subject.

INTRODUCTION

The Centers for Disease Control and Prevention and National Institute for Occupational Safety and Health (NIOSH) define workplace violence (WPV) as "violent acts, including physical assaults and threats of assaults, directed toward persons at work or on duty" (National Institute for Occupational Health and Safety, 2018). The often unrecognized psychosocial component of violence is further refined in the World Health Organization's definition of WPV as "incidents where staff are abused, threatened or assaulted in circumstances related to their work, including commuting to and from work, involving an explicit or implicit challenge to their safety, well-being or health" (WHO, 2016). Health-related industries, particularly those involving patient care, experience the highest rates of WPV compared to all other industries—with patients described as the most significant contributor to provider injuries resultant from violence. Serving as a crucial public health safety net, EMS is in a constant state of response to the persistent and emerging health needs of the community (Studenke et al., 2007). As a result, EMS

responders are expected to provide patient care in unpredictable and ever-changing environments, and while some occupational hazards are "clear and imposing," others, like violence, can be "insidious and silent" (Miller, 2001). The year 1978 marks the beginning of a decades-long conversation by the EMS industry about violence experienced in the workplace when the phenomenon "aggression begets aggression" was first noted (Lewis, 1978). Similar sentiments continue to be voiced by emergency medical providers four decades later. By contrast, the first academic study was published in 1993 (Tintinalli, McCoy, 1993). Research on violence against EMS responders categorized violence as verbal abuse, physical abuse, property damage or theft, sexual harassment, sexual assault, and intimidation. Acts of violence against EMS responders have been reported as "struck by patient", "punched in the face by a drunkard", "tackled by a large man", and "assaulted by a combative patient" (Taylor et al., 2016). Formal recognition of this issue is increasing; however, compared to other healthcare settings, violence in the prehospital setting is inadequately described and requires further consideration (Bigham et al., 2014). It seems the violence toward prehospital emergency professionals is an often-neglected topic. There is no complete understanding of the incidence of violence in the Czech Republic, nor are there recommendations for specific professional communities regarding the problem of violence and how to resolve it in prehospital emergency care (Pekara, 2017). On the other hand, we were witness to inappropriate communication from paramedics who seemed to devalue patients and their relatives (Knor, et al., 2020).

The Medical College, Duškova 7, Prague 5, provides bachelor university education in the following non-physician fields of healthcare studies: General Nursing, Midwifery, Radiology Assistant and Paramedic Practice. As such, it is responding to the changes in education requirements for healthcare workers in non-physician professions as determined by the Czech Republic's Ministry of Health Act no. 96/2004 Coll. Our education is in line with EU directives and, in accordance with the resolution of the European Commission's Internal Market Directorate General, graduates will have their qualifications automatically recognised in EU countries. A large number of renowned specialists take part in teaching, including medical doctors and nurses with university degrees. Our college has its own publishing practice, and the teachers who work here are also active in publishing textbooks and research papers. There are a number of distinguished academics among the staff and in the College's Academic Board. The bachelor program Paramedic Practice is the only bachelor program in the Czech Republic with two mandatory courses (five-semesters each) for paramedic students: Professional Communication and Prevention of Violence, Self-protection. The focus is on training communication, simulation scenarios with actors and real patients, training for prevention of violence and the background techniques of nonviolent self-protection in their professional practice after graduation.

This study is important for incoming paramedics and other workers in health care, educational institutes, and health care settings. The results could contribute to better practices and the mandatory subjects will become part of education for all students who are preparing for practice placements.

Goals of the study are:

- to compare an intervention group of paramedics/nurses participating in a training session compared to a control group not participating in a similar training session;
- to verify where there is the greatest benefit of mandatory education in self-protection and prevention of violence.

METHODS

Between February and June 2021, we conducted 20 qualitative, open-ended, semi-structured interviews with paramedics two years after their graduation and achieving bachelor's degrees. 10 interviews were managed with paramedics of graduation from Medical College in Prague – they undertook two mandatory subjects (five semesters): Professional Communication and Prevention of Violence, and the Background of Self-protection. We wanted to compare an intervention group of paramedics who undertook a specialised training session with a control group which did not participate in a similar training session. Therefore, we conducted another 10 interviews with paramedics who had the same educational level, age, and work experience. Crucially, they had not participated in the two mandatory courses.

The inclusion criteria for the first group with mandatory courses was two years of experience in practice (emergency medical services, emergency or intensive care unit - paramedics in the Czech Republic are prepared after the graduation for emergency services and for emergency/ICU or anaesthesiology in a hospital). The process of sample selection was accidental - we reached out to our alumni through our alumni club and we decided to select 5 men and 5 women. The inclusion criteria for the second tested group was the same process as first - we needed to find (absolutely) the same sample but without mandatory courses during their bachelor education. In the case of the second group, we reached out to alumni from another four universities in the Czech Republic (Bohemian Region, South Bohemian Region, North Region and West Region of the Czech Republic). As before, we selected 5 men and 5 women. The semi-structured interviews focused on thematic aspects, such as personal experience with the violence in their professional careers, experiences with violence resolution and with de-escalation methods. Both tested groups answered ten questions. The average length of an interview was 41 min (range: 21–64 min). All interviews were audio-taped, anonymized, and transcribed verbatim. All transcripts were read and reread to ensure familiarity with the data. The analysis was conducted by two members of the research team, who were not involved in the education of the students. The coders followed the principles of qualitative content analysis, a method that provides useful access to large amounts of data by preserving the advantages of quantitative content analysis and complementing them with qualitative interpretative steps of analysis. During the analysis, using AtlasTi 6.2 software, the data was repeatedly coded, moving from concrete passages to more abstract levels of coding, from codes to categories and finally to three overarching themes. This process was both inductively deriving themes from the data and searching for repeating concepts (Mayring, 2000), as well as deductively analysing the data on the grounds of previously conducted literature research and the current research question. These steps were repeated as coding guidelines for each interviewee group were gradually developed. All findings were critically tested and discussed among researchers who had different disciplinary backgrounds (sociology, psychiatry, psychology, nursing and medical ethics). Any disagreements were resolved by discussion.

Table 1 demonstrates the participants varied in their sex, age and professional background.

Table 1: Clinical and socio-demographic characteristics.

Table 1 Clinical and socio-demographic characteristics	paramedics	ICU nurses	anesthesiologist nurses	emergency nurses
Gender				
men	4	2	0	2
women	4	2	2	2
Age (range)	23-38	23-38	23-38	23-38
Years of professional experience (range)	2	2	2	2
Educational level (BSc.)	100%	100%	100%	100%

(Source: Own)

RESULTS

We identified three overarching themes in which changes are seen as necessary for the implementation of comparing an intervention group of paramedics participating in a training session compared to a control group not participating in a similar training session: conceptual, prevention and perception factors. The participants from the group with mandatory subjects are assigned R1-R10, the participants without mandatory subjects are assigned A-J. The summary and main results are adduced in Tables 2, 3 and 4.

Conceptual factors

Three concepts which are implemented in this problem are the definition of violence, causes, and consequences of violence. The definition of violence may be perceived as variable. Causes of violence are often connected with "event shock" and "delayed response time". The consequences comprise of "exposure to physical violence", "verbal abuse" and situations that put EMS staff and organisations at risk of significant harm.

Definition of violence

It is difficult to provide an accurate definition of violence and aggression for the following reasons: The perception of what constitutes violent behaviour varies between cultures and social backgrounds. There are a wide range of behaviours that can be described by the term 'violence'; often the boundaries between acceptable and unacceptable behaviour can be vague.

The conflict created is often not only on patient's side but also on the side of the staff. The violence is mostly a defensive reaction caused by pain, stress, frustration, or bad communication. These reactions show us what we can improve and what we can do for patients (ICU Nurse, R3).

Violence is a behaviour – only a bad behaviour. Violence is an inappropriate behaviour, an abnormal reaction which encompasses aggressive transactions and an unwillingness by patients to cooperate. Violence is when patients cannot behave normally after I speak. (Nurse, B).

Causes of violence

Event shock refers to the prevalence of severe, unexpected events such as illness or trauma that may cause anxiety and agitation, resulting in unpredictable and uncontrollable behaviour. Delayed response time can be due to a delay in requesting help, an imagined delay, unrealistic expectations, or actual delays in the arrival of EMS. Further delays can be due to staff negligence or a lack of resources, including the availability of an ambulance.

Causes? Fatigue from hard night shifts on staff the side unambiguously. Patients are mostly in stress because of a lack of information. During a bad shift, I cannot give enough time to patients and meet their needs. Most conflict is caused by stupidity and from frustration, stress, or pain. I can imagine the helplessness on patients' side (ICU Nurse R4).

The main causes of violence are alcohol, drugs, poor communication with drunk people and their uncontrolled emotions. It's just that when someone is confused, you cannot talk with him. Of course, mental health illnesses are a strong trigger factor (ICU Nurse D).

Consequences of violence

There are serious physical injuries included (eye and face injuries, bites, kicks, dislocations and fractures, bruises, and scratches) and psychological consequences such as stress, irritability and headache, anxiety, depersonalisation, depression, sleep disorders, fear of safety, and disturbing memories. Psychological injuries cause social consequences, including impact on social interactions, leading to isolation or personality changes in the workplace.

Violence is feedback to someone's behaviour. Conflicts and violence are generally good for clearing the air, the relieving tension and getting the situation back on track (Paramedic R1)

Conflict and violence are good for cleaning the air. Violence is good for learning something. But I have already experienced a lot of bastards, for which it is not enough to repeat myself over and over again (Paramedic 1).

Table 2: Conceptual factors.

Conceptual factors	Group 1	Group 2
Definition of violence	Conflict is often created by staff, not just patients.	Violence is a behaviour – only the bad behaviour.
	Violence is mostly a defensive reaction to pain, stress, frustration, bad communication.	Violence is only on the patient's side.
Causes of violence	Staff fatigue from hard night shifts; frustration, stress or pain from patients.	Alcohol, drugs, poor communication with drunk or person suffering from a mental illness, people with uncontrolled emotions.
Consequences of violence	Violence is generally good for clearing the air, relieving tension, and getting the situation by on track.	Conflict is good and something can be learned from it

(Source: Own)

Preventive factors

EMS staff have plenty of room to prevent violence. They may focus on providing optimal services by ignoring violence against them, exhibiting self-control, and managing violence through various strategies including explaining, convincing, relaxing, using confidence and self-defence techniques such as leaving the scene or keeping distance. They may also build trust, accept client demands, take refuge when needed or seek cooperation with the perpetrator. Another strategy involves cooperation with the police, who play an important role at the scene to prevent violence or reducing injury. Preventive factors include prevention of violence and resolution of violence.

Prevention of violence with patients or colleagues

Interventions to prevent violence against health workers in non-emergency settings focuses on strategies to better manage violent patients and high-risk visitors. Interventions for emergency settings focuses on ensuring the physical security of health-care facilities.

The resources could be in training, mainly in communication. That is why it is so important to conduct safety assessments, because that is where we are going to discover unique findings — things we have not though about. It is important to educate employees based on the results of that self-assessment. We should use preventive measures, early warning scores and train the staff in preventive strategies – it is better and easier to prevent violence than deescalate it.

Keep calm, keep a calm tone/intonation of voice, do not provoke someone, and try more sophisticated conflict resolution techniques. Among the communication techniques I remember: listening, asking open questions, and do not raise your voice. It's a good help to keep a safe distance (Paramedic R2).

If the patient is aggressive, I do not raise my voice to him, and do not use phrases such as: Calm down! On the contrary, I use these types of phrase: You are noisy or you are disturbing other patients, or you have crossed the safe distance. If the patient is already noisy, swears and aggression can be seen, then I try not to give him any orders, because then the patient gets even angrier. For Preventing unrest between colleagues, if he doesn't want to speak, I leave him be and I try to support him (Paramedic R3).

For a colleague, I solve unrest by removing him from the place/scene of the event and try to prevent any transfer of violence from the colleague to patients. I keep distance and try to hear out the restless patients and then offer an opportunity to solve the problem (Paramedic R4).

If my colleague behaves violently towards a patient, we solve it by distancing ourselves from the patient and telling him to do the same, try to relax, and then we comment on it in the car after the case. Occasionally, I remind colleagues why we are on the scene for patients (Paramedic 3).

Of course, sometimes we have medical drivers here with whom you can't get along with. I prevent conflicts with a colleague by not provoking him and instead helping him in any way with work. I solve a violent patient primarily with the help of a good communication. I'm not even afraid to shout at the patient, as it usually works very well – They have to know who the master of the situation is. It's like with pets (Paramedic 4).

Resolution of violence with patients or colleagues

The first step to reducing violence against healthcare Workers is to affirm that it should never be allowed or ignored. Healthcare organisations must educate their staff and break down these notions that violence is expected or acceptable.

Education and training should reinforce the idea that these types of behaviours are unacceptable under any circumstances. Leaders must emphasise this message and provide adequate support for staff who encounter violent behaviours.

Organisations can also identify and track the impact that workplace violence has on individual units and the organisation by looking at employee days away from work, work restriction, or staff turnover in relation to workplace violence.

We try to keep a safe distance and to always have an escape route. If the patient is very restless, I call the Police. Among the techniques of physical restraint, the respondent did not mention anyone (ER nurse R8).

Sometimes we must cooperate with the police. I try to keep the intervention calm and not to hurt the patient unnecessarily. Even when intervening with a particularly violent patient, we always try to maintain their safety (ER nurse R9).

I don't think it makes sense to solve or explain something to a restless patient. It is pointless. If the patient does not calm down, I choose physical strength. We often call the police or solve the situation straightaway with them. They should go to some patients all the time. (ER Nurse 8).

In the case of extreme violence, I stop talking and show my figure and strength. Most will immediately tame the patient only when I stand up or shout. For safety I also have a telescopic baton (ER nurse 8).

Of course, if the patient exceeds the limit of decency, I react similarly - for example, when he grabs my sleeve, I do not like it and I defend myself practically… If he does not calm down verbally, we coerce and call a doctor to "medicate" him or we can do it ourselves - we already know quite well. We have been fought many times. (Anaesthesiology Nurse 3).

Table 3: Preventive factors.

Preventive factors	Group 1	Group 2
Prevention of violence with patients or colleagues	Listen, ask open questions and do not raise your voice. It helps to keep a safe distance	Good communication, remove the violent colleague from the scene I'm not even afraid to shout at the patient
Resolution of violence with patients or colleagues	To keep the intervention calm, and not to hurt the patient unnecessarily. Well-timed calling the police, keeping a safe distance and always having an escape route	Fighting with the patients. Demonstration of power, shouting at the patients

(Source: Own)

Perception factors

In addition to traditional methods of restraint, such as belts and locked doors, the health care staff also used indirect restraint by removing patients' mobility aids. Factors contributing to the use of these restraints include requests to ensure the patient's safety and social reasons, in the form of a lack of legislation on the use of more traditional restraints. The use of restraints causes feelings of guilt among staff, but on the other hand, it is a way of making patients feel more secure.

I perceive the coercion as a last option to calm the patients down. The patients who are dangerous to themselves and their surroundings and pull out catheters, etc., I perceive coercion as the right thing to protect the patient (Anaesthesiology nurse R2).

I consider the coercion a bad solution. It can be useful but should seldom be used, and if it can't be avoided, the patient should be monitored and cared for (Anaesthesiology nurse R1).

That is debatable. Sometimes there really is no other way. However, staff often use coercion when they are lazy or are poor communicators (Emergency nurse R2).

That person deserves nothing else. Sometimes it would take more than coercion; probably you understand what I mean. I don't have many conflicts. People are more afraid of me. And so it's good (Anaesthesiology nurse 2).

Sometimes coercion doesn't even retrain the patient and we have to use a bigger force and something pharmacology. I perceive a patient with belts to be dangerous to himself and his surroundings. Coercion is needed (Anaesthesiology nurse 1).

I perceive a violent patient as a patient who is dangerous to himself and his surroundings. I perceive coercions as a necessity in situations where good advice does not work and the patient behaves like a madman (Emergency nurse 2).

Table 4: Perception factors.

	Group 1	Group 2
Perception factors	Coercion as a last option. Compassion with patients.	Coercion is normal practice. No compassion with patients.

(Source: Own)

DISCUSSION AND CONCLUSION

The rate of occupational injuries among paramedics and other EMS professionals is eight times higher than the national average for all workers and twice as high as the rate for police officers. It seems that there is no occupational group with a higher injury or fatality rate than paramedics and EMS providers (Maguire et al., 2005). Internationally, no general study has been published that has investigated the exposure rate of undergraduate paramedic students to acts of workplace violence, whilst there have been two studies reporting midwifery student exposure to workplace violence (Boyle, McKenna, 2016). A Turkish study by Lash and colleagues (2006) investigated midwifery student exposure to various types of verbal abuse and their subsequent response, but due to the study type, a phenomenological study, no exposure rates were reported. Of the

midwifery students eligible to participate in the study 90% elected to do so. The studies have identified that nursing students are exposed to acts of workplace violence, including verbal abuse, bullying and physical abuse by people such as educators, other healthcare professionals, their patients, and the patient's relatives/friends (Clarke et al., 2012; Cooper and Curzio, 2012; Cooper et al., 2011; Hakojärvi et al., 2014; Hinchberger, 2009; Magnavita and Heponiemi, 2011). There have been three studies that have investigated midwifery students' exposure to acts of workplace violence (Gillen et al., 2009). These studies concentrated on verbal abuse or bullying and found high numbers of the perpetrators were other healthcare professionals or, surprisingly, mentor midwifes.

From past anecdotal experience in general, we know that paramedic students are hesitant to formally report acts of workplace violence against them during ambulance service clinical placements as they do not want to put their chance of getting a job at risk. There is also a risk that some students after their graduation might not get on to live practice. A study involving physiotherapy students found there were "negative psychological consequences" as a result of their exposure to acts of WPV during clinical placements (Stubbs and Soundy, 2013). Likewise, a study from the UK identified 20 % of nursing students considered leaving the profession because of WPV exposure during clinical placements (Tee et al., 2016). The results of a pilot study by Boyle and McKeena (2017) demonstrated that undergraduate paramedic and midwifery students are exposed to acts of violence when undertaking their clinical placement. The study identified that students were exposed to a range of work-related violence from verbal abuse through to sexual harassment. These results also highlight a need for student education prior to attending the clinical placement on how to deal and cope with workplace violence and the importance of reporting workplace violence exposure. A study by Janssen and Emerenciana (2019) implies that their students regularly experienced aggression from patients and their relatives during their traineeship.

There are no doubts about violence against student paramedics and nurses during their practice placements. This is why the Medical College in Prague started teaching mandatory subjects for their paramedic students in 2014. After six years we decided to verify how beneficial these subjects are. We compared an intervention group of paramedics participating in a training session compared to a control group not participating in a similar training session and attempted to verify the greatest benefit of mandatory subjects for self-protection prevention of violence.

We identified three overarching themes in which changes are seen as necessary for the implementation of our groups: conceptual, prevention and perception factors. Conceptual factors include three concepts which are implemented in this problem: definition of violence, causes, and consequences of violence. In section Definition of Violence, the group with mandatory subjects (G1), described the definition more empathically (this group saw violence as a mutual problem - not only patients but also staff) for patients than group (G2), who had not undertaken the special training subjects. The group without training described violence as a patient-only problem. As shown in the section Causes of Violence, G1 spoke of stress factors, problematic communication, patients' pain and staff fatigue. G2 saw causes of violence as alcohol, drugs, poor communication with drunk individuals, or patients who were mentally ill and unable to control their emotions. The section Consequences of Violence highlights something both groups described consistently - violence can be good when, for example, clearing the air, relieving tension, or correcting the situation. However, there were some notably inhumane answers in this section from G2.

Preventive factors include prevention of violence and resolution of violence. The Section Prevention of Violence with patients or colleagues included in G1 interventions which are focused on strategies to better manage violent patients are open questions, supportive communication and listening patients. Interestingly, all G1's answers in this section pertained to keeping distance and a safety line before patients or colleagues got violent. G2 also used good communication to prevent violence, but their comments appeared to show negative connotations towards violence prevention – respondents from G2 did not show as much patience as respondents in G1 (more patience, more time for negotiation). In section Resolution of Violence, with patients or colleagues, respondents from G1 demonstrated advised reactions, caution and a high level in taking care of patients who are very aggressive. Respondents from G2 preferred demonstrations of power with very aggressive patients as a conflict resolution.

The section Perception Factors also highlights the different answers from both groups of respondents. Respondents from G1 preferred compassion with patients who they had to coerce. Also, these respondents felt like coercion was a necessary instrument for difficult or violent patients when other tools had been exhausted. Respondents in G2 expressed, as in previous sections, that coercion is absolutely necessary and felt that coercion was a useful technique for everyday practice. Respondents from G2 showed no sympathy towards patients who had to be coerced.

We can state in general that respondents who undertook their bachelor's degree and mandatory training are better prepared to be in contact with violently patients than the group without this training. Respondents with mandatory training also expressed higher levels of compassion with violent patients. This group also considered the cause of violence, not only violence resolution, and showed effort and knowledge with regards to prevention, adeptness in communication techniques, self-protection (keeping distance from violent patients or colleagues) and respect for their patient's space in negotiation.

We have verified there is a great benefit to teaching mandatory subjects for self-protection and prevention of violence for paramedics and nurses in their practice placements.

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MOODLE TEST – A SUITABLE TOOL FOR CREATING FAIR TESTING DURING DISTANCE AND PRESENCE TEACHING

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Abstract

When combining distance and full-time/presence study, there is a need (in COVID time) to use effective tools to verify students' knowledge. According to our survey, three platforms are mainly used in the Czech Republic to create distance tests at secondary schools and universities: Google Forms, Microsoft Forms and LMS Moodle. After a year of experience, it turns out that the tests on the Moodle platform prove to be optimally suitable for online teaching and tutoring thanks to the possibility of "Question bank" (Google and Microsoft do not offer, 30. 4. 2021) divided into categories, from which a unique test for each student is randomly drawn. The Moodle tests thus excludes: unethical behaviour (copying) and increased frequency of testing after returning to the full-time form of study.

However, mainly at secondary schools, Moodle is not the most widely used platform to create tests. We see the disadvantage in the time associated with the creation of a bank of tasks from which tests are generated. Therefore, we created and offer the „Question Banks" (in .XML format) as an example in selected areas of biology – viruses, cell, algae, fungi, etc. (in Czech) for secondary schools.

In addition, we verified that you can also easily transfer the Moodle test to school PC (or students' mobile) during full-time education/exams, allowing teachers to save on printing costs. Other advantages can be seen in the many feedback functions and statistical comparison options of the tests, which can be an advantage over the paper version of the tests.

Keywords

Biology. Learning Management System. Moodle. Test. Question Banks. Unethical behaviour.

INTRODUCTION

This contribution was created in response to the COVID pandemic, which began in March 2020, when in the Czech Republic there was a reduction in full-time teaching during almost the entire school year 2020/21 (excluding September and June) at all levels of schools. One of the most discussed issues came to the fore, the unethical behavior of students during testing - cheating (Rohlíková, 2020). Lancaster and Cotarlan (2021) report that the level of unethical behavior with the transition to distance learning and

testing has increased uncontrollably, with as many as 80% of students surveyed admitting to cheating. In the Czech Republic, a separate working group "Ethics of Online Teaching and Examination" was established to address this topic, coordinated by Charles University within the Centralized Development Project of the Ministry of Education, Youth and Sports for 2021 "Strengthening the academic integrity of university students with focus on the risks and opportunities of distance learning and assessment methods". International conferences, such as the European Conference on Academic Integrity and Plagiarism held in June 2021, also deal with the topic of online student cheating, as schools expect to incorporate online teaching experience into future practice (Polčáková, 2021).

The oral distance examination with the camera on gives the student the least chance to cheat. However, in contrast to online written examination, where many more students can be tested at one time than just one, it is a time burden for teachers. Therefore, a more time-efficient way of testing comes to the fore - written online tests, which are, however, one of the most problematic methods of online evaluation, because it is very difficult to prevent fraud. It is therefore necessary to take measures to protect against fraud, so-called *proctoring* (supervision of the course of examinations) and to eliminate unethical behavior of students (Rohlíková, 2020). In the USA, there is already online proctoring at a high level, where the student is equipped with a special device that has: a fingerprint sensor, a 360 ° camera incl. evaluation of risky movements (leaving the room, telephoning, studying materials), recording of all sounds and the function blocking other processes on the PC - this recording is then part of the test (Proctorio, Examity, Verificient, Honorlock and others) (Brdička, 2020). According to Rohlíková (2020), the so-called Safe Exam Browser can be used in the Czech Republic, which opens a web page with a test and prevents other applications and windows from opening on the PC. However, this Plugin causes students technical difficulties, complicates the course of the entire exam and does not prevent copying from another device, such as a mobile phone (the author's own experience). The visual inspection of all students at a specific time during a written distance test seems to be the simplest. However, we meet a much-discussed issue of the requirement to mode cameras on; the universities usually have this obligation enshrined in the guidelines for online testing, but in primary and secondary schools the situation is more complicated (Pavlas 2021). In addition to visual inspection, copying in the online space can be eliminated by asking questions that lead to an understanding of the context and do not test mere knowledge (Štuka, 2020; Rajsiglová, 2018; Rohlíková, 2020). Comprehension questions are ideal to combine with test setup functions: time limitation, reordering of questions and answers, which offers at the time of writing not only large platforms (Google Forms, Microsoft Forms), but also smaller test tools such as Edookit, etc. The disadvantage of such compiled tests lies in their mixing from one set of, for example, 20 questions that students share. This can be eliminated by generating tests from a large set of questions, which is divided into categories according to difficulty, where the computer creates a unique test for each student by random selection according to the commands (Voborník, 2014). This tool, the so-called *task bank*, is usually available in Learning Management System (LMS) software packages; available in the Czech Republic, for example, in the freely available LMS Moodle software package.

LMS Moodle (Learning Management System Modular Object-Oriented Dynamic Learning Environment) is a tool for creating and running e-learning courses offering a system of managing the entire teaching, while Open Source is available under the open license GPL (General Public License), resp. no acquisition or other license fees are paid

(Maněna, 2015). It is computer software located on the Internet available in the Czech language, usually on the school server, to which teachers and students log in with their account. Moodle contains in one place both tools for accessing materials and study management, such as the administration of courses, study plans, student activities or communication platforms, as well as tools for student testing (Bauerová, 2010). The advantage of LMS systems lies in their complex nature, where a good level of teaching can ensure a high level of teaching material, where each chapter of the course can be completed by self-tests to verify the acquired knowledge (Papáček 2014). Moodle is considered one of the best LMSs, when it is described as the right one for e-learning "supporting constructivist education" (Lorenc 2015). On the other hand, such a sophisticated system also has its disadvantages, which consist in the need to have a network administrator at school, who installs this LMS, backs up, updates, solves errors, educates himself/herselfs to it and offers teachers training, incl. quick support. And it's not free. From the user's point of view, a certain obstacle is a somewhat illogical non-intuitive control and more complex creation of tests through the question bank (Maněna, 2015; Hodál, 2012 Moodle developers from all over the world are already working on this, led by the main coordinator M. Dougiamas from Australia. After the latest version 3.10 from 2020, a breakthrough version 4.0 (resp. 3.11) is approaching, where large and more dynamic changes in site navigation and overall modernization are expected (Lorenc, 2020). In addition to the basic versions, there are also a number of expansion modules that can be customized exactly as needed. The history of LMS Moodle development dates back to 1999, when M. Dougiamas worked with Blackboard's WebCT at Curtin University of Technology, Australia and decided to create a new LMS to streamline the online learning process, which he registered under the trademark. In August 2002, the first official version of Moodle 1.0 was released, which was gradually translated into 27 different languages (Dougiamas, 2003). The first Moodle Moot conference was held in 2004, after which a partnership with commercial space took place. In 2005 it was moved to a dedicated environment (Melichar, 2020) and already in the same year the use of Moodle at universities in the Czech Republic is registered (Rohlíková, 2005). As of the date of writing this article up, Moodle has over 192 million registered users from 246 countries, with 912 sites registered in the Czech Republic (sites 2021), an increase of more than a third over the last six years (Lorenc, 2015). Melichar (2020) states that about three quarters of domestic secondary schools, grammar schools and vocational schools are listed in the register of Czech registered sites and lists it as the world's most popular and most used LMS solution. Very clear manuals for version 2.5.2 to 3.0 (Maněna, 2015; Voborník, 2014). There is also an inexhaustible number of "few pages" of electronic PDF manuals available on the Internet, which have been prepared at various schools as part of the Education for Competitiveness operational programs (abbreviation in Czech: OPVK). In the online environment, the "Moodle User's Guide" on the website of the Faculty of Philosophy of Masaryk University http://moodledocs.phil.muni.cz/ , which corresponds to version 2.9, proved to be the best for us. Regular webminars on the topic of administration, the creation of tests in Moodle are organized, for example, by the Central Library of Charles University (Mrs. Mašatová and Ovesleová). You can also use online support at moodle.org with the "Moodle Czech" community with a discussion with very quick feedback (the authors' own experience).

Compilation of the test within the Moodle course takes place in the Activity tool (the other two elements are Learning Material and Block), in the Test module (alongside a wide portfolio of other 13 activities such as survey, forum, lecture, task, workshop, etc.) (Melichar, 2020). There are more than 16 types of tasks to choose from, such as classic ones, eg selection from possible answers, assignment, supplementary, short formed

answer, no / true, but it is also possible to use other technical elements that we do not get on paper (Chlebek, 2008), especially interactive tasks of dragging texts / images into an image or interesting applications image Hotspots in H5P (Bujok, 2015). Creating your own test takes place in two stages. In the first phase, the teacher creates test questions with a uniform naming system into predetermined categories, which he classifies in the question bank - this step is important to think calmly with paper and pencil in hand (chapter Methodology - creating a question bank). The task bank can contain hundreds of questions that can be further expanded during the test. In the second stage, we are already compiling our own test from selected questions (Chlebek, 2008). LMS Moodle allows you to configure tests so that they can be used at several levels: in the learning process, as self-tests, and subsequently for the students' own diagnostic process (Bujok 2015; Voborník 2014). Rights in the system are handled by roles that are assigned to users, such as administrator, teacher, student, guest, etc.

In this paper, we bring experience with the creation of a bank of tasks in LMS Moodle from the university in the field of biology, which we subsequently pilot-tested also at the secondary school.

The presented work aims with regard to COVID pandemic emergency distance education at primary, secondary and higher education in the Czech Republic:

1. Analyze with the help of a questionnaire survey:

a) the frequency of oral and written examinations;

b) representation of various platforms for creating tests focusing on Moodle;

c) the reasons why teachers chose the given platform and how they reflected on the possibility of eliminating unethical behavior of students.

2. To offer a bank of tasks LMS Moodle in biology for secondary schools as a tool for creating unique tests that significantly eliminate unethical behavior of students.

METHODS

Compilation and evaluation of questionnaires

To find out which platforms for the creation of written distance tests teachers chose during COVID distance learning, we chose the method of a questionnaire survey. First, an online questionnaire was created in Google Forms. The comprehensibility of the questions and the time required to complete the questionnaire were verified by a pretest on 15 respondents. The questionnaire was anonymous, took about 8 minutes to complete, and contained a total of 8 questions concerning, for example: how long the selection of the testing platform was initiated, what user and pedagogical criteria (characteristics of the selected testing platform) were important for the selection; last but not least, demographic data, such as: the length of practice or the field taught. incl. space for notes. Data collection took place in the period March 14th - May 30th 2021 in the online environment on Google Forms and the server vypnto.cz. Teachers were addressed through the Association of Grammar Schools (PhDr. Schejbalová), Výluka Civic Association (Mgr. Fryzelková) and regional delegates of the Biological Olympiad (primary school, secondary school). University respondents were contacted by sending a direct link to the online questionnaire in Google Forms. The vypnto.cz server, where 12 responses were obtained, ensures its own distribution. 64 questionnaires were collected on Google Forms, incl. pretest, resp. in total, responses were obtained from 76 respondents. Multiplicity of

responses from one institution was not desirable, so we did not distribute the questionnaire through our colleagues with a request to complete it from their colleagues. Prior to the evaluation, duplications were removed and the evaluation took place in Excel using the COUNTIF function.

Development of the structure of the Moodle question bank and verification of tests at universities and secondary schools

The question bank in Moodle is the main building block from which test questions are drawn. The most important is the first step, determining the categories of tasks, which we developed practically a year and a half during intensive work with tests in emergency distance learning during the COVID pandemic. The search for the most suitable structure for the question bank took place at the University of Hradec Králové with the help of 1st and 2nd year students. in the fields of: Teaching with approval of biology and professional specialization Biology and ecology in three biological subjects.

There were 270 students who were actively invited for feedback during the weekly mid-term auto / tests, which were compiled from a question bank and serve as the basis for the final test.

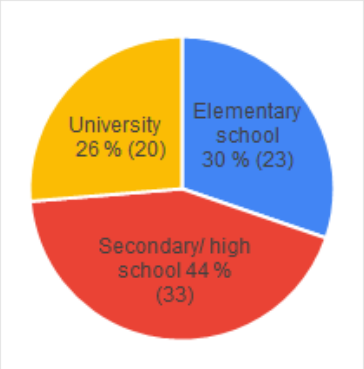
The experience gained from universities student feedback was used in compiling a bank of tasks for high school students on the topic "Biology for the 1st year grammar schools". The pilot verification of the mentioned bank took place by tests during distance learning at the Slavičín Grammar School in May 2020.

RESULTS

Questionnaire survey

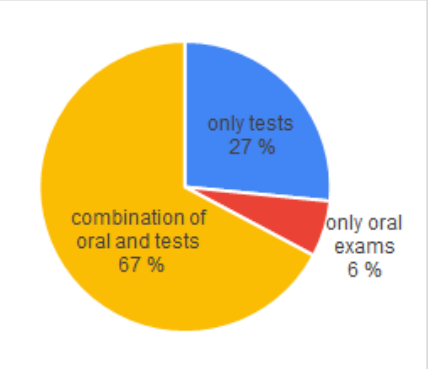
A total of 76 questionnaires were obtained, with most respondents being teachers from secondary schools or higher grammar schools (44 %), from the 2nd grade of primary or lower grammar (elementary) schools (30 %) and universities (26 %) the representation of teachers was comparable (30 and 26 %, Figure 1).

Figure 1: Teacher affiliation.



(Source: Own)

Figure 2: Knowledge verification.



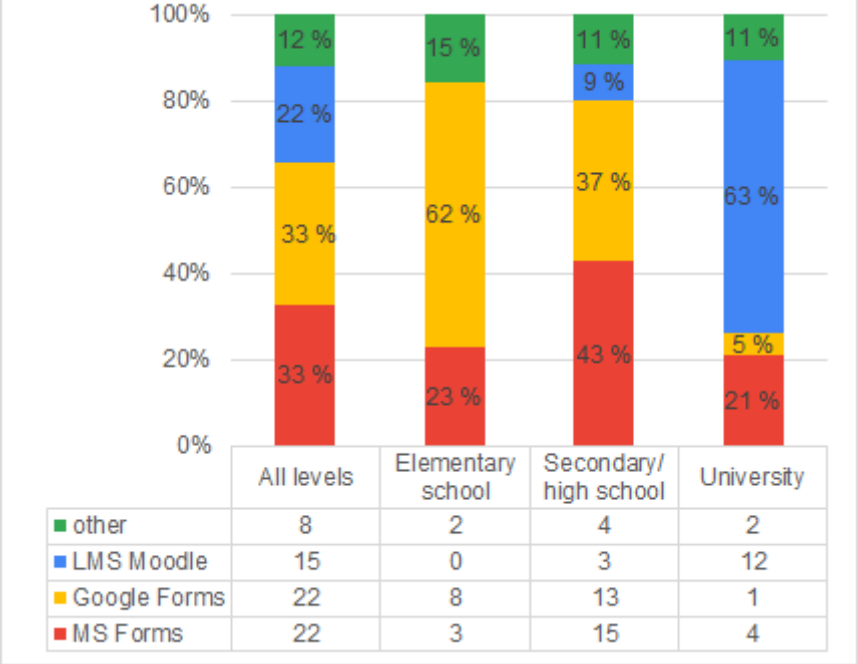
(Source: Own)

In the first research question, we were interested in the choice of teacher in terms of testing methodology. As many as two-thirds of respondents said they used oral examinations and written online distance tests at the time of online teaching. 27 % of teachers bet to try it only in writing. The remaining 6 % chose only the oral form of

the exam (Figure 2), and in most cases they were universities, twice the 2nd grade. Elementary school and only in one case a secondary school.

The second research question was focused on the representation of platforms for the creation of distance tests with a focus on Moodle. The results show (Figure 3) that users mainly use three main platforms. The first place is shared by two platforms “ruling" in video calls also, namely Microsoft and Google (each 33 %) and the third is LMS Moodle with 22 %.

Figure 3: Different testing tools/platforms according to school level.



	All levels	Elementary school	Secondary/ high school	University
other	8	2	4	2
LMS Moodle	15	0	3	12
Google Forms	22	8	13	1
MS Forms	22	3	15	4

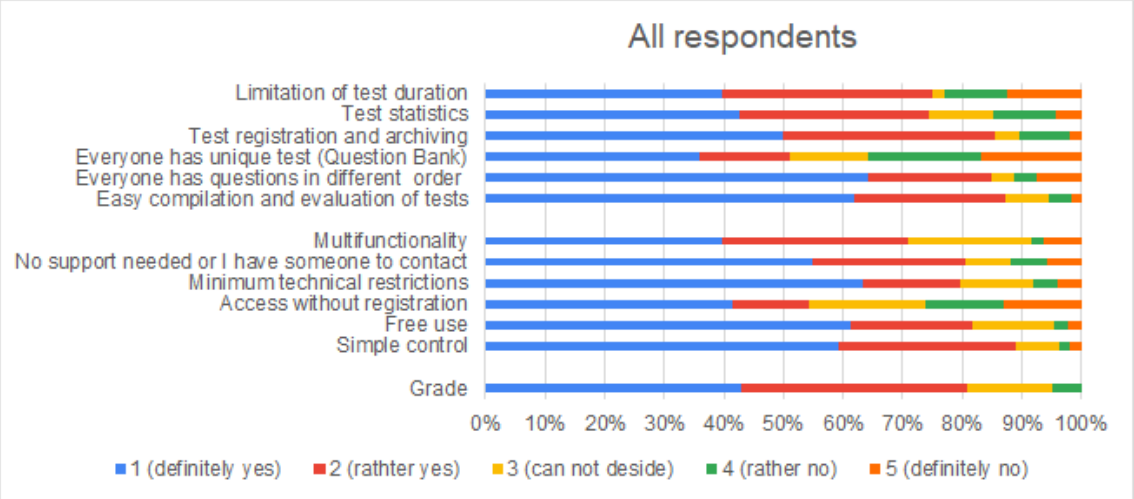
(Source: Own)

The remaining 12 % of teachers bet on smaller platforms such as Quizz, MUNI, Socrative, Liveworksheets, Nearpod, etc. An interesting fact is that LMS Moodle is primarily a domain of universities, only in three cases was its use recorded in high school, in subjects of biology and mathematics. Other respondents from secondary schools used MS Forms (43 %) for testing, which was determined again by the school management in about half of the cases. If we compare these three most used testing platforms with the help of user evaluation, Google and Moodle turned out comparable (1.8 and 1.9), while MS Forms (Teams) has an average mark of 2.6. Looking at respondents' practice averages, Moodle chooses those with the highest experience (17 years), followed by Google Forms (16,2 years) and MS Forms (15,5 years).

The third research problem focused on screening the reasons why respondents chose a given platform for creating a test and whether they reflect the features of the test tool to eliminate cheating. Figure 4a summarizes the criteria that respondents identified as important. From the user's point of view, the teacher seems to be the most important simple control when choosing a test platform, on the contrary, access without / with registration to the test is not a measure (Figure 4a). From a pedagogical point of view, simple compilation / evaluation of tests and the possibility to regroup questions are most required. Other methods to eliminate cheating - limiting the length of the test and creating a large set of tasks (Question Bank) are not such a priority. However, when we divide the respondents into groups according to the testing platform (Figuer 4b-d) they have chosen

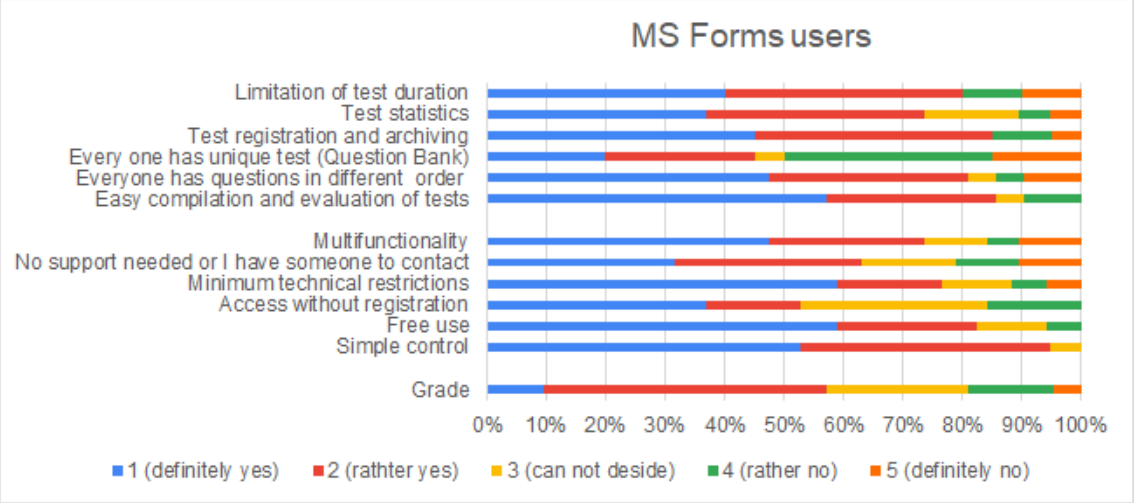
/ assigned to them, we see a significant difference in requirements. For LMS Moodle (4d) users, the priority is to create a unique test from a larger set of tasks (question bank) and set test duration limits, while Google Forms and MS Forms (4b, c) respondents do not see these two factors as a priority.

Figure 4a: Factors important to choosing the testing platforms - all respondents.



(Source: Own)

Figure 4b: Factors important to choosing the testing platforms - MS Forms users.



(Source: Own)

Figure 4c: Factors important to choosing the testing platforms - Google Forms users.

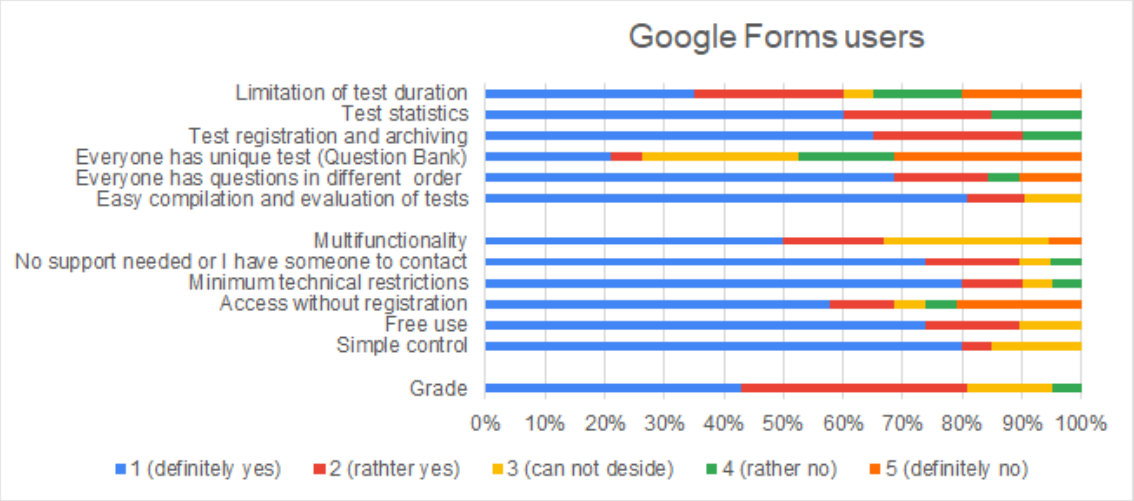


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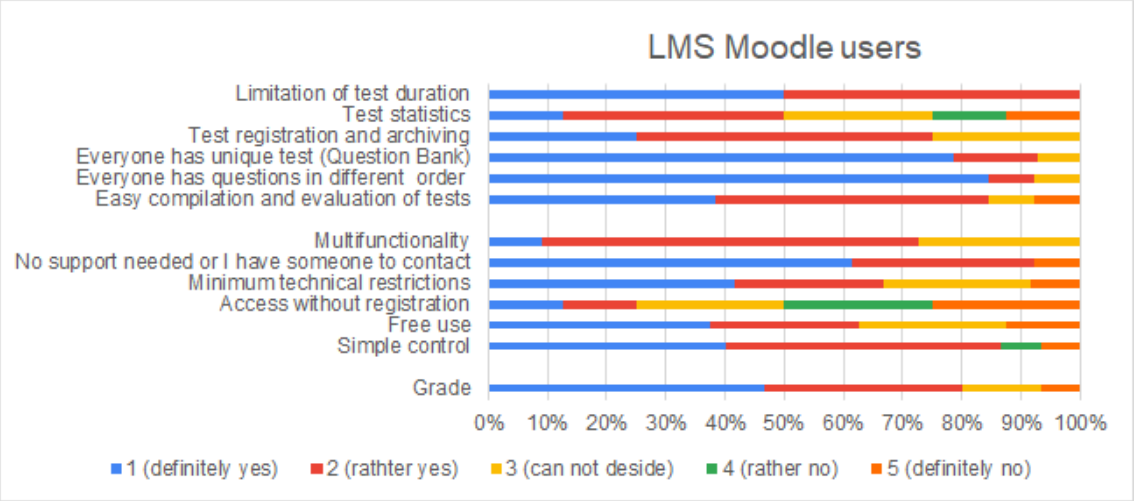
Figure 4d: Factors important to choosing the testing platforms - LMS Moodle users.



(Source: Own)

Moodle question bank for high school biology, its import and test compilation

Part of this work is our "Moodle question bank for secondary/ high school biology" in the .xml format, which you can import into your course in the module Settings> Course administration> Question bank> Import. After importing, you will see the question bank and its structure (Figure 5). You will find two categories here - closed questions for 1 point (U1) for 1 min. and 2 points (U2) for 1.5 min. and within them 7 subcategories according to the subject matter. The bank contains a total of 104 tasks that can be freely combined when compiling the test.

In order to facilitate the first steps for high school teachers to work with Moodle, a sample bank of tasks in .xml format for high school biology was prepared within this work. With a total of 104 questions, the question bank covers seven topics of the Secondary School Biology: viruses, bacteria, eukaryotic cells, green algae and ores, fungi, chromists, protozoa. At the request of interested readers, the authors (see contact) will provide step-by-step instructions for importing this question bank into LMS Moodle and compiling the test.

The repetitive / final test can be set up in a similar way as the continuous test, for example, you let Moodle randomly draw successively from each of the 5 subcategories (lesson topics) U1 after 3 questions and U2 after 1 question, respectively. 21 questions + 7 questions.

Figure 5: The structure of the Moodle question bank for secondary/ high school biology.

(Source: Own)

DISCUSSION AND CONCLUSION

The main topic of this work is the elimination of unethical behavior of students when passing exams in the form of written distance tests, so we focus mainly on the use of LMS Moodle, which as the only platform, commonly used in the Czech Republic, allows the compilation of unique tests to reduce the risk of cheating. In this context, it is striking that only 9 % of secondary school teachers use this tool, although about three quarters of domestic secondary schools and grammar schools have it registered (Melichar, 2020). One possible reason is the rapid transition to online teaching in March 2020 and Autumn 2020, when the selection of teaching tools was spontaneous with the main requirement to choose a multifunctional platform offering video calls with file sharing in teams, modern design and simple intuitive test set-up. It seems that at the time, the extent to which part of the multifunctional test package eliminates students' unethical behavior was not a priority for the user community. An interesting part for discussion or further research is why most high schools have chosen to use MS Teams (hence Forms) when they have registered LMS Moodle software. One of the possibilities is insufficient educational support in LMS Moodle at individual schools, when compiling tests, the teacher encounters the requirement to create a question bank, where training is usually necessary and then a large time disposition for the first set-up of the task bank. At the time of writing the article, MS Forms does not offer the task bank function, although it is repeatedly requested by the users on the Internet. One of the possibilities is to gradually teach future teachers to structure the task bank within the university study and to compile a test for the other classmates in the team during teaching in the form of a "role exchange". We tried to apply this procedure in the summer semester of 2021 with first-year students, future teachers, at the University of Hradec Králové. Leaving aside the surprise of students that building tests in Moodle is more difficult than expected, another obstacle was the inintuitiveness and pre-flood design of the program, which could be solved in the near future by the expected upgraded versions of Moodle starting with 4.0 (Lorenc 2020).

At the time of distance learning in the school year 2020/21, teachers at secondary schools compiled tests mainly in MS Forms and Google Forms. To make it easier for secondary school teachers to get started with Moodle, a sample question bank has been prepared, covering a total of 104 questions on seven biology topics: viruses, bacteria, eukaryotic cells, green algae and ores, fungi, chromists, protozoa.

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DIGITAL EDUCATION THROUGH PROBLEMATIC INTERNET USE PREVENTION PROGRAM

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Abstract

The purpose of the presented study was to create and conduct a prevention program that was implemented entirely using the Internet. The prevention program concerned Problematic Internet Use, a phenomenon in which the way of using the Internet is characterized by a certain problematic pattern, manifested in the behaviour, emotions and time management of the person. The need to create such a program arose because of the difficult access to prevention programs, the need to move them to a remote form due to the coronavirus pandemic, and the desire to reach as many people as possible who can benefit from it. The program was developed based on research conducted on predictors of Problematic Internet Use. The program structure includes 3 specialty programs and one general program, and within each program there are three durations: one week, 2 weeks, and one month. The entire program, from initial enrolment, completion of the questionnaire, assignment to program type and duration, to the final survey and evaluation, was conducted via the Internet. The research was conducted on a Polish group and included 360 people assigned to different types of programme. The results indicate that there were no statistically significant differences in programs lasting one week. There were statistically significant differences in the following programs: emotions and moods, general, procrastination and time management both at 2-week and monthly durations. And on the occurrence of statistically significant differences for the monthly prevention program focusing on social skills. Results were obtained on a sample of 18- to 45-year-old. The ongoing program is continued, but the results indicate a change, especially in longer prevention programs as measured by the repeated completion of the Problematic Internet Use Scale 2. The prevention program was created in Polish and transmitted using a dedicated website, social media, and email. Further research aims to increase the number of individuals and possible wider application.

Keywords

Prevention Programme, Problematic Internet Use, Personalized Prevention, Longitudinal Studies

INTRODUCTION

The phenomenon of Problematic Internet Use is widespread and found in both psychological practice and research. Many researchers recognize the multidimensionality of the human-computer relationship in terms of both positive and negative aspects (Ceyhan, 2008; Bulut Serin 2011). It has been pointed out that the way we use the network is closely related to many other constructs, such as, for example, personality traits, social skills or emotional coping (Mottram, Fleming, 2009; Ceyhan, Ceyhan, 2008; Spada et all., 2014). It is the complexity of the analyzed phenomenon that shows that works on an effective and at the same time general prevention program are rare in the research of authors dealing with this topic (Saletti, Van der Broucke, Chau, 2021).

The aim of this article is to present a prevention program based on the research on predictors of Problematic Internet Use. This program is designed to be tailored to the individual needs of the recipients both in terms of duration and the type of content they are exposed to (Probierz, Gałuszka, 2020). Due to the ongoing Covid-19 pandemic, the program was conducted entirely using the Internet. This article presents the results obtained so far, while the program continues and further data is collected.

Regardless of the situational difficulties and the specific nature of the program, the implementation of the research made it possible to examine the effectiveness of the constructed tool and to identify those elements that require further refinement in later steps.

THEORETICAL BACKGROUND

Problematic Internet Use is a phenomenon that has its theoretical basis in cognitive-behavioral psychological theory (Caplan, 2010; Caplan 2003). It assumes that for a given construct to occur, it is not enough to have only temporary situational problems, but also a kind of pathology behind maladaptive patterns of action. Only the combination of previously developed maladaptive patterns and a situational crisis leads to the occurrence of the phenomenon of Problematic Internet Use. It is defined as a set of maladaptive thoughts, beliefs, and behaviors that affect many levels of a person's daily life. The impact can be seen through the negative effects of excessive Internet use, such as fatigue, distraction, and difficulty maintaining balance, but also through other, more subtle aspects of a person's behavior. Such aspects may include a preference for social contact over face-to-face meetings or dealing with emotions by venturing online. This multifaceted nature of the problem indicates that the created solution should allow for some degree of personalization of the program and allow for adjusting it to the relevant needs of the recipient. Only then such a program has a chance to bring real improvement in the subjects.

So far, the prevention programs dealing with various phenomena can be divided into those realized on a stationary basis, through face-to-face meetings, and those realized on the Internet (Lam, Lam, 2016, Andersson, 2016). The possibility of direct contact with the target group allows the program to be conducted and changes to be analyzed and people to be directly observed (Rial et al., 2018). In the case of programs carried out remotely, often the recipient of the program does not have direct contact with its implementer. In the context of phenomena occurring in social psychology, such a situation is not the most advantageous. Lack of the possibility of personal involvement and presence of another person makes the motivation to participate in the program rest

more on the participant. Additionally, greater anonymity increases the risk of individuals dropping out during the study, and mediated contact exposes individuals to more communication noise (Ke, Wong, 2018). Moreover internet-delivered prevention program which focus on coping with Problematic Internet Use could be found as one of limited worth of the intervention. Despite all these imperfections, network-based prevention programs also have a number of positive aspects. One of the first is the possibility of their implementation regardless of the place of residence of the researcher and the tested person, the program can be carried out at any hour, without significant changes in the schedule of the participants. This method of implementation also allows the program to reach a wider range of people, and thus the ability to recruit more subjects. In longitudinal studies, in which a participant is engaged more than once to join an activity after a certain period of time, the number of participants drastically decreases over time, so extensive recruitment allows for a satisfactory research sample at the end of the study. Furthermore, attendance to internet-delivered program can strengthens participants' intrinsic motivations. Online interventions may benefit from personal values about task completion, sense of control and being able to identify with the program. (Donkin, Glozier, 2012).

In this prevention program, the theoretical aspects of Problematic Internet Use are transformed into a possibly practical application. The following sections present the framework of the program and describe how it is implemented.

AIM OF THE RESEARCH

The aim of the research is to carry out an experimental prevention program on Problematic Internet Use. The results obtained will be analyzed to answer the following questions.

1. Is the prevention program about problematic Internet use effective? In order to measure the effectiveness of the program, a GPIUS2 questionnaire was administered to the participants, which was repeated. This yielded results that will be analyzed for statistically significant differences. This analysis will be conducted within a given type and given length of program.
2. Will any specialized program type be more effective than another? Comparative analyses of the two difference indicators will be developed for this purpose, if the differences between the two indicators are statistically significant, then an interpretation of one program being more effective than the other is possible.
3. Are there differences among study groups assigned to different lengths of program duration (i.e., degree of PIU risk) in terms of age and amount of time spent online? Descriptive statistics for each group will be developed and statistical tests of significance of differences will be performed.

MATERIAL AND METHODS

The prevention program was delivered in a multimodal format offering participants a variety of specialty programs and durations. The prevention program was open to anyone who agreed to participate in the study. Those who were not interested in the prevention program but wished to support the study were eligible as a control group. Both the treatment and control groups completed the Generalized Problematic Internet Use

Scale 2 (GPIUS2) in Polish validation (Probierz, Gałuszka, Gałuszka, 2020). This is an instrument used to measure Problematic Internet Use. It consists of 15 questions and allows for the measurement of 5 subscales and a total score. This scale was filled out by the respondents from both groups twice. The first time after the declaration to join the prevention program and the second after the completion of the prevention program.

Both the time and the topic of the program were different and depended on the results obtained in GPIUS2. The duration of the program was closely related to the degree of risk that could be determined based on the total score obtained in the questionnaire. Based on previous research, ranges based on mean scores (and standard deviations) were distinguished to determine whether an individual was at low, medium, or high risk for Problematic Internet Use (Probierz, Sikora, Gałuszka, Gałuszka, 2019). The degree of risk was related to the duration, for low risk a 1week prevention program, for medium risk a 2week program, and for high risk a 4week duration.

Another piece of information that was obtained during the initial screening was the type of program the individual would be assigned to. This information came from the scores that could be obtained for the subscales. There were 3 specialized programs and one general program. The first specialized program was emotions and moods, the second was social skills and communication, and the third was procrastination and time planning. The last program was general and combined all of the above. The subscale score indicated which type of program would be the best fit for the subject. For subjects who scored highest on the Emotion Regulation scale, this was the Emotions and Affects program; for subjects whose dominant scale was Preference for Social Online Interaction, this was the Social Skills and Communication program; and lastly, subjects whose average on the Compulsive Internet Use, Cognitive Preoccupation and Negative Aspects scales was higher than the other two scales were assigned to the program. Such individuals were then assigned to the Procrastination and Time Management program. If there was no clear dominance of any of the scales, the general program was assigned.

This means that the structure of the programme included 3 durations - 1,2 or 4 weeks and four themes - 3 specialist and one general which gives a total of 12 possible combinations of participation in the programme.

The research was conducted online via social media, mailing lists and a dedicated website. Recruitment for the study was ongoing due to attempts to evenly recruit participants from different groups. Materials for the prevention program were sent out using the selected messenger and the number of materials was dependent on the duration of the results (Nakayama et al., 2020).

A sample of 360 subjects was obtained and used for the analyses conducted. At present, the prevention program is further continued and in the future analysis on a larger sample of subjects (more than 1000) is planned.

RESULTS

In order to analyze the obtained results, data on descriptive statistics, characteristics of the study group or normality of the distribution of the studied variables were prepared. Then the analysis of the differences within the studied groups (one group - two measurements) and between the research group and the control group (two different groups) was carried out. The obtained results were analyzed in terms of the research questions posed earlier.

Table 1: Descriptive statistics for studied variables divided into 3 groups (based on duration of programme).

Variables	Duration	M	Me	Mo	Min.	Max.	SD	Skewness	Curtosis
Age	1 week	31.32	30.00	23	20.00	47.00	8.16	0.53	-1.00
Internet Usage (hours per day)	1 week	4.14	4.00	2	1.00	14.00	2.38	1.98	5.71
Internet Usage (hours per week)	1 week	28.98	28.00	14	7.00	98.00	16.63	1.98	5.71
Starting Age	1 week	16.46	14.00	12	3.00	30.00	6.59	0.77	-0.48
Age	2 weeks	28.42	27.50	28	18.00	47.00	8.07	0.82	-0.40
Internet Usage (hours per day)	2 weeks	4.94	5.00	5	2.00	10.00	1.71	0.54	0.52
Internet Usage (hours per week)	2 weeks	34.59	35.00	35	14.00	70.00	11.95	0.54	0.52
Starting Age	2 weeks	14.43	13.00	Multi.	4.00	32.00	5.99	0.98	0.64
Age	4 weeks	21.73	22.00	22	15.00	29.00	2.98	0.33	0.02
Internet Usage (hours per day)	4 weeks	6.07	6.00	8	2.00	12.00	2.29	0.26	-0.06
Internet Usage (hours per week)	4 weeks	42.47	42.00	56	14.00	84.00	16.03	0.26	-0.06
Starting Age	4 weeks	9.42	10.00	10	4.00	17.00	3.19	0.08	-0.53

(Source: Own)

Based on Table 1, there are some general trends by which it is possible to describe the study group. The study groups were equal in size and each group consisted of 120 participants. The group with the lowest risk is also characterized by the highest average age, the average age at which the individual started using the Internet, and the lowest average amount of time spent online per day and per week. The mean and variance values obtained allowed us to calculate the significance of the differences between the study groups.

Table 2: Two-tailed p value tests for descriptive variables

	two-tailed p value test			two-tailed p value test	
Age	1 week - 2 weeks	$p<0.006$	Starting Age	1 week - 2 weeks	$p<0.013$
	2 weeks - 4 weeks	$p<0.001$		2 weeks - 4 weeks	$p<0.001$
	1 week- 4 week	$p<0.001$		1 week- 4 week	$p<0.001$
Daily Internet Usage	1 week - 2 weeks	$p<0.031$	Weekly Internet Usage	1 week - 2 weeks	$p<0.030$
	2 weeks - 4 weeks	$p<0.001$		2 weeks - 4 weeks	$p<0.001$
	1 week- 4 week	$p<0.001$		1 week- 4 week	$p<0.001$

(Source: Own)

Based on Table 2, the observed trends in Table 1 are also reflected in the significance of the differences between the two means. All pairs analyzed obtained a statistically significant p-value when analyzed two-sided.

To test whether there were statistically significant differences between the second measurement at the end of the program and the first measurement at the beginning of the program, a t-test was performed for the dependent variables in the case of a normal distribution and a Wilcoxon rank-test for variables that did not have a normal distribution, for the 12 groups studied. The aggregated results can be found in Table 3.

Table 3: T-test paired test and Wilcoxon rank test between GPIUS2 results after completing programme and before starting it.

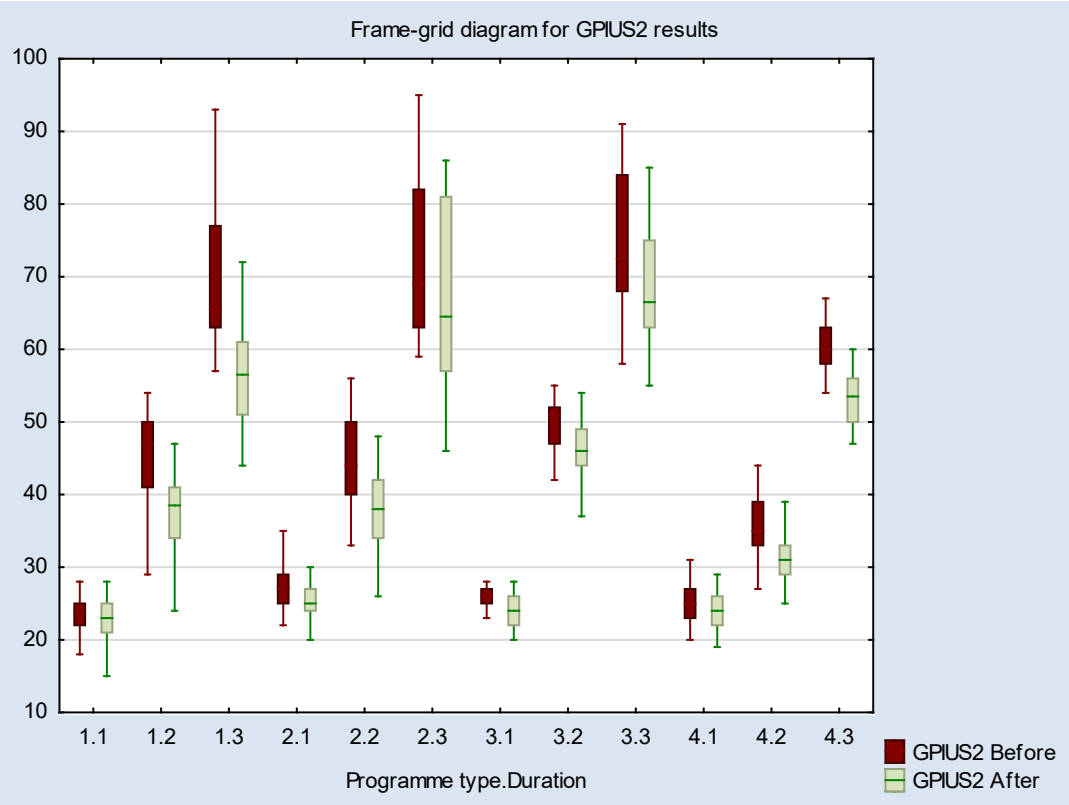
Group Number	Duration	Type	t	p
1	1 week	EA	-3.01	p<0.005
2	2 weeks	EA	-16.74	p<0.001
3	4 weeks	EA	4.78*	p<0.001
4	1 week	CS	-5.30	p<0.001
5	2 weeks	CS	-10.99	p<0.001
6	4 weeks	CS	4.10*	p<0.001
7	1 week	TM	4.10*	p<0.001
8	2 weeks	TM	-9.43	p<0.001
9	4 weeks	TM	-7.65	p<0.001
10	1 week	G	-6.19	p<0.001
11	2 weeks	G	-8.38	p<0.001
12	4 weeks	G	-11.83	p<0.001

*Wilcoxon rank test; EA – Emotions and Affects, CS – communication skills, TM – time management and procrastination, G – general.

(Source: Own)

The studied results are also shown in Figure 1.

Figure 1: Frame-grid diagram for GPIUS2 results.*



*First number is programme type: 1-EA, 2-CS, 3-TM, 4-G. Second number is duration: 1 – 1week, 2 – 2weeks, 3 – 4 weeks.

(Source: Own)

In order to test whether there were significant differences between programs, it was decided to calculate the number of change points, i.e., the difference between the GPIUS2 survey before and after program entry. This step was dictated by the fact that individuals assigned to different program lengths started with different GPIUS2 levels. The resulting scores were checked for a normal distribution. Results for more than half of the variables indicated a lack of normal distribution. A Kruskall-Wallis rank ANOVA H=201.42, p<0.001 and a chi2-174.1 median test, p<0.001 were performed, followed by multiple comparisons between study groups, the results of which are presented in Table 4.

Table 4Multiple comparisons between studied groups.

Variable: GPIUS2 points drop	Z-value, *p<0.05, **p<0.01, ***p<0.001										
	1	2	3	4	5	6	7	8	9	10	11
EA 1 week (1)											
EA 2 weeks (2)	7.74***										
EA 4 weeks (3)	9.48***	1.74									
CS 1 week (4)	1.73	6.01***	7.75***								
CS 2 weeks (5)	6.22***	1.52	3.26	4.49***							
CS 4 weeks (6)	4.97***	2.77	4.51***	3.24	1.25						
TM 1 week (7)	1.44	6.3***	8.04***	0.29	4.78***	3.54*					
TM 2 weeks (8)	3.59*	4.15**	5.89***	1.86	2.63	1.38	2.15				
TM 4 weeks (9)	5.8***	1.95	3.69*	4.07**	0.42	0.82	4.36***	2.21			
G 1 week (10)	0.64	7.1***	8.84***	1.09	5.58***	4.33***	0.8	2.95	5.16***		
G 2 weeks (11)	4.15**	3.59*	5.33***	2.42	2.07	0.82	2.71	0.56	1.64	3.51*	
G 4 weeks (12)	7.08***	0.66	2.4	5.35***	0.86	2.1	5.64***	3.49*	1.28	6.44***	2.93

(Source: Own)

The analyses conducted allow for both a comparison of different prevention program types within the same duration or the same program types within different durations. It should be noted, however, that individuals assigned to different durations had different degrees of risk and started from different GPIUS2 score ranges. Therefore, the results between different durations are not recommended for broader generalization, despite the statistically significant results.

Based on the research questions posed and the results obtained, the following conclusions were developed. In order to examine the effectiveness of the program, the statistical difference between the twice measured GPIUS2 scale was tested. A statistically significant result was obtained for each highlighted variable. The effectiveness of the program understood as obtaining lower scores for the variables studied was obtained. Analyses of differences were also conducted for the variables age, age of Internet use initiation, daily and weekly Internet use time. All the pairs brought in were found to differ at a statistically significant level. As can be seen from the summary of descriptive statistics those with the highest risk were the youngest in terms of age, both daily and weekly time also increase with risk level and this increase is statistically significant. It was decided not to analyze the age of onset further, because it was different for different age ranges of subjects and may not be a significant variable shaping Problematic Internet

Use, but only the social fact of the emergence of the Internet in Polish homes. The last analysis was a comparison of differences between groups. There were no statistically significant differences between the different types of prevention program for a duration of 1 week. For a duration of 2 weeks there were differences between the Emotions and Affects a Time Management and Procrastination program, and the Emotions and Affects a General one. This means that the change between the first measurement and the second measurement was statistically greater in the Emotions and Affects program than the Time Management and Procrastination and General one. For the duration of 4 weeks, which is the highest risk level, statistically significant differences were distinguished between the Emotions and Affects program and Communication Skills and Time Management and Procrastination. This means that the Emotions and Affects program had a statistically larger difference in measurements than the other two statistically significant relationships.

CONCLUSION

Based on the data obtained and the analysis conducted, the research questions posed were verified. As it was shown the developed prevention program is effective on the studied group. Regardless of the type of program or its duration, a statistically significant change in the result of Problematic Internet Use was demonstrated. However, some limitations of the study should be noted, which should be taken into account when interpreting the obtained result. First of all, the program was conducted on a group of 360 people, which, divided into 12 subgroups, allows for 30-person research subgroups. This means that the results obtained may change in the case of larger study groups. Due to the fact that the program is continued it is planned to obtain as many people as possible. The participants of the program were from Poland, aged between 18 and 45. At the moment no research has been conducted on older groups. Another factor was that the program was conducted using the Internet. This is a rare solution in the case of the broader topic of behavioral addictions, especially the relationship between man and the Internet. In the future, there are plans to create an equivalent of the conducted program for inpatient delivery so that effectiveness can be compared between different forms of participation. Despite these limitations, however, it is important to note some important information that was obtained after the program was implemented. Of note here is the tailoring of the program to the needs of the participant in terms of both the defined risk and the nature of the Problematic Internet Use. The obtained results provide valuable information on the direction of further research, as well as allow for evaluation of the work done so far and conducting further research in this area.

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DIGITAL TOOLS TO FACILITATE LEARNING: STRIKING THE RIGHT BALANCE

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The number of digital tools that have emerged in response to the unprecedented events that had forced education around the world to move online is astonishing. In many ways, they have helped teachers to alleviate the otherwise negative impact of Covid-19 pandemic on the sustainability of the educational systems around the world. Nevertheless, despite all the praise that the technology deserves, many teachers and learners are still advocating for the return to traditional classrooms and looking forward to 'getting back to normal'. The questions we asked in our research are these: how much does technology contribute to the learning process and what is the reasonable balance between the technology and traditional methodology in the learning process? This relatively small study focuses on adult education in general and learning English for Specific Purposes in particular. The methodology consisted of analysing learning outcomes achieved in the traditional and digital learning environment and surveying 24 adult learners on their perception of the digital learning environment, its role in the process of learning and its impact on their progress. The findings suggest that despite all the potential benefits of the use of technology in the classroom, there is relatively low correlation between the mode of learning and types of digital tools used in online learning and the attainment of learning outcomes. However, the use of technology as part of the learning process contributes significantly to the development of adult learners' digital literacy and promotes positive attitude to the use of technology in contexts other than education.

Keywords

Digital learning tool. Online learning. Adult learners. English for Specific Purposes.

INTRODUCTION

The Covid-19 pandemic has forced the shift towards teaching and learning from home and this has affected not only schools and universities, but also vocational and professional non-formal learning. Before the pandemic, only one-third of college students took courses online, half of which were enrolled in exclusively online programmes. The situation with adult learners was twice not as good (Protopsaltis and Baum, 2019). In this period, technology started playing a key role in ensuring access to education overall. It has also become much more obvious that there are intra-individual differences in engagement, i.e. during a learning independent progression, engagement changes over time and requires adaptive support to cater for the learners' needs. These differences must be taken into consideration, which makes teaching more complicated and flexible at the same time. Therefore, the challenge has been to design online learning environments that would allow reaching learning outcomes and meaningfully engage learners. From mostly supportive role it has been playing in pre-Covid times, now the use of technology has become a core essential for teaching and learning. There are, however, considerations related not only to the various aspects of technology, but most importantly, to pedagogy.

The unimagined event of a global pandemic hitting all countries across the world in the aftertime of digital revolution of the brink of the 21 century has triggered developers

all over the world to develop, update and restyle many of the already existent digital learning tools designed to facilitate learning. Under these circumstances, the lists of top tools for learning have grown astonishingly from 150 best to 300 bests in just under one year, with many newly designed apps to make the transition to online learning easier, more engaging, and arguably more effective. In many ways, they have helped educators to alleviate the otherwise negative impact of Covid-19 pandemic on the sustainability of the educational systems around the world. Nevertheless, despite all the praise that the technology deserves, many teachers and learners are still advocating for the return to traditional classrooms and looking forward to 'getting back to normal'.

This exploratory study attempts to evaluate learning outcomes achieved in the traditional and online learning environment and synthetise 24 adult learners' perceptions of the digital learning environment, its role in the process of learning and its impact on their progress and development of different skills. Quantitative and qualitative data was gathered through entry and achievement tests as well as a questionnaire.

LITERATURE REVIEW

Teaching and learning with technology inevitably add another layer of complexity in understanding learner engagement because learning is mediated by both technological hardware and software applications. In studying students' online engagement, Dixson (2015) considers these four factors: (a) skills (e.g., keeping up with readings, being organised, and listening and reading carefully); (b) emotion (e.g., putting effort and making lessons meaningful and relevant); (c) participation (e.g., engage in online conversations, interact with other students); and (d) performance (e.g., able to do well in tests and assessments). Martin and Bolliger (2018) emphasises the importance of three types of interactions inherent to effective online courses: learner-to-learner interaction, learner-to-content interaction, and learner-to-instructor interaction. Technology, learner factors, and types of interactions are considerations that shape the ways teachers design and implement online learning experiences to engage students meaningfully.

Meaningful engagement is possible in case all the learners' needs are taken into consideration. Technology-based learning approaches enable the presentation of learning resources (e.g. content, support or navigation) in a dynamic form. This typically occurs as a reaction to collected and evaluated data which can change during the learning processes, e.g. due to learning progress. Inherently, online tools may help identify what a learner does or does not understand and provide help accordingly until a certain learning goal is met. This help can reduce dropout rates, lead to better learning outcomes and help students achieve their learning goals faster. The notion of providing learners with assistance tailored towards their specific needs has a long history in pedagogy - e.g., in the form of one-to-one teacher. (Ifenthaler & Seel, 2005). As a matter of fact, technology-based learning systems provide forms of adaptivity beyond what can realistically be accomplished in traditional classroom settings in terms of resources or scale (cf. Koedinger et al., 2013). However, the use of technology in the classroom should be justified; by no means should the tool itself overshadow the real purpose of learning (Syzenko, 2016).

METHODOLOGY

In this study, we had 24 participants, all adult learners (aged 24 to 58) doing an English for Specific Purposes course of 80 hours at different levels in either a group (14 participants) or one-to-one (8 participants) mode. The ESP course was designed in accordance with the needs analysis but in all instances, it focused on the development of all language skills with an emphasis on promoting learner's confidence in communication in a variety of professional contexts. We formulated two research question in this study:

1. How much does technology contribute to the learning process?

2. What are learners' perceptions of the effectiveness of online learning?

Ultimately, the question we wanted to answer as educators, was this one:

3. What is the reasonable balance between the technology and traditional methodology in the learning process?

To answer the first question, we analysed and compared two uncorrelated sets of entry and achievement tests of learners taking an ESP course in face-to-face mode (for this purpose, we used our data from pre-Covid tests) and in online mode. To answer the second question, we designed a questionnaire with a set of closed-ended statements using with a five-point Likert scale and two open-ended questions for gathering learners' individual experience and feedback. To answer the third question, we looked at the findings of this study holistically and tried to consolidate and suggest our vision of the reasonable balance the technology and traditional methodology in the learning process. Participation in this study was voluntary and anonymous.

FINDIGS AND DISCUSSION

In this section we will look into the findings of our study, analysing the digital component first, and then moving to the results of the achievement in language tests.

Synchronous learning software. Online learning traditionally exists in a combination of synchronous and asynchronous learning modes. Since Google Classroom as an asynchronous element have been used with all adult learners in our context since 2017, well before the pandemic started, we were interested in learners' perceptions of the new mediums for synchronous learning, i.e., video-conferencing services. Several video-conferencing services have been used extensively throughout the pandemic. Most used include Zoom, Microsoft Teams, Google Meet, and Skype. All the services have their advantages and certain drawbacks but all of them have more or less similar features.

When asked about the importance of features of video-conferencing software for effective learning, the following results were received: all learners strongly agree or agree that stable connection and good quality of video and sound are very important, most learners agree that user-friendly design and interactivity are important and slightly lower importance is given to pricing and security features. Somewhat lower importance given to security features is quite alarming as it may indicate insufficient attention to safe and responsible use of information online.

Table 1: Features of video conferencing software.

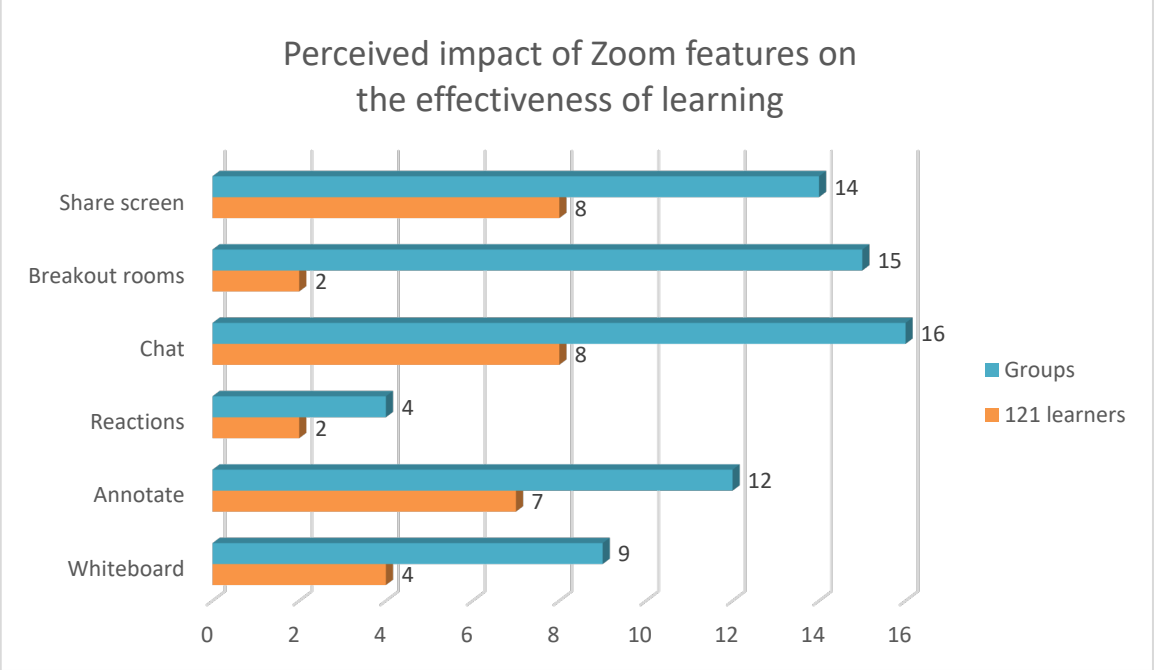
Features of video-conferencing software	very important	important	somewhat important	not very important	not important

Connection stability	22	2	0	0	0
Quality of video and sound	19	5	0	0	0
User-friendly design	10	11	3	0	0
Availability of interactive tools	6	12	4	2	0
Advanced security features	2	10	8	4	0
Pricing (free or small fee)	8	10	6	0	0

(Source: Own)

Since all the adults' learners participating in survey had used Zoom video-conferencing software for online learning purposes, we attempted to evaluate learner's perceived impact of certain zoom features on the effectiveness of learning. We asked learners to tick zoom features which, in their opinion, contributed positively, to the effectiveness of learning.

Figure 1: Perceived impact of Zoom features on the effectiveness of learning.

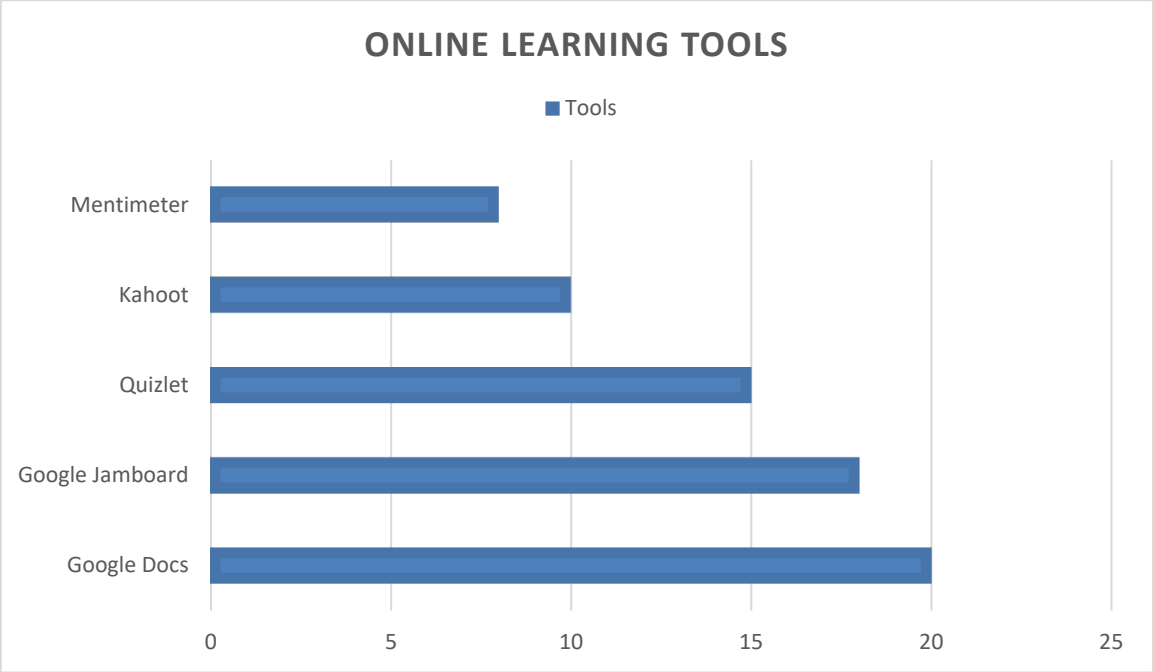


(Source: Own)

As we can see from the results below, learners believe that chat, share-csreen, and annotate features support the effectiveness of learning the most. Breakout rooms also have very big impact on learners who studied in a group, whereas significantly fewer one-to-one learners mentioned this feature. This can be easily explained by the fact that the use of breakout rooms is largely inexistent with 121 learners as there is no learner-to-learner interaction involved in 121 classes.

Online learning tools. In the process of experimenting with the plethora of online learning tools available now for different purposes, such as task design, learner-to learner, collaboration, formative and summative assessment, we also wanted to see what the real impact of these tools on the quality of learning is. We asked learners to indicate tools that, in their opinion, benefited them most during the course. The results were as follows.

Figure 2: Online learning tools.



(Source: Own)

When asked to comment in an open question to comment on the effectiveness of online tools for their learning, most (71 percent) agreed that online tools contribute positively to the development of their language skills. Moreover, some learners (36 percent) mentioned that they started using these tools for other purposes, not related to language learning, e.g., making business presentations. However, a few learners (12 percent) gave the following comments: a. "tools are not necessary, take time from the language", b. "I didn't think these tools were good for me, I prefer speaking with the teacher", c. "I had many problems with tests, they didn't work", d. "I didn't like online tests".

In our experience, when working with adult learners in an ESP course, the use of digital tools is welcome and, in the long run, has a positive impact on the effectiveness of learning. However, it is also important to consider that learners need time to learn how to use the tool properly. In our opinion, it is also advisable to use the same tool for particular purposes. To give an example, we can use Google Jamboard and Padlet for synchronous and asynchronous collaboration purposes. Both tools have more or less similar functionality with Jamboard being a simpler toll with fewer features. For learning purposes, it is enough to choose one that caters best for learning objectives and stick to it, as it will give learners opportunity to focus more on tasks rather than learning and exploring the tool. This also facilitates development of their core skills.

Therefore, in our next question, we asked learners to evaluate the impact of their online ESP course on the development of their core skills, also known as the 21st century skills.

Table 2: Core skills.

Statement	Strongly Agree	Agree	Somewhat agree	Disagree	Strongly disagree
Online learning has a positive impact on my creativity and innovation skills	2	9	9	4	0
Online learning has a positive impact on my collaboration skills	9	8	7	0	0
Online learning has a positive impact on my problem-solving skills	4	13	5	2	0
Online learning has a positive impact on my critical thinking skills	3	10	8	2	1
Online learning has a positive impact on my digital literacy	11	12	1	0	0

(Source: Own)

As we can see from the results, most adult learners agree that online learning contributes positively on the development of all their core skills, with a particular emphasis of the positive impact on collaboration skills and digital literacy. We believe that this is an important achievement for adult learners, as we know that digital literacy levels and engagement with online tools is traditionally lower with the age groups represented in our study (mostly Generation X) compared to the younger generations (Generation Z and Alphas).

Progress and achievement. To analyze the effectiveness of online learning on learning outcomes and achievement in the development of language skills, we first compared the results of the achievement tests in all skills in courses delivered face-to-face and online.

Table 3: Language Skills Test scores of adult learners taking face-to-face ESP classes (average)

	Reading	Listening	Written Production	Oral Production	Oral Interaction
Entry Test	*72.3*	*60.3*	*71.5*	*71.0*	*64.2*
Achievement Test	*87.7*	*69.1*	*79.9*	*76.2*	*75.2*
Progress	*+15.4*	*+8.8*	*+8.4*	*+5.2*	*+11*

(Source: Own)

Table 4: Language Skills Test scores of adult learners taking online ESP classes (average).

	Reading	Listening	Written Production	Oral Production	Oral Interaction
Entry Test	*69.4*	*64.2*	*70.1*	*68.3*	*59.4*
Achievement Test	*80.6*	*74.5*	*83.3*	*74.6*	*70*
	+11.2	*+10.3*	*+13.2*	*+6.3*	*+10.6*

(Source: Own)

As we can see from the results of the achievement tests in online mode, progress in reading skills was noticeably lower, achievement in spoken interaction was slightly lower while achievement in spoken production was somewhat higher. Interestingly, the findings suggest that online learning environment is particularly well-catered for the development of learners' writing skills, an assumption both teachers made throughout the course based on the quality of learner's written outputs. This was strongly supported by the results of

achievement tests in writing (online learning as compared to face-to-face learning). Possible reasons for this higher exposure to written texts, using chatbox and, most importantly, working collaboratively and individually on writing tasks in digital environment, which mostly replicates real life written production. There is also slightly better progress in the development of listening skills, which can be exposed to a larger share of exposure to video content during online lessons. There was no significant difference in learner achievements in all skills related to one-to-one or group mode of learners.

In our questionnaire, we asked our learners to evaluate the impact of online learning on the development of their language skills. Their perceptions match largely with the findings observed in the analysis and comparison of the achievement tests above. Learners acknowledge that online learning helps them develop all skills effectively with larger share of Agree and Strongly Agree answers regarding the development of writing and listening skills.

Table 5: Learners' perceptions of the effectiveness of online learning on development of language proficiency.

Statement	Strongly Agree	Agree	Somewhat agree	Disagree	Strongly disagree
Online learning improves my reading skills effectively	0	12	10	2	0
Online learning improves my listening skills effectively	5	15	4	0	0
Online learning improves my writing skills effectively	7	10	5	1	0
Online learning improves my speaking skills effectively	3	11	8	1	1
Online learning is more effective than face-to-face learning	1	2	7	12	2

(Source: Own)

Despite giving mostly positive feedback on the effectiveness of online learning on the development of all the four skills, the response to the last statement is strikingly in favour of the face-to-face learning. This suggests that despite all the perceived benefits and mostly positive experience gained during the forced move online during the Covid-19 pandemic, many learners still prefer face-to-face teaching mode. What is missing, as reported by learners, is social contact as language learning and communication are all deeply social experience. This opinion is also shared by many educators, as we know from our discussions with colleagues and some studies published on this topic to date.

CONCLUSION

The findings of our small study suggest that despite all the potential benefits of the use of technology in the classroom, there is no significant difference between the mode of learning (face-to-face or online) and the attainment of learning outcomes in ESP courses. Yet, online mode seems to promote the development of writing and listening skills more effectively compared to the face-to-face mode. Also, the findings suggest that use of technology as part of the learning process has a positive impact on the development of the core skills and contributes significantly to the development of adult learners' digital literacy. As proved by adult learners' feedback, online learning experience promotes

positive attitude to the use of technology in contexts other than education, e.g. in work-related tasks, such as giving presentations and collaborating with colleagues on writing reports. Even though we, as educators, still feel the sentiment among the learners to return to face-to-face classes, there is also enough empirical data that suggests that the attainment of learning outcomes does not really depend on the learning mode. Yet, it is our conviction, that the attainment of outcomes depends primarily on a well-thought mix of good pedagogy and a carefully selected number of comprehensive digital tools that facilitate learning.

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SOFT SKILLS DEVELOPMENT IN ONLINE COOPERATIVE LEARNING

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Abstract

Cooperative/collaborative learning (CL) is not a new concept. But it took on new meaning and content during the COVID-19 pandemic, when virtually all university education was shifted online. There are some key meanings of CL – collaborative learning strategy, peer instructive learning and learning in small groups etc. Now CL solves not only the problem of training students' hard skills in group work. It resolves a very important task of developing soft skills, primarily digital competences, communication skills, group interaction and decision-making, solving complex educational problems in group work, critical, creative and reflective thinking, self-motivation, responsibility and self-organization. To create projects, students need to master digital programs that allow them to unite in groups, visualize ideas and solutions, etc. As part of this work, students also teach each other to use new computer technologies. Recently lecturers and students began practicing peer-to-peer learning which successfully solves the issues of involving students with different levels of academic performance in the educational process, increasing learning motivation and interest in the independent organization of their educational work with the help of older students or groupmates.

We have developed a questionnaire to identify students' opinions on CL online. N=400. The results of the survey led to the following conclusions about the benefits of cooperative learning for soft skills development: students receive more time for individualized learning; direct interaction between students promotes active learning; students feel more comfortable and open when interacting with peers in small groups; working in a group using online technologies fosters a sense of belongingness, even in distance learning; students share a similar discourse, allowing for greater understanding. Research also indicates that CL activities typically promotes team-building spirit and more supportive relationships; greater psychological well-being, social competence, communication skills and self-esteem; higher achievement and greater productivity in terms of enhanced learning outcomes.

Keywords

Cooperative Learning. Soft Skills. Students. Online Learning.

INTRODUCTION

Cooperative/collaborative learning is not a new concept. But it took on new meaning and content during the COVID-19 pandemic, when virtually all university education was shifted online. Universities have faced the difficult challenges of translating education into an online format. This step prompted a radical change in the methodological settings of the educational process, as well as urgently learn to use the Internet technologies of online teaching/learning for all participants of the educational process. This, of course, required some time, energy and additional skills and competences.

At the same time, a very important function of higher education remained behind the scenes – the organization of space for the full-fledged educational socialization of future specialists. It is possible only in case of intensive interpersonal communication and interaction in the classroom, when working in groups to perform creative tasks, develop projects, solve cases, etc. Such activities enhance an exchange of knowledge and opinions, stimulates intensive communication not only at the vertical level of interaction "teacher – student", but also at the horizontal level – "student – student". Is it possible to provide all this on different Internet platforms? The learning has almost completely moved online. Such a configuration of the educational process has been developed taking into account the "intermediary" in the form of a gadget, which complicates the communication process for many reasons, both technical and psychological: the lack of a modern gadget, the lack of high-speed Internet, the lack of skills for using modern technologies of distance learning, as well as emotional burnout from the need to stay constantly in front of a computer or tablet screen and building communication only in a distance format, loss of motivation, unfulfilled expectations, narrowing the circle of live communication, reducing possibility of an individual approach of academicians to work with a student, etc. To a large extent, lecturers have lost an opportunity to influence emotional sphere of students, that is, distance learning is aimed more at the formation of knowledge (hard skills) to the detriment of soft skills development and ultimately emotional intelligence.

In such a situation, the question arises of how it is possible to help first of all the first-year students to become integrated into the process of study and adapted to the university life; develop their hard and soft skills in active interaction; facilitate their self-organization and self-understanding. The possible answer is – collaborative education or peer-to-peer learning (Daniels, 2008; Gibson, 2004; Fisher, 2005; Laal, 2012 etc.).

Peers are a group of people with whom an individual spends time and feels a sense of connection. Peers and peer groups are "situated through shared participation in particular types of behaviors and activities" (Gibson, 2004). A peer group is one from whom an individual seeks acceptance or approval. Identifying with and seeking acceptance from a peer group often go hand in hand. "Affiliation and acceptance are exclusively interrelated – each generates the other" (Tierney, 2005). Being a member of a peer group necessitates that a student feels a sense of identification with his or her peers.

In A. Maslow's model, people must have belongingness issue satisfied in order to address needs of achievement. For example, a student with deprived relationship concerns will be less able to participate in classroom learning opportunities. The ability to learn is built on a foundation of comfortable relationships with others, including peers, and classroom learning is all about learning with and in the presence of others (Maslow, 2005). "Expectancy by value" theories of motivation include the incentive or rewarding aspects of motivation, which may also stem from relationships with others. Behaviorism provides one way to explain the association between motivation to learn and peer interactions. In basic behaviorist theories, relationships between people affect learning only as much as people reinforce each other in the academic arena (Ho, 2006). Albert Bandura's social learning theory speaks precisely to the human interactions involved in learning. Observational, or "vicarious" learning is based upon learning by watching then modeling or acting similarly to others. To ensure this sustained interaction, individuals must be invested in their peer groups and feel a sense of accountability to other members. Peer groups can refer to a student's set of close friends, a student's classmates, or a student's teammates. Students can be part of or influenced by multiple peer groups at the

same time. Their success is also shaped by their position within peer groups and various social networks.

Therefore, the main aim of our study was to get feedback from students, if they lack something in online learning situation caused by lockdown, and understand how to minimize these losses in a distance learning model, as well as to determine the place and opportunities of peer instructors in improving the quality of training and the development of soft skills among junior students

Our research hypothesis was based on the fact that a very effective peer-to-peer learning strategy, which has proven itself well in adult education, will make it possible to compensate for the lack of interaction and intensive communication necessary for students by updating the collaborative method of work in an online format.

METHODS

In order to receive an adequate feedback from the students which could give us data for analysis we have developed a questionnaire concerning the opinion of the students about a quality of online education. The questionnaire includes 26 statements to be evaluated from 1 to 5 by the respondents. The scale differentiated all the meanings from 1 – "totally disagree" to 6 – "completely agree". The questionnaire included 2 blocks of statements: the level of satisfaction with online training for hard skills development and the level of satisfaction with online training for soft skills development.

The purpose of the questionnaire was to gain information concerning student satisfaction with online learning for hard and soft skills development. A six-point Likert scale with a bipolar format was used to avoid students' selection of a totally neutral position for many items. The questionnaire was reviewed and validated by a panel of experts including a psychologist.

The sample consisted of 400 Bachelor students of the 1st and 2nd years of study from different full-time study programs where students are trained in the fields of engineering and math (50 students), natural (50 students), social (50 students) and humanitarian (50 students) sciences. It included 282 females and 118 males. We focused our research on 1st and 2nd year students, since they (after entering the university) have been in lockdown conditions for almost 2 years, studying online. Based on the results of observation and interviews, this situation had a negative impact on the adaptation of students to study at the university, on the fact that their expectations related to the university period of their life were not fully justified. First of all, this concerns the lack of the ability to build a good network and interpersonal communication with fellow students. It also reduced their possibility to develop their leadership skills, group work skills, debating skills, etc. to the full extent.

The research allowed us to see the gaps in online training of the students having in mind the education trend of soft skills development. It is articulated now and then as an important outcome of training. Processing of the received data was carried out using content analysis and descriptive statistics.

RESULTS

The survey results showed that students of technical and natural specialties experience quite complete satisfaction from online education aimed at shaping their hard

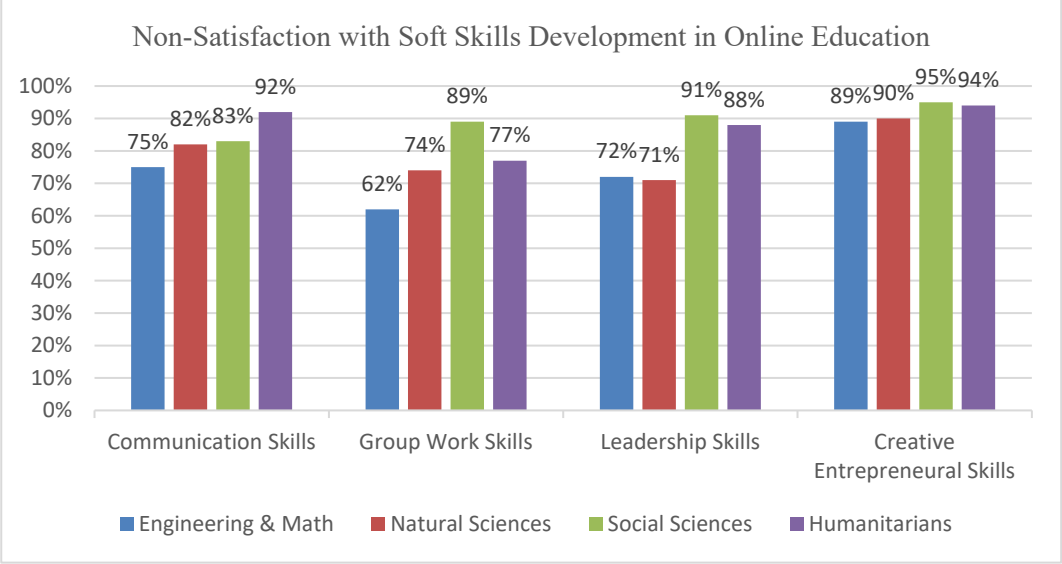
skills (71% and 68%, respectively). This percentage is lower among students of social sciences and humanities (54% and 51%). We can conclude that practically all students have a high level of academic adaptation and a sufficient level of development of digital competencies, as well as a culture of working online with a lecturer.

A different situation arises when students assess the possibilities of online learning for the formation of soft skills when working with teachers in the context of formal education. Between 75 and 92% of the respondents in the sample indicate the absence of both formal and informal communication in the context of online learning. And this does not indicate the absence or underdevelopment of computer literacy, since when conducting practical classes, many lecturers use the possibility of dividing an academic group into subgroups to work in Google classrooms, Zoom and other online platforms used in online learning. This suggests that online learning, after nearly two years of lockdown, is still seen as a compromise or complementary form of learning. And live communication significantly distinguishes online education from classical. So, in the opinion of the respondents, today they are deprived of the possibility of normal educational socialization in the system of higher education. Similar results have been obtained by researchers in many countries, where students are actively advocating returning to university classrooms.

Among the proposed for the assessment according to the criterion of the importance of soft skills, students singled out communication skills, group work skills, leadership skills and creative entrepreneurial skills.

The results concerning student satisfaction with the formation and development of basic soft skills by lecturers in the process of online learning are presented in Figure 1. They show that the formation of very important skills and competencies necessary for professional development, career growth and life success remain outside the focus of the lecturer's attention.

Figure 1: Non-Satisfaction with Soft Skills Development in Online Education



(Source: Own)

This niche in online education can be successfully occupied by collaborative peer education. Webinars, forums, informal online meetings, work on creative projects in small groups, start-up projects and hackathons, trainings, discussion groups – all these

are important resources for deepening knowledge, but what is more important, for developing the soft skills necessary for a modern young person.

Almost 100% of respondents agree with this. Preparation and implementation of student instructors in the process of developing students' soft skills in a university environment can be ensured by introducing the program “Train the Trainers” into the practice of universities.

DISCUSSION AND CONCLUSION

So, the obtained results of empirical research gave us the opportunity to state that students of all specialties studying online experience a deficit of interpersonal contacts at the horizontal level, and even having an increased sense of loneliness during lockdown nevertheless they go on learning online. Gaining knowledge often comes down to simple reproduction. And the development of soft skills such as critical and creative thinking, project work skills, group discussion, reflective writing, debating, leadership behavior, decision making, etc. not paid enough attention. To overcome this gap, in our opinion, collaborative learning is worth to be used.

The results of our research are correlated with the findings from the previous studies on the effectiveness of online peer learning in academic achievement and learning motivation. B. Daniels stressed that the students’ motivation levels were significantly higher for courses that embed online peer learning in traditional learning (Boud, 2001; Fisher & Baird, 2005; Daniels, 2008; Razak, 2010).

It is discovered that application of learning in collaboration, can lead to many advantages. Collaboration is a philosophy of interaction and personal lifestyle where people are accountable for their actions, including learning and respect the abilities and contributions of their peers. Group members make efforts to think creatively, assess problems, and make decisions as a team (Laal et al., 2013). But sometimes distance learning prevents an active collaboration during the regular classes online. First of all, because of time limits and the tendency of many students not to switch on camera during the classes excusing it by their privacy or other reasons. It creates the barriers in communication.

The background for organizing collaborative learning online has been found in Gordon’s theory of social interaction skills where he focused on three pillars for the peer instructors: active listening skills, I-messages and avoiding road blocks which cover core components of social and emotional learning (Gordon, 2003).

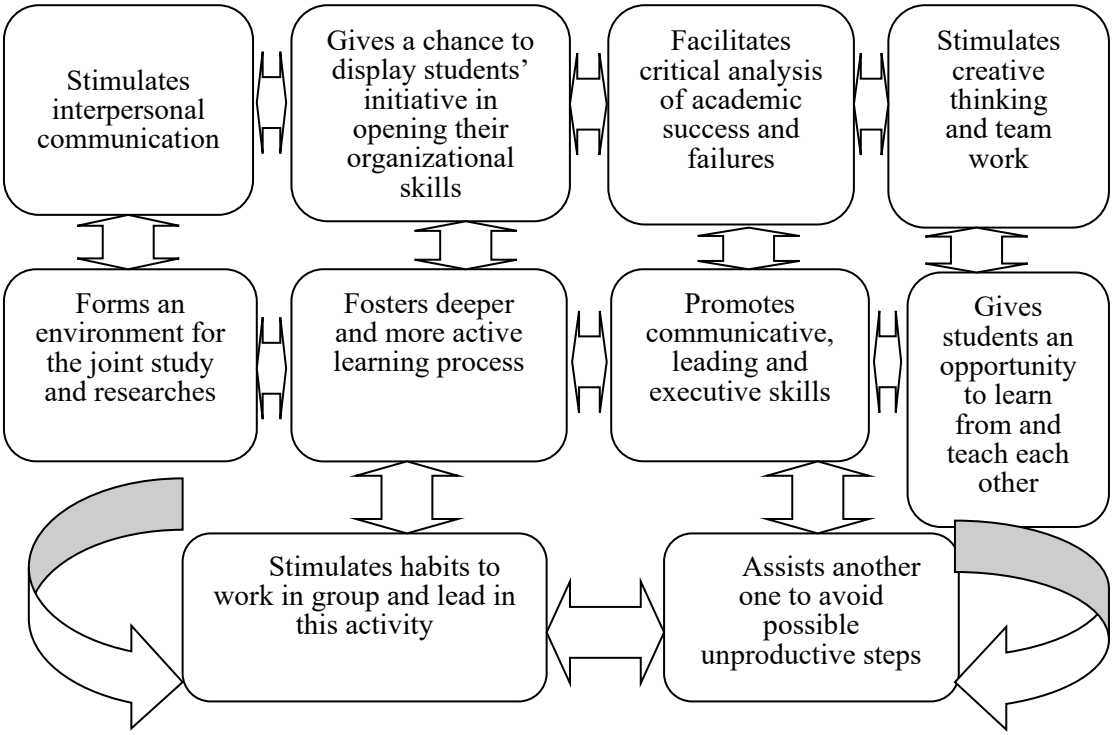
Cooperative learning divides groupmates into small groups where each person is responsible for teaching others, and each contributing a unique piece to the group performance on a task. The main benefits of peer teaching include, but are not limited to, the following:

- Students receive more time for individualized learning.
- Direct interaction between students promotes active learning relying on soft skills.
- Peer teachers reinforce their own learning by instructing others.
- Students feel more comfortable and open when interacting with a peer.

- Peers and students share a similar discourse, allowing for greater understanding (Paschenko, 2018).

On the one hand, collaborative learning undoubtedly improves the knowledge of each participant of the educational process. But, on the other hand, which is no less important, it gives each participant of such a learning model a sense of involvement in the dynamic process of discussion and development of personally significant knowledge and skills, and the possibility of group work and decision making solving problems and/or creative tasks facing students, which allows them to develop their skills necessary to perform various group roles – from leader to performer, from generator of ideas to their developer, from expert to critic, etc. Such work, regardless of whether it happens online or face-to-face, performs psycho-corrective functions to increase the adaptability and stress resistance of students in the process of prolonged self-isolation in conditions of lockdown and distance learning. In addition, collaborative learning aims to develop soft skills in the students.

Figure 2: The PROS of the Peer-to-Peer Interaction Method.



(Paschenko et al., 2018)

Moreover, peer-to-peer learning creates a network which could be perceived as an eco-system for personal development.

So collaborative work not only increases learning motivation in students but also helps to develop such soft skills as self-motivation, goal setting, prioritizing and responsibility. It is very important because 62% of respondents stressed that online learning has affected the loss of their learning motivation and they need some leverage to increase it by restoring a network of peers to communicate and work together.

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INTERACTIVE DISTANCE MATERIALS OF MATHEMATICS AND DESCRIPTIVE GEOMETRY FOR VŠB - TU OSTRAVA

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Abstract

The coronavirus disease COVID-19 pandemic caused schools to stop teaching overnight. Closure of primary, secondary, and tertiary educational institutions is a huge challenge for the education system as it needs to establish a stable, fully-fledged, and long-term viable system of online education. This process has become the more difficult to undergo as schools could not prepare for it. Fortunately, with the nowadays generalized access to the Internet, every student is enabled to continue his/her studies in online form, and every school, on the other hand, has means to ensure online education.

Also, we, the university teachers, had to face this challenge how to replace classroom teaching as fast and efficiently as possible. All subjects having been taught by means of direct contact so far ranging from lessons themselves and taking tests to oral exams have had to be hastily transformed into a digital form. Thanks to the fact that for several years now, we have been involved in intensive production of study materials to support distant learning, which are presented in this paper, and the LMS electronic learning system, we have managed to avoid interrupting teaching activities without major problems at the time when personal attendance of students at schools was prohibited.

Keywords

Descriptive geometry. Mathematics. Student. Distance studies. Interactive. LMS.

INTRODUCTION

All subjects are primarily taught based on teacher-student communication. Communication in the classroom runs as any other form of communication – it is multimodal (Alwood, 2001). Being mutually complementary and supportive, various means of communication are used so that students and their teacher understand each other (Reich, 2008). Verbally transmitted information is usually made more specific as well as more comprehensible for all participants in communication by adding visual input (images, graphs, daily-life object, etc.). These communication principles can be maintained be it either in the classroom or online learning environment. Other inputs applied in teaching include kinaesthetic (gestures, facial expressions, movement, etc.) and tactile (manipulation with models, etc.) inputs. While being freely used in the classroom environment, they can be used to a limited extent only in the online environment. However, they can be replaced with creativity enhanced by this environment. It is important to maintain interaction within a group even during online lessons. Several research studies have been conducted around the issues of designing course material for distance education. A brief

review of the literature reveals that the most frequently expressed concern in courses designed for distance learners has to do with providing the learner with adequate feedback (Howard, 1987; McCleary et al., 1989). Learner feedback is listed as one of the five most important considerations in course design and instruction, and it is identified by (Howard, 1987) as the most significant component in his model for effective course design (LaPointe et al., 2004). Five principles of designing course materials include guided activity, reflection, feedback, control, and pre-training.

We aim at following these communication principles in designing interactive distant learning course materials as mentioned above. E-learning environments may contribute to the teaching and learning process if the integration is done within the framework of proper pedagogy. Building customized E-learning programs places high demands on design, programming skills, and time (Kotzer et al., 2012). Materials are intended to foster direct education. The reason for this is that the number of students enrolling for studies at VSB – Technical University of Ostrava has declined rapidly in the last decade. Further decline in a number of students occurs right after their entrance to the university, when almost 40% of students leave the university as early as in the first semester without passing any of the exams. One of the reasons for this trend is the difficulty of studies and insufficient number of dedicated course hours, in the part-time study form, in particular. First-year students must master mathematics, physics, and chemistry. These subjects are generally very demanding, especially for students with insufficient knowledge from their secondary schools (Dlouhá et al., 2019). However, nobody says that this group of students has no chance to successfully finish their studies at VSB – TUO despite this handicap. Therefore, we have tried to find a way to help them. One of the ways is the very process of designing distant study materials allowing us to extend collective learning even outside the extent of classroom learning. Every student has thus an opportunity to practice at his/her own pace.

Before starting our work on designing complementary study materials, we had made a survey among students asking them about their preferable study materials. Despite being satisfied with our study material portfolio, students themselves look for further materials on the Internet. In case of possible knowledge gaps, students make effort to bridge these gaps by watching YouTube videos and tutorials with solved problems on the Internet. Only 2% of students feel no need to complement their knowledge. 68% of students look mainly for solved problems, be it in the form of video tutorials or on specific websites, with only 20% of surveyed students looking for unsolved problems. Our survey proved the prevailing trend of our times: "When I do not know something specific, I will check Youtube." (Hamříková et al., 2017). We did our best to meet the demands of students and as such we have incorporated videos as one of the key features. The success of the video tutorial is ascribed to its design, which attended to and even incorporated key qualities of paper-based tutorials, while also capitalizing on the strengths of video (Meij et al., 2016). Students may make use of theory, commented video lectures as well as solved problems tutorials, exercises to practice, and tests with keys. These materials have already been created for all courses of mathematics and descriptive geometry, instruction of which we provide.

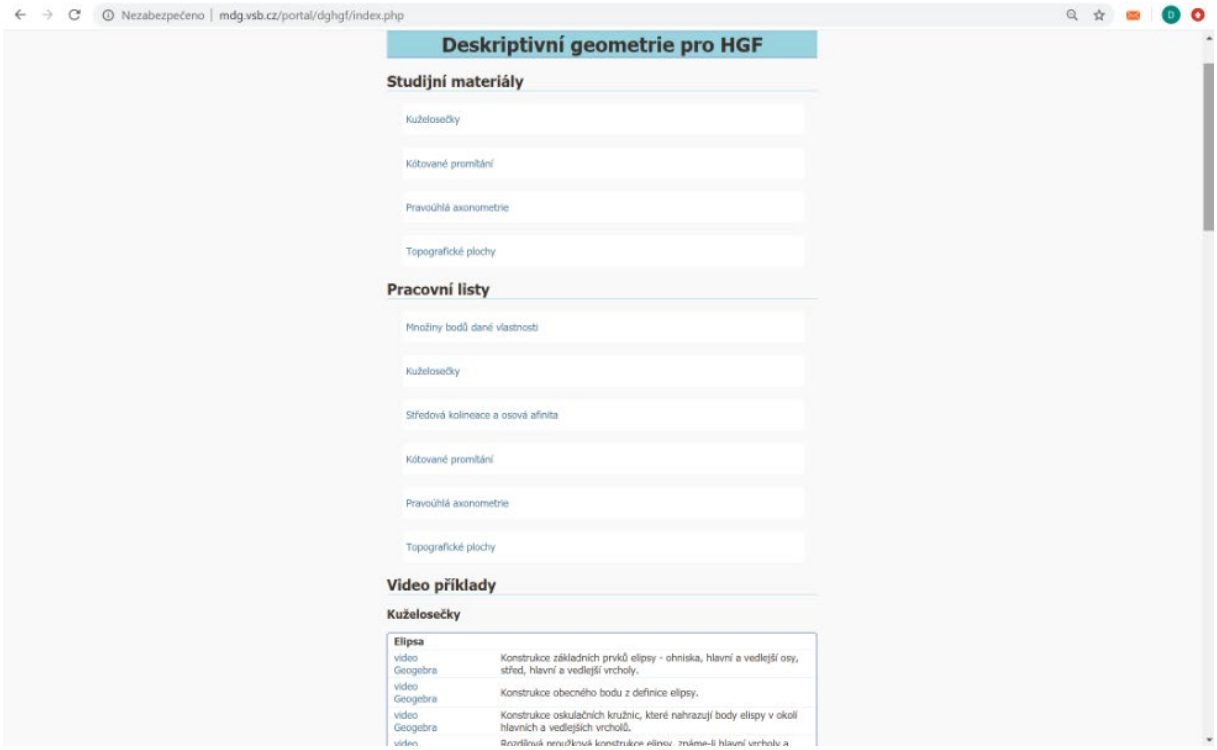
During quarantine when need for transferring education in the online environment arose we could apply these materials immediately without interrupting classes. In the first three weeks, classes took asynchronous form. In the following week, we could start giving presentations and lead tutorials according to the timetable thanks to the BigBlueButton product within LMS Moodle.

COMPLEMENTARY DISTANT STUDY MATERIALS

Materials for all subjects are saved on a publicly available portal where a student selects the subject he/she is interested in. We chose this storage allowing not only our students but also other interested people to access these materials. If we stored these materials in the LMS system, they could be used only by students registered as users in a given subject.

One of the subjects is, for example, Descriptive geometry for the Faculty of Mining and Geology of VSB – TUO (http://mdg.vsb.cz/portal/dghgf/index.php). After clicking on this subject, students get to a website offering appropriate text books, worksheets with unsolved problems and applets in GeoGebra with step-by-step constructions of these problems to check accuracy of construction. In places where a student has troubles finding a solution, there is a recorded video tutorial available for each problem including analysis of the problem and audio commentary of the step-by-step construction. For video recording we use interactive board, program for operating the board, which is called the Device manager, then the Camtasia studio for cut and sounding and a graphic GeoGebra calculator for functions and 3D mathematic, which is free to download.

Figure 1: Demonstration of the subject page.



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In the period of asynchronous form of learning, students were given particular chapters in textbooks to study followed by the instruction to construct given problem areas included in worksheets accompanied by related commented video tutorials. As a feedback, students were given to solve problems in a week time. We invited students to solve problems collectively. In case of need, they could reserve one of the announced consultation times via Skype. After students submitted the given problems and their solutions, correct solutions were published, and we addressed the mistakes students made.

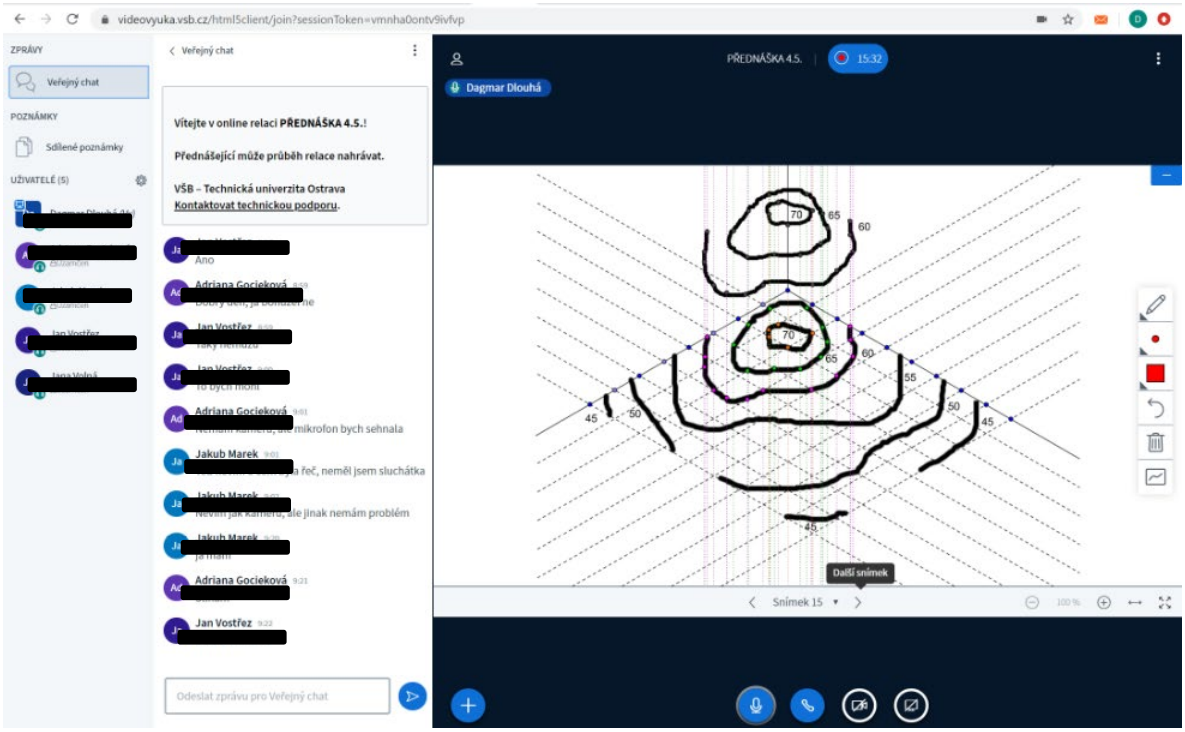
This solution based on contactless instruction was temporary. If we had to continue this way, we would not be able to manage the extent of the prescribed study areas for this semester

as the pace of learning would rapidly slow down. Therefore, we have decided to start recording lectures accompanied by audio commentary on a tablet featuring the ProMotion function. This allowed us to write as if on a real board using a special pen. These videos were made accessible to students in LMS. The disadvantage was the video size limit set in LMS. This, however, remained to be asynchronous form of instruction and we all missed mutual communication. We thus started to prepare for teaching in the Microsoft Teams environment. Nevertheless, at the same time we were provided information that the university prepared its own LMS-embedded online environment, which is interconnected with the school portal for students and employees.

ONLINE BIGBLUEBUTTON CONFERENCE ENVIRONMENT

The BigBlueButton product in LMS Moodle was put into operation for us by the Centre for Information Technology of VSB – TUO. Connecting to broadcasting (relation), participants move from LMS to the BigBlueButton conference environment operated at the university data centre. Neither students need to register nor notify in the system as they are already signed in. There is no need to install anything in the computer as everything runs only in the web browser. The only thing to do for using microphone, webcam, and sharing the screen is to allow the web browser access to the given devices and features. Students (audience) enter each broadcasting/relation (room) with implicitly forbidden sharing of the microphone and/or webcam. The lecturer is allowed to unblock the given devices. In the case of a lecture, unblocking is not necessary as students may write comments in the chat even during the lecture. In BigBlueButton, the lecturer can decide anytime during the lecture if to make a permanent recording of the ongoing relation/lecture. The recordings made in BigBlueButton in LMS can be hidden or deleted by the lecturer anytime. The lecturer is allowed to use a presentation or share screen as a visual input. For presentations, MS Office (PowerPoint, Word) package or PDF files can be used. The screen serves as an interactive board, and the lecturer is allowed live entry into the recorded presentation using interactive tools available on the panel.

Figure 2: Screen view.



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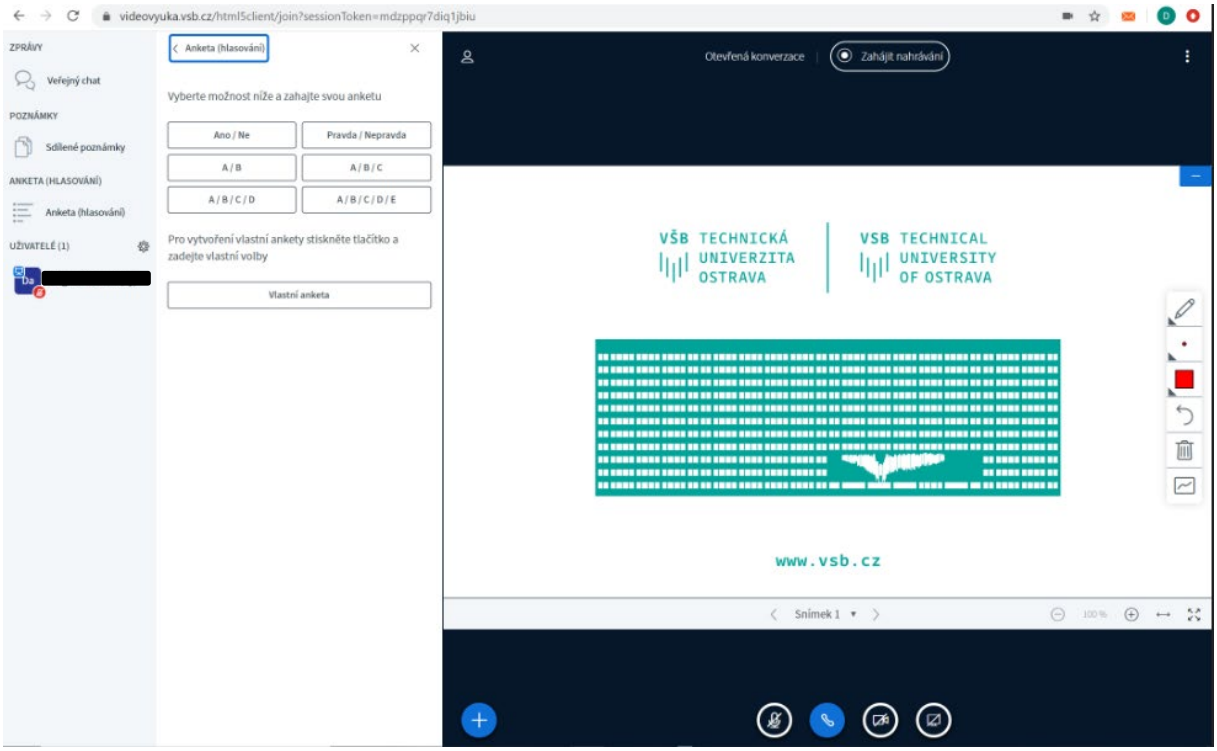
To prepare for an online presentation is by far more difficult than for an on-site presentation. The lecturer must more intensively clarify the expected outcome of the presentation and its timing as in an online environment as there is no space for improvisation. Already while preparing a presentation, it is necessary to think hard how to maintain the presentation dynamics. It is advisable to prepare small tasks for students to solve themselves. There are several ways how to check them. Students may write their results in the chat window, or the lecturer may allow them to use some of the interactive tools available on the panel. A great means of communication is a survey. In proper formulation of a task or a question, a whole group may answer at the same time. The lecturer can see students' answers. In the end, the lecturer may release the survey's results.

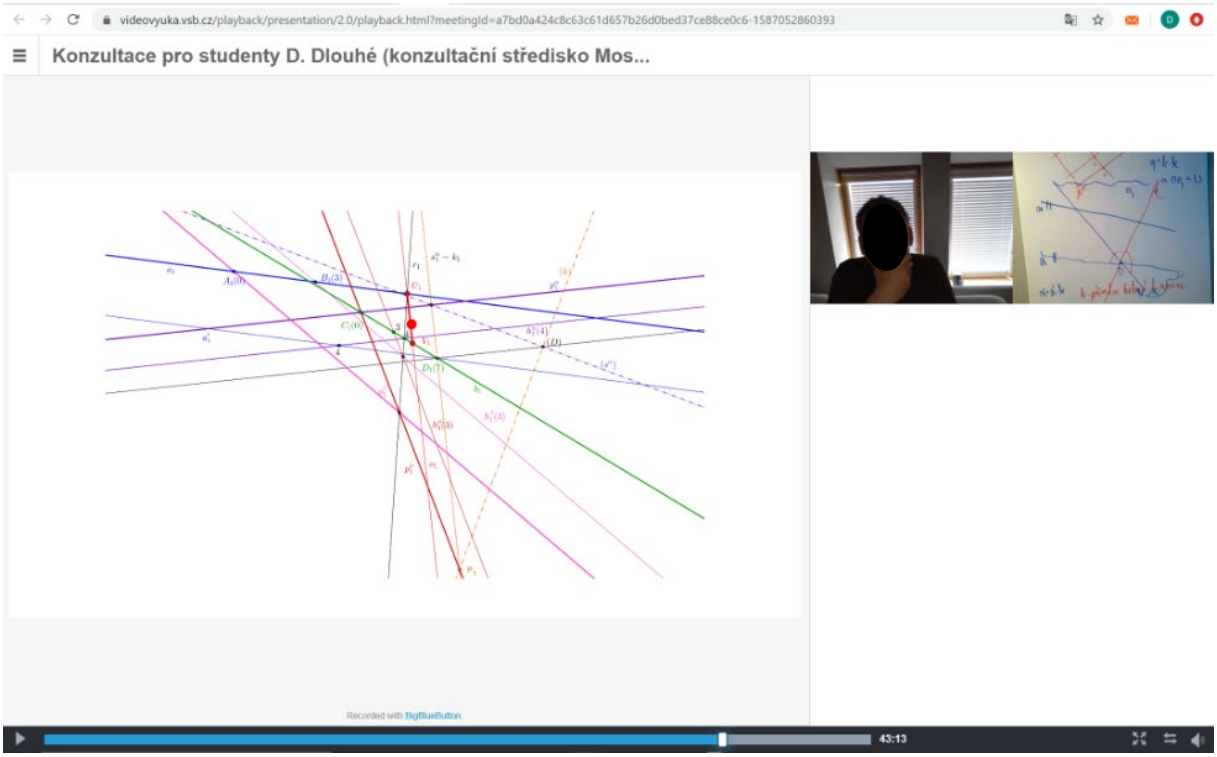
Figure 3: Screen view.



(Source: Own)

The survey can also be used during the students' individual work when they do use a computer so that screen sharing cannot be used for carrying up the check. By aptly selected questions, the lecturer has an opportunity to observe the students' progress in solving the given task. Where students are stuck, it is possible to insert a short key in the presentation using an interactive tool. However, it is more advisable to consider potential mistakes or difficulties ahead in order to count with them while preparing the presentation. Another device which can be used is a camera. Particularly convenient is the use of an overhead camera, which can shoot a sheet of paper to write on. Students can simultaneously see the presentation and an image provided by such camera.

Figure 4: Video taken during a consultation.



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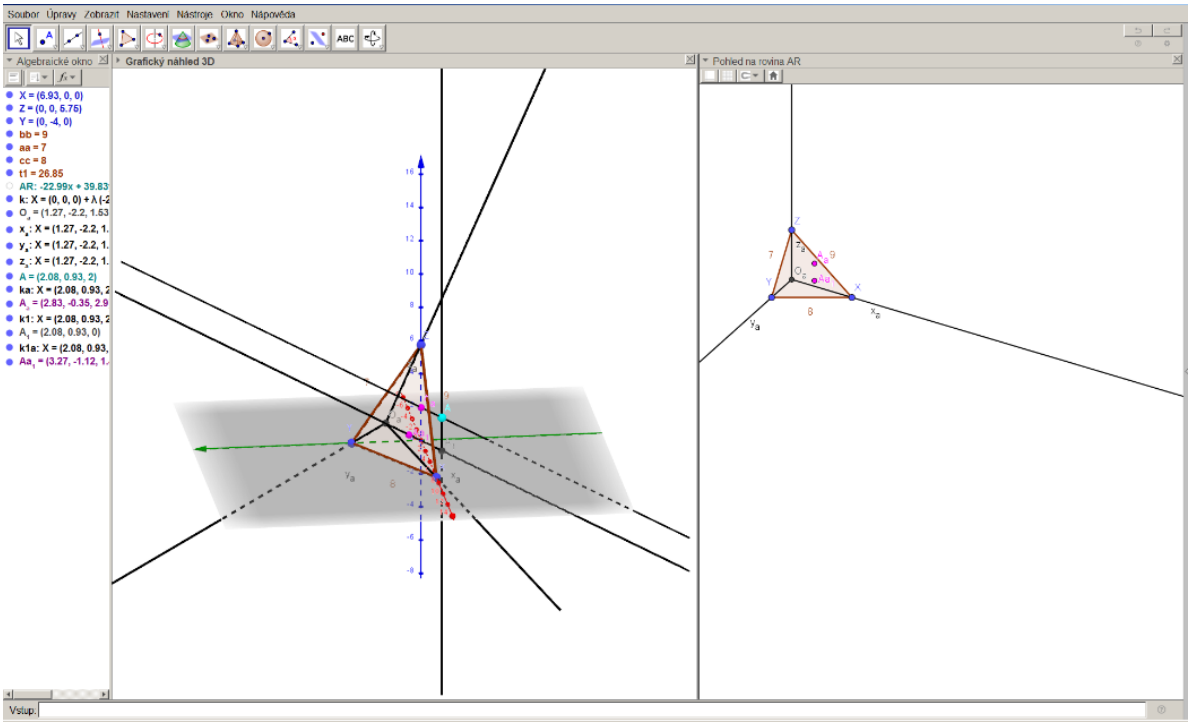
ONLINE TEACHING OF DESCRIPTIVE GEOMETRY

In preparing a descriptive geometry lecture, the GeoGebra software is used.

Figure 5: GeoGebra.

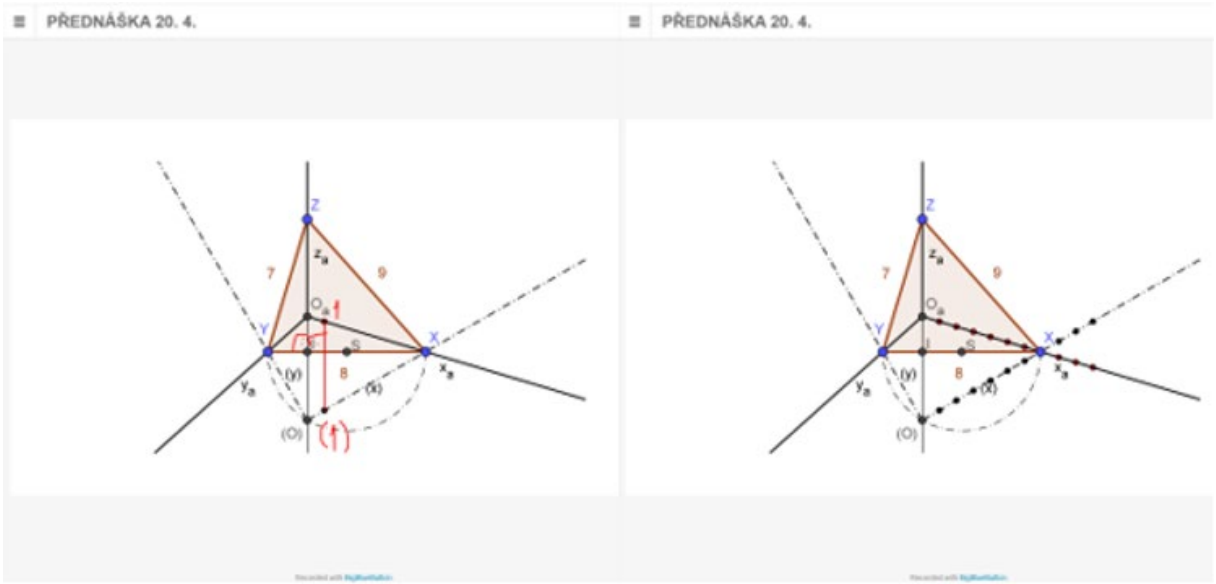


(Source: Own)

GeoGebra is a program focused on dynamic geometry (DGS), which also includes some of the elements of computer algebra (CAS – Computer Algebra System). It is continuously localized into many languages including Czech. It is well arranged with very intuitive control and fast-developing – on its website (http://www.geogebra.org), new versions keep emerging. The program is freely available for non-commercial use - see the licensing conditions introduced in the program environment. In preparing the educational materials, we take advantage of the feature allowing us to work simultaneously in two windows. In one of the windows, we use the module for displaying problems in 3D, and in the second window, on the other hand, we can observe the 2D rectangle projection of the solved problem into the picture plane. This way we are trying to make up for tactile entry into learning. Another possibility is to compare geometrical figures to objects of everyday use, which might be at students' hands (e.g., plain – ruler, glass – cylinder, etc.). An oral commentary may then serve to instruct students to model the problem themselves.

We download each step of construction and insert it, one by one, in the presentation. Since individual steps “keep coming”, we discuss with the students the following step and draw it in the presentation using interactive elements.

Figure 6: Demonstration of a preparation for the following construction step.



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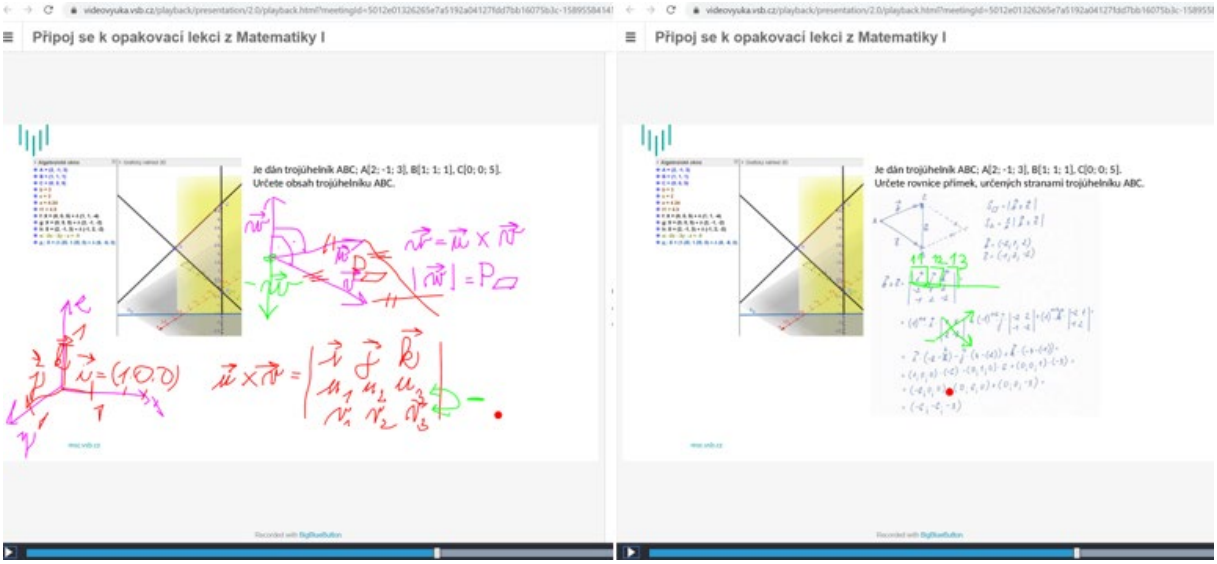
ONLINE TEACHING OF MATHEMATICS

While there is a lack of materials to teach descriptive geometry, far more materials are prepared for online teaching of mathematics not coming only from our production. We can take advantage of numerous, high-quality materials from verified sources available on the Internet.

Online lectures as well as seminars take place in the BigBlueButton conference environment. During the lecture, we use standard presentations supplemented with white pages serving as a board. Lectures are recorded and made available to students via LMS. In seminars, when students are supposed to practice what they were taught during lectures, again we discuss with students the following step, take survey questions into consideration, and only after that we move forward in the presentation. As writing directly on the screen requires a lot of space, we combine the prepared presentation with completing it using interactive elements.

For self-study purposes, students may use our materials with each of them focused on a given course of mathematics (Fundamentals of Mathematics, Mathematics I, Mathematics II, Probability and Statistics, Numerics, etc.) provided by a prepared website, where complementary distant study materials can be found – suitable textbooks, worksheets with theory, and worksheets with both solved and unsolved problems. They can also use a huge library of video tutorials with an audio commentary.

Figure 7: Demonstration of step-by-step problem solution.



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SHARING

Maintaining contact with other colleagues by means of occasional online conversations is the way to foster awareness of what is on at school. At the same time, it is necessary to share acquired knowledge about online education and its coordination, help each other implement new technologies, discuss further process of education, and prepare collectively for online exams. Being said above that all subjects are primarily taught based on teacher-student communication, then this communication should be maintained not only between the lecturer and a student but also in the team of lecturers as well as among students. We have therefore prepared for students open virtual classrooms where they can meet, learn together, and ask their teachers questions they cannot answer themselves. We can respond to questions either directly in the chat or we can discuss a particular problem area in the earliest possible online lesson.

CONCLUSION

The closure of schools and an immediate transfer to online learning was a tremendous challenge for both teachers and students. We cannot yet objectively assess how well we faced this challenge. However, we can already say that we were forced to take up new technologies, which we would not probably consider for teaching under normal conditions. We have filled courses in LMS with a plenty of new educative materials applicable even once classes take place back in classrooms. We will maintain consultations in LMS because we know that part-time students are highly interested in them. Nevertheless, all teachers and students alike are looking forward to collective face-to-face classes back at school.

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USING E-TEST IN ONLINE MATHEMATICS EDUCATION DURING A PANDEMIC FOR FERENC RAKOCZI II TRANSCARPATHIAN HUNGARIAN COLLEGE OF HIGHER EDUCATION STUDENTS

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Abstract

The COVID-19 pandemic has greatly changed mathematics education for the Ferenc Rakoczi II Transcarpathian Hungarian College of Higher Education students. One of the difficult points for a teacher is the survey during online education. In mathematics, open-ended worksheets are typically preferred for summative assessment of students 'knowledge. Although the educational application of e-tests was already present, with the introduction of distance learning it became even more relevant in mathematics. Meanwhile, the e-tests currently measured by teachers are not examined in terms of goodness indicators (objectivity, validity, reliability). In this article, we approach e-tests to measure knowledge of mathematics education at the Ferenc Rakoczi II Transcarpathian Hungarian College of Higher Education. The aim of the research is to present the statistical evaluation of the summary e-test I prepared. I created this on a platform that is easy to assign as there is no need to register students. To preserve objectivity, I created the items according to the dimensions of the Bloom taxonomy by observing the necessary application of open and closed task types. I calculated its reliability using Cronbach's alpha, the low value of which may have been due to the low mean correlation. Because the reliability of the test is low, its validity is also relatively low, as it does not measure true value well.

Keywords

Distance learning. E-test. Mathematics education. Goodness indicator. Bloom-taxonomy.

INTRODUCTION

Due to the COVID-19 pandemic, it was also necessary to introduce online education in the 2020/21 school year. As a teacher, I strive for objective evaluation. In distance learning, I solved the examination and the summative assessment of the level of knowledge with the help of video calls and e-tests. Thus, the problem arose of how to correctly create tests for students knowledge level measurement. In the following, I present the most important information needed for test preparation, which I studied and used for my research and self-examination.

Distance learning and e-test

It is important to understand what is meant by 'distance learning.' Because the technology is evolving, the definition of what distance learning is continues to change (King et al., 2001). According to Keegan (1980), the main elements of a definition of distance education are:

- the separation of teacher and learner which distinguishes it from face-to-face lecturing;
- the influence of an educational organization which distinguishes it from private study;
- the use of technical media, usually print, to unite teacher and learner and carry the educational content of the course;
- the provision of two-way communication so that the student may benefit from or even initiate dialogue;
- the possibility of occasional meetings for both didactic and socialization purposes;
- the participation in an industrialized form of education (Saykılı, 2018).

Distance education is a planned learning experience or method of instruction characterized by quasi-permanent separation of the instructor and learner(s). Such variation includes the types of media or technology used (print, radio, computer); the nature of the learning (workshop, seminar, degree program, supplement to traditional classroom, levels of support); institutional settings; topics addressed; and levels of interactivity support (face-to-face, online, blended, none) (Burns, 2011).

The practices, philosophies and cultures of the persons attempting and developing open and distance learning have impacted how it is designed and conducted (Saykılı, 2018). One of the fastest-evolving modes of distance education is Web-based or online learning (also referred to as virtual learning or e-learning). Indeed, in many parts of the globe, online learning equals distance education. The potential of online learning rests on its ability to do the following:

- Deliver multichannel instruction encompassing print, audio, visual, and video-based content.
- Provide multiple formats for text-based, audio, and video-enabled real-time communication and collaboration with peers across the globe.
- Offer “anytime, anyplace” learning, provided learners have access to the Internet (Burns, 2011).

According Korenova Therefore we can define the term “e-test” dually: 1. In a narrower meaning, the e-test is an electronically controlled didactic test with an option to enrich it with multimedia elements. 2. In a wider meaning, the e-test is an electronic interactive material based on a system of questions and searching for answers created not only for measuring, but also for reaching educational goals (hence can serve as tools for innovative teaching methods). Using e-test we are able not just to determine the students’ knowledge, but with these new digital tools we can increase the students’ motivation, use them during repetition, exercise, controlled discovery methods. The e-test is very attractive from the students’ point of view because the digital world is very close to them (Korenova, 2013).

The use of digital technologies in teaching, distance learning and e-tests is addressed by several authors in publications such as (Guncaga, Korenova & Kostrub, 2018; Korenova, 2015; Korenova & Hvorecky, 2018; Kónya & Kovács, 2019; Slaninka & Simonka, 2017; Vaclavik, Sikorova & Barot, 2019).

Goodness indicators and coefficient alpha

Measurement is central to the construction of a quality student assessment even in the case of a classroom-designed or non-standardized assessments instrument (Eluwa et al., 2011). One of the most important priorities of the automatic e-test assessment and organization is resource saving (Sokolova & Totkov, 2005). The tests used in most tests are usually performance tests, in which case the answer to each item can be correct or incorrect. Such items and variables are called dichotomous (bivalent) variables (Hidegkuti-Balázs, 2015).

In evaluating the quality of an assessment tool, a discussion of reliability and validity is essential. The reliability is the degree to which an instrument consistently measures the ability of an individual or group while validity is the degree to which an instrument measures what it is intended to measure. The classical test theory provides a very simple way of determining the validity and reliability of a test (Eluwa et al., 2011).

In 1951, Cronbach proposed an alpha coefficient (Hidegkuti-Balázs, 2015). Cronbach's alpha is a measure used to assess the reliability, or internal consistency, of a set of scale or test items. In other words, the reliability of any given measurement refers to the extent to which it is a consistent measure of a concept, and Cronbach's alpha is one way of measuring the strength of that consistency (Goforth, 2015).

Figure 1 shows the Cronbach's formula, where n is the number of items, V_t is the variance of the total scores and V_i is the variance of the item scores (Panayides 2013).

Figure 1: Cronbach's alpha.

$$\alpha = \frac{n}{n-1}\left(1 - \frac{\sum_i V_i}{V_t}\right)$$

(Source: Panayides, 2013)

Panayides (2013) describes alpha that has the following important properties: (a) α is the mean of all possible split-half coefficients (b) α is the value expected when two random samples of items from a pool like those in the given test are correlated (c) α is the lower bound of the coefficient of precision … (d) α estimates, and is the lower bound to the proportion of test variance attributable to common factors among the items … (e) α is an upper bound to the concentration in the test of the first factor among the items.

The resulting α coefficient of reliability ranges from 0 to 1 in providing this overall assessment of a measure's reliability. Although the standards for what makes a "good" α coefficient are entirely arbitrary and depend on your theoretical knowledge of the scale in question, many methodologists recommend a minimum α coefficient between 0.65 and 0.8 (or higher in many cases); α coefficients that are less than 0.5 are usually unacceptable, especially for scales purporting to be unidimensional (Goforth, 2015).

If the number of items is small or the average correlation is low, the Cronbach's alpha value will also be low. Nor does a high Cronbach's alpha mean that test items measure a same dimension (Hidegkuti-Balázs, 2015).

Examination using e-Learning environments guarantees reliability, objective assessment, and application of identical assessment criteria for each examinee. Using e-tests teachers can check the knowledge and skills in many more domains compared to the

classical form of examination. Moreover, learners can see outcomes of their achievements and learning progress much faster compared to the time necessary for the classical way of examination (Sokolova & Totkov, 2005).

Bloom-taxonomy

Test questions and assignments, which are included in a concrete e-test can be chosen based on different principles and rules. Opinions of different authors expressed in the literature, are very contradictory. Some authors consider that the test assignments must be chosen according to their type (according to the appropriate classification), and others think that they must be chosen according to their content (including relationship with the subject domain) and/or cognitive objectives of the learning process (Sokolova & Totkov, 2005).

Bloom's Taxonomy is a classification of the different objectives and skills that educators set for their students (learning objectives). The taxonomy was proposed in 1956 by Benjamin Bloom, an educational psychologist at the University of Chicago (Shabatura, 2013). A group of cognitive psychologists, curriculum theorists and instructional researchers, and testing and assessment specialists published in 2001 a revision of Bloom's Taxonomy with the title A Taxonomy for Teaching, Learning, and Assessment (Armstrong, 2010).

Table 1 shows two-dimensional cross-classification of Types of Knowledge by cognitive processing skill.

Table 1: The Taxonomy table.

The Knowledge Dimension	The Cognitive Process Dimension					
	1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual knowledge						
B. Conceptual knowledge						
C. Procedural knowledge						
D. Metacognitive knowledge						

(Source: Anderson, Krathwohl et al., 2001)

These 6 levels can be used to structure the learning objectives, lessons, and assessments of your course:

- Remembering: Retrieving, recognizing, and recalling relevant knowledge from long-term memory.
- Understanding: Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.
- Applying: Carrying out or using a procedure for executing, or implementing.

- Analyzing: Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.
- Evaluating: Making judgments based on criteria and standards through checking and critiquing.
- Creating: Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing (Shabatura, 2013).

In the revised taxonomy, knowledge is at the basis of these six cognitive processes, but its authors created a separate taxonomy of the types of knowledge used in cognition:

- Factual Knowledge
  - Knowledge of terminology
  - Knowledge of specific details and elements
- Conceptual Knowledge
  - Knowledge of classifications and categories
  - Knowledge of principles and generalizations
  - Knowledge of theories, models, and structures
- Procedural Knowledge
  - Knowledge of subject-specific skills and algorithms
  - Knowledge of subject-specific techniques and methods
  - Knowledge of criteria for determining when to use appropriate procedures
- Metacognitive Knowledge
  - Strategic Knowledge
  - Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge
  - Self-knowledge (Armstrong, 2010).

METHODS

During the distance learning introduced due to covid-19, I took several tests in the 2020/21 school year. At first, I didn't consider test theory yet, then I felt it was lacking and I was increasingly trying to create appropriate knowledge level gauges.

I graduated a pilot research at the Ferenc Rakoczi II Transcarpathian Hungarian College of Higher Education Mathematics and Informatics students. The group of 8 people wrote several tests in the spring of 2021, which I had created on several surfaces. In this article, I present the 20-item examination test, the open and closed tasks of which I created based on the Bloom taxonomy. The distribution of taxonomies and items is shown in Table 2.

Table 2: Taxonomies and items.

Bloom's taxonomy	Piece		Items	Piece
B1	5		One choice	6
B2	2		Multiple choice	1
B3	2		True – false	4
C1	4		Matching	5
C2	2		Input digit	2
C3	5		Input text	2
Sum	**20**		**Sum**	**20**

(Source: Own)

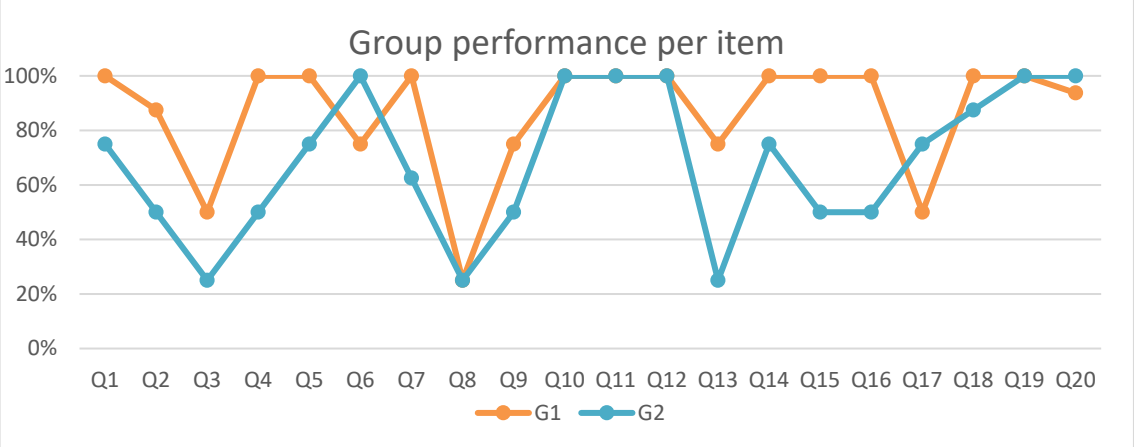
I used the Online Test Pad (https://onlinetestpad.com) platform to create the test. I chose this interface for several reasons: here I found most of the item types I was looking for with a simple editing interface; complex configuration options in terms of filler constraints; the test can be distributed by sharing a link without registering and creating a group (group creation is also possible on the interface if necessary); the test downloadable in pdf format for offline application; can be easily completed online using both a computer and a mobile phone after opening the link.

Students had 30 minutes to complete the test, while they were video call with me. On the video call I saw that they used only their knowledge. In addition to theoretical knowledge, it was also necessary to solve practical tasks.

RESULTS

In the summative e-test, all students managed to reach the required minimum of 50% completion. The best result was 95%. In order to analyse the effectiveness of the e-test more accurately, I classified the 8 results received into 2 classes in the group above (G1) and below (G2) the performed average. Figure 2 shows well which items (Q1, Q2,…, Q20) show surprising results.

Figure 2: Results of groups per item.



(Source: Own)

Let us first consider tasks Q6 and Q17, for which several correct answers were received from group G2. Question Q6 based on Bloom taxonomy C3 (procedural + apply) was an open-ended question, students needed defining the limit of a function. I ruled out the possibility of choice, it was necessary to perform an independent calculation, so better

results could be expected from above-average students. For problem Q17, the solution of a B1 (conceptual + remember) true-false type item had to be given. Here, even in the case of incorrect and correct solutions, in addition to remember, there are opportunities for uncertainty and non-remember in both groups, which led to the results seen.

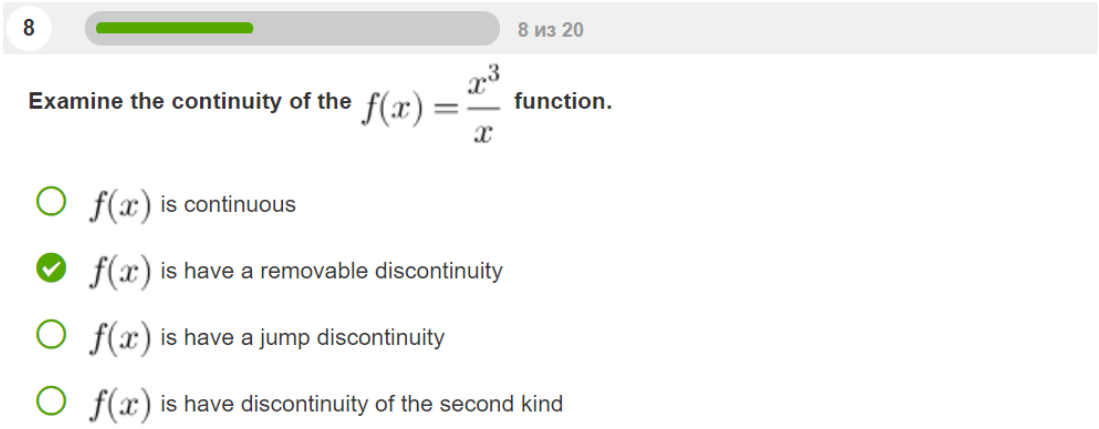
Questions Q10, Q11, Q12, and Q19 were answered correctly by all members of both groups. These questions were on Bloom B1 and C1 (procedural + remember) level and they were matching, input text, true-false, and one choice type of items. It can also be considered a mistake of the research that these items had to be recalled for basic knowledge, although I paid close attention to the students to give a correct answer only with their clear knowledge.

Statistically, the most difficult questions were questions Q3, Q8, and Q13, in which the groups gave correct or incorrect answers while the results remained at the level appropriate to the group or performed equally poorly. All three items contained practical assignments, based on Bloom taxonomy C3 (procedural + apply) and one choice type.

In question Q3, the domain of a rational function had to be specified correctly, for which the criterion of the square root in the denominator of the fraction had to be known and applied. Under the square root was the quadratic equation could be easily solved using the Vieta's formulas.

Question Q8, shown in Figure 3, proved to be the most difficult item for both groups. One correct answer was received to this question in which the continuity or discontinuity of a function had to be determined.

Figure 3: Item 8 for the test.



(Source: Own)

In this case, I assume that due to lack of time, students did not count but chose one answer from those listed. I drew this conclusion because in the Q7 question before it, the formulas had to be matched to the same concepts in Q8. Everyone in group G1, while only one student in G2 paired correctly, the others could only solve half of the question. In group G2, not the student who gave correct answer to Q7 gave the correct answer to Q8.

For question Q13, the difference between the 2 groups was greater. While 1 person from group G1 spoiled the answer, 1 person from group G2 was able to answer correctly. In the task, the primitive of the given function had to be marked. To get the right answer, the students had to know the concept of a primitive function and the primitive of

trigonometric functions. A student who confuses the concepts of primitive and derivative of a function had the opportunity to mark a wrong answer.

Surprisingly many students made a mistake in these questions in both groups. This allows me a condition to assume that in these cases, the multiple-choice type allowed room for inaccurate work or wrong choices without calculations and thinking.

The questions not mentioned earlier show the expected difference between the two groups, which suggests that they are good in reliability and well measured. These include a mix of item types and questions corresponding to Bloom taxonomy levels. Nevertheless, from the point of view of statistical analysis, the examined task set cannot be considered a reliable e-test, because the Cronbach's alpha value of 0.15 is too low, so it falls into the unacceptable category.

DISCUSSION AND CONCLUSION

Seeing my results at the end of the analysis, I conclude that while the best start was to delve in the theoretical knowledge before trying it out in practice, I don't have to stop this if the expected results don't show up on the first try.

One of the aims of the research I achieved by making it easier to create an objective e-test using the Bloom taxonomy. It was helped to maintain objectivity by being created on an online platform and improved it by the system itself. Its validity depends on its reliability, which, given the results obtained, I cannot yet establish with certainty.

Figure 2 suggests that the e-test examined, and its results are rather reliable. In contrast to the low value of Cronbach's alpha. This may have been due to low mean correlation or small sample size. To clarify this, it would be advisable to repeat the research, preferably in a larger group, as more accurate calculations can be performed with a multi-item sample. If I get a similar result after repeating, I can conclude that this e-test is unreliable.

Overall, the research has not been fully effective, so further research is needed.

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EXPRESSIONS OF FOLK WISDOM ACQUIRED AND MASTERED VIA THE METHOD OF PERSONALIZATION

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Abstract

Communication is a broad categorization of competence, and it might include subparts, such as reading comprehension, speaking, listening, and writing. Blended learning, a method of personalization, is ideal in educational settings since it mixes traditional classroom instruction with online delivery of instruction and content, including learning activities outside school, granting the learner a degree of control over time, place, pace, and path. Based on the unsatisfactory results constantly achieved in performance in reading in the Programme for International Student Assessment and later demonstrating communicative language competences that are not in concordance with the Common European Framework of Reference for Languages, students of the University of Economics in Bratislava are motivated in business English courses to be interested in improving their reading skills by working with online articles, acquiring and mastering business vocabulary and idiomatic expressions causing difficulty in comprehension, improving communication, and, most importantly, achieving better study results. The paper provides discourse analysis for idiomatic expressions and tests the significance of the difference between the grades achieved in final tests by 97 students of the experimental group and the control group via the method of Hypothesis Testing, namely t-Test. The results confirm that, in a blended learning approach, technology is seen as a powerful tool to enhance what is already proven to be effective pedagogy.

Keywords

Text. Fixed formulae. Blended learning. LMS Moodle. Communication. Sociolinguistic competence.

INTRODUCTION

The *Programme for International Student Assessment* (PISA) 2018 results reveal that the Slovak Republic, together with other six countries or economies, saw declining mean performance in reading. Slovak readers achieved unsatisfactory results in the assessments in 2003, 2006, 2009, 2012, and 2015. In 2018, the Slovak Republic (out of 79 countries) was in the 41st place, i.e. statistically significantly below the OECD average.

The data also indicate that there is a close inter-relationship between a student's performance in PISA and his or her parents' level of education (as measured by their educational qualifications). Countries or economies with more highly educated and skilled adults are at an advantage over countries or economies where parents have less education (OECD, 2019).

There is a change between 2009 and 2018 in what and why students read. Chatting online (e.g. Whatsapp®, Messenger®) is the activity with the highest percentage (93.1%), then, searching for practical information (e.g. schedules, events, tips, recipes) (84.1%),

and reading online news (79.7%). Exactly 49.1% of students state that they read only if they have to; 29.0% of them read fiction (e.g. novels, narratives, stories), and only 18.5% of students read magazines and 25.4% read newspapers (OECD, 2019).

Evolving technologies have changed the ways people read and exchange information. The rapid digitalization of communication has a profound impact on the kind of information literacy that young adults will need to demonstrate in their future jobs and in their wider social interactions.

Both digital communication and face-to-face communication are equally important at school and in the workplace. Sociolinguistic competence concerns the capabilities (knowledge and skills) required to deal with the social dimensions of language use. Since language is a sociocultural phenomenon, much of what is contained in the *Common European Framework of Reference for Languages* (hereafter CEFR), particularly in respect of the sociocultural, is also of relevance to sociolinguistic competence (Council of Europe, 2020).

Since the educational results are not positive in most cases, students of the University of Economics in Bratislava are motivated to improve their communication skills via working with online texts. The aim of the paper is to provide discourse analysis for the expressions of folk wisdom, namely idioms, by a control group of students through personalization, and to test the significance of the difference between the grades achieved in a final-term business English test and a final-term idiomatic test by both the experimental and control groups of students. The method of Testing Hypothesis, namely t-Test, tests the Alternative Hypothesis (H_1) and the Null Hypothesis (H_0).

SOCIOLINGUISTIC COMPETENCE

The competence models developed in applied linguistics in the 1980s influenced the CEFR. Hymes (1967) coined the term ‘communicative competence’ as a reaction to Chomsky’s notion of ‘linguistic competence’. The concept has developed over years and different models of communicative competence have been presented by scholars, such as Hymes (1967, 1972), Canale and Swain (1980), Canale (1983), and many others. Aspects of communicative language competence are presented under ‘linguistic competence’, ‘pragmatic competence’, and ‘sociolinguistic competence’ (Council of Europe, 2020). These aspects are always intertwined in any language use. The different aspects of each competence are, for instance, vocabulary range, vocabulary control, sociolinguistic appropriateness, turn-taking, coherence and cohesion, fluency, etc.

Canale and Swain (1980) state that sociolinguistic competence in their model is made up of sociocultural rules of use as well as rules of discourse. Sociocultural rules of use help language users to produce and understand appropriately language data based on the speaking components of communicative events outlined by Hymes (1967). Rules of emerging discourse include cohesion and coherence principles which focus on communicative functions of the combination of utterances.

According to Canale (1983), sociolinguistic competence “addresses the extent to which utterances are produced and understood appropriately in different sociolinguistic contexts depending on contextual factors such as status of participants, purposes of the interaction, and norms or conventions of interaction’, and appropriateness of both form and meaning” (Canale, 1983, p. 7). Appropriateness of meaning also includes kinesics and proxemics.

Holmes (1992) asserts that using language appropriately involves knowing the sociolinguistic rules for speaking in a community. It means understanding the influence of social factors on speech behavior. People in different communities acquire varied types of knowledge and they learn to use language appropriately in their own community. The knowledge that underlies people's ability to use language appropriately is known as their sociolinguistic competence.

In multilingual communities, choosing the appropriate *variety* or *code* to use involves choosing from distinctly different languages, as well as *styles* within a language. Children learn their ethnic language first and later other languages are added for purposes, such as education and communication with a wider range of people in a wider range of contexts. *Vernacular languages* are the first languages people learn. A language of wider communication or *lingua franca* is often essential addition to a person's repertoire. Vernacular languages contrast with lingua francas in many ways which reflect their different functions for speakers. For the same reason they differ from *standard languages*, too. The factors that result in the promotion of a particular variety to the status of standard are social rather than linguistic. However, as a result, members of a speech community generally need to acquire some familiarity with a standard language as part of their sociolinguistic competence (Holmes, 1992).

In a monolingual community, sociolinguistic competence includes learning to use the community language in a way which reflects a person's membership of various overlapping social groups. People belong to a particular social group – whether they define it in terms of class or caste or simply group. People also live in a particular region. It is possible that these factors are evident in their speech, but the first will almost certainly be indicated linguistically. If they live in a monolingual community, the social group to which they belong may be indicated by their *pronunciation*, by their *grammar*, or by their *vocabulary* – or by all of these. People almost certainly also indicate in their speech whether they are female or male, children or adults. They unconsciously acquire as part of their sociolinguistic competence the linguistic features which convey these messages in their own community. They learn how to speak appropriately for their gender and age group. Using language appropriately involves learning to take account of who people are talking to. The *setting* itself and the *purpose* of interaction are further factors which influence speech style – choosing vocabulary typical of more formal or less formal speech (Holmes, 1992).

In short, the matters treated in sociolinguistic competence are those specifically relating to language use: a) linguistic markers of social relations (e.g. greetings, address forms and expletives), b) politeness conventions (e.g. the straightforward application of the 'co-operative principle'), c) expressions of folk wisdom, d) register differences (e.g. differences in level of formality), and e) dialect and accent (Council of Europe, 2001).

Sociolinguistic appropriateness – the aspect of sociolinguistic competence

Key concepts operationalized in the 'sociolinguistic appropriateness' scale comprise: using polite forms and showing awareness of politeness conventions, socializing without requiring the interlocutor(s) to behave differently (from B2 Level up) and employing *idiomatic expressions*, allusive usage and humour (at C Levels), recognizing sociocultural cues, mainly those pointing to difference, and acting accordingly, and adopting an appropriate register (from B2 Level up).

In business English courses, we start with learners with level B2 of general English language competence. According to the CEFR (Council of Europe, 2001), they start to

acquire an ability to cope with variation of speech, plus a greater degree of control over register and *idiom*. They can express themselves confidently, clearly, and politely in a formal or informal register, appropriate to the situation and people concerned. With some effort they can keep up with and contribute to group discussions, even when speech is fast and colloquial. They can sustain relationships with native speakers without unintentionally amusing or irritating them.

When looking at the CEFR scale of sociolinguistic appropriateness (Council of Europe, 2020) and Slovak undergraduates with level C1 of English language competence, some of them can recognize a wide range of *idiomatic expressions* and *colloquialisms* (they appreciate register shifts), however, they need to confirm occasional details, mainly if the accent is unfamiliar. Some of them can understand humour, irony, and implicit cultural references, however, only some of them pick up nuances of meaning. It is not possible to judge whether they can follow films employing a considerable degree of *slang* and *idiomatic usage*.

Due to 26 hours of instruction per business English course, Slovak students are neither trained to use language flexibly and effectively for social purposes, including emotional and allusive usage, nor to adjust their level of formality (register and style) to suit the social context: formal, informal, or colloquial as appropriate, and maintain a consistent register. Only some of them have a good command of *idiomatic expressions* and *colloquialisms* with awareness of connotative levels of meaning. Therefore, Slovak students need to be trained to appreciate virtually sociolinguistic and sociocultural implications of language use by proficient users of the target language and so that they can react accordingly. They also need to be trained to effectively employ a wide variety of sophisticated language to command, argue, persuade, dissuade, negotiate, and counsel.

EXPRESSIONS OF FOLK WISDOM

Folk wisdom is the body of knowledge and experience that originates from the beliefs and opinions of ordinary people. Many scholars investigate folk wisdom and the behaviour of people. For instance, the concepts of ‘optimism’ and ‘pessimism’ are rooted in centuries of folk wisdom about the consequences of people’s expectations for the future (Carver, 2001). Or folk wisdom has long invoked the concept of ‘willpower’ as an essential ingredient for successful self-control and self-discipline, suggesting that energy is consumed in such acts of volition (Baumeister and Vohs, 2016). Sanchez-Burks et al. (2006) examine cultural differences and similarities in folk wisdom about the effects of perceived conflict.

Folk wisdom claims that ‘we get what we give’ and ‘what goes around comes around’. These folk sayings assume that people will respond to a person similarly to the way the person responds to them. However, there is also the possibility that people will get something different from what they give others (Malloy, 2018). Or, although folk wisdom claims that ‘money does not make happy’, findings point to an overall low, but remarkably positive relationship. Not surprisingly, the prediction of happiness from economic resources improves if other indicators of wealth, besides income, are considered (Jonas et al., 2001). Scholars who deal with folk wisdom are Mieder (2005, 2014), Sadikovna (2021), and many others.

Expressions of folk wisdom are fixed formulae of different type that both incorporate and reinforce common attitudes and contribute notably to popular culture. They are frequently used, for instance, in ELT course books, newspaper articles, or in spoken

communication. A knowledge of this accumulated folk wisdom is a noteworthy component of the linguistic aspect of sociocultural competence.

There are many scholars who deal with idiomaticity or phraseology and provide different classifications of idiomatic expressions, e.g. Fernando (1996), Sonomura (1996), Kvetko (2006, 2014), Cowie et al. (1993), McCarthy and O'Dell (2002), O'Dell and McCarthy (2010), etc. The CEFR (Council of Europe, 2001) provides the following list of expressions of folk wisdom; a) proverbs, e.g. *don't judge a book by its cover*; *where there's a will, there's a way*, b) idioms, e.g. *see eye to eye*, *under the weather*, *have blue blood (in one's veins)*, c) familiar quotations, e.g. *I have nothing to offer but blood, toil, tears and sweat*. (Winston S. Churchill), and d) expressions of belief, such as weather saws, e.g. *fine before seven, rain by eleven*; expressions of attitudes, such as clichés, e.g. *it takes all sorts to make a world*; and expressions of values, e.g. *it's not cricket*. Graffiti, slogans, catchphrases, workplace cards, and posters often have this function.

When considering the expressions of folk wisdom, it is up to lecturers to consider which proverbs, clichés and folk idioms learners should need and be required to recognize and understand as well as use themselves.

BLENDED LEARNING

Modern information and communication technologies (ICT) are commonly used by university teachers all around the world since they want to improve the quality of the teaching and learning process as well as to contribute to the development of students' skills via blended learning. To name a few scholars, we can mention Tang (2013) who does research into blended learning and states that modern technologies, e.g. the Moodle platform, make it feasible to conduct it. He discusses listening, speaking, reading, writing, and translating activities that English as a Second Language learners (ESL) can develop via blended learning. In Shaykina's (2015) view, blended learning in English Language Teaching (ELT) can enhance the effectiveness of the process itself. She lists open educational resources, e.g. Moodle, GoConqr, Emaze, HumBox, and Scoop.it and says that Moodle is one of the most effective resources used at the university. Gluchmanova (2016) raises the level of vocational education in foreign languages with the use of Moodle as well as the latest ICT. Her approach to ELT has proven to be successful. According to Lasić-Lazić et al. (2017), blended learning can improve the learning experience. Moodle offers a wide range of activities that can be implemented in English for Professional Purposes (EPP) Teaching, e.g. Chat, Database, Forum, Hot potatoes, Journal, Lesson/Lecture, Questionnaire, Survey, Dictionary, Shareable Content Object Reference model (SCORM), Wiki, Assignment, and Workshop.

Many European universities provide an exceptional education. Based on the professional experience, universities in the UK or Finland offer one of the best educations in the world. A world-class education expands the student's choices and enriches his or her experiences allowing him or her to fulfil his or her potential and make the most of life's opportunities. Its core teaching is based around conversations, normally between two or three students and their tutor. The student has the chance to talk in-depth about his or her subject and to receive individual feedback on his or her work. Apart from tutorials, that are central to teaching at universities and offer a very rare level of personalized attention from academic experts, students also have a combination of seminars, lectures, language classes, etc. These opportunities provide the perfect environment for an outstanding education.

The Department of English Language of the Faculty of Applied Languages also tries to raise the level of business English courses via blended learning. By working with articles – an assignment done using LMS Moodle – students are given feedback on their work on topics. A tutorial from our side relies on the exchange of ideas so they need to be ready to give a presentation of each article, to present and defend their opinions, accept constructive criticism, and listen to others. Personalized learning is an important way to develop students' abilities to think for themselves – an essential skill for academic success.

METHODS

Part 1

Sample. Twelve first-year students of the Faculty of Commerce of the University of Economics in Bratislava participated in the first phase of the research.

Methodology. During the summer semester of 2018/2019, the group of students worked with newspaper or magazine articles in order to improve their reading and communication skills. They were supposed to find a source of their interest and read twelve articles. However, they were recommended to read articles focused on management and human resources, since these topics were central ones covered in a business English course. For their work, they have chosen the following sources: *Marketing Week*, *Business Insider*, *The Independent*, *The Guardian*, *Adweek*, and *Forbes*.

Data analysis and discussion. The main aim of the study is to analyze discourse the students worked with. A 91,410-word corpus is analyzed for idiomatic expressions. The qualitative analysis covers idioms they were able to identify with the help of their lecturer. The spread of idioms is considerable, yet they are classified under two general headings – *phrase idioms* and *clause idioms* (Cowie et al., 1993).

RESULTS

Tables 1, 2, 3, 4 show the corpuses of idioms found in the chosen sources and provide additional information, e.g. *fml* (formal), *infml* (informal), *BrE* (British English), *AmE* (American English), *AustrE* (Australian English). Since, there are many variants of idioms, the underlined words are the ones that occur in the corpuses. After each table, there are two or three example sentences with idioms used in context as well as their meanings and functions.

[1] While engagement and awareness are important, sales are nonetheless the key measure of success which Cantillon says may sound 'blunt' but it's *as clear as day* when it's the product the influencer is wearing. (Tesseras, 2018)

[2] Aiken says the increase is a sign that ministers 'recognise the value of our work' and see communications as a 'powerful force for good'. However, he will not be *resting on his laurels*. (Vizard, 2018)

[3] *Two heads are better than one*. The decision to go with two partners instead of one means McDonald's can make best use of both companies' areas of expertise. (Roderick, 2017)

Table 1: Idioms used in *Marketing Week* articles.

Marketing Week (23,641-word corpus)	**Total:**
Phrase idioms	**25**
a big name, bits and pieces/bobs, one's bottom line, the bottom line, (a) brave new world (*catchphrase*), (the) carrot and (the) stick, a double-edged sword, a slice of the pie *AmE*, a square peg (in a round hole), trial and error (as) clear/plain as day/daylight, (in) black and white, devil-may-care *old-fashioned*, in the pipeline, in place, off the beaten track, on the table for the meantime, a great/good deal (of sth), in all one's/its/their glory/majesty, in (the) face of sth, in the long/medium/short term, on the spot, out and about *BrE*, year on year	
Clause idioms	**37**
be all well and good, steal the spotlight *esp. AmE*, (be) on the/one's radar (screen), bear/keep sth in mind, bridge the gap/divide (between), bring sth to life, come into effect, come/enter into force, cut it/things fine, fall into the trap of doing sth, fill/fit the bill (fit) *BrE, AmE, AustrE*, get on the wrong side of the law, (go) hand in hand (with sb/sth), heap praises on sb/sth, keep/lose track of sth/sb, labour the point, learn a lesson/learn lessons, pack a punch *infml*, pave the way (for sb/sth), play catch-up *AmE*, put sb/sth to the test, (not) rest/sit on one's laurels, ring true, scratch the surface, set/start/keep the ball rolling, shoot oneself in the foot, stand out from the crowd, sticks in the/your mind, take sb/sth by storm, take sth to heart, take a/one's stand (on sth), throw sb in at the deep end (the) chances are (that), how on earth/in the world? *infml*, it's not rocket science, two/many heads are better than one (*saying*); what/that makes sb/sth tick *infml*	
Total:	**62**

(Source: Own)

In the example sentences, *as clear as day* has a function of a component, and it is an adjectival phrase [Comp (AdjP)]. It is used figuratively with a meaning of 'obvious; that can be understood easily without further explanation'. *Rest on one's laurels* is a subject-less clause pattern and stands for 'to be so satisfied with one's own achievements that one makes no effort to improve'. Finally, *two heads are better than one* is a saying which means 'two people co-operating are likely each to make up for deficiencies in the other's reasoning, memory, methods or plans'.

Table 2: Idioms used in *Business Insider* articles.

Business Insider (21,009-word corpus)	**Total:**
Phrase idioms	**28**
the big picture, the bottom line, a fig leaf, a/the means to an end, a think-tank around-the-clock, back-and-forth, laid-back, tell-tale, top-notch across the pond, along the way, as far as sb/sth goes, at the end of the day *infml,* at one's fingertips, (at) first hand, (the) first thing (in the morning), behind bars, by and large, here and there, in one's (own) backyard, in situ *fml*, on the horizon, (on the one hand…) on the other (hand)…, on the outside, out of the blue *BrE, AmE, AustrE*, per capita, up for grabs	
Clause idioms	**27**
not be all it's cracked up to be, be bulging/bursting at the seams *infml*, (be) in one's element, be like watching paint dry *humorous*, be worlds apart, bear/keep in mind that…, burn a hole in one's pocket *humorous*, give sb a leg up/leg-up (on) *AmE infml*, go with the flow, have time on one's side/time is on one's side, hit sb/sth hard, keep one's/an eye on sth/sb, keep/lose track of sth/sb, kiss/say/wave goodbye to sth, make (funny) faces, pack on (the) pounds, pack a punch, paint a (bleak/rosy etc.) picture of sth, pass muster, run high, serve (one's) time, shoot from the hip, steer clear of sth/sb, take a chance/chances (on sth), take sth/sb into account, take a/its/their toll (on sth) all work and no play (makes Jack a dull boy) (*saying*)	
Total:	**55**

(Source: Own)

[1] 'While deemed by many experts and hoteliers to be a solution in search of a problem, the panic button message has proved to be *a*n effective *fig leaf* for the new

workforce rules, making the initiative appear to be about protecting women, rather than the merits of the other mandates,' the AHLA said about the Seattle measure during a board meeting in November 2016, according to HuffPost, which obtained notes from the meeting. (Stone and Matousek, 2018)

[2] These, along with irritability, lack of patience with colleagues or clients, feeling entirely unfulfilled and simply disillusioned by your job, are *tell-tale* signs that you are burnt out. (Alpert, 2018)

[3] And it seems that an *all-work-and-no-play* mentality has bred a workplace underpinned by a sense of fear that you're never quite working hard enough. (Reid, 2018)

A fig leaf is a noun phrase (NP) and it means 'something that someone uses to try to hide an embarrassing fact or problem'. (In the Bible, Adam and Eve used fig leaves to cover their sexual organs when they discovered they were naked.). *Tell tales* is a verb + direct object pattern V +O meaning 'to spread information about another's secrets, misdeeds, faults, and habits'. However, it can also appear as a noun compound (a tell-tale) or in attributive use (tell-tale). *All work and no play (makes Jack a dull boy)* is a saying which means 'if there is too much concentration on working and not enough time for relaxation or other interests, the worker will become bored and the quality of his or her work will deteriorate.' It is often adapted and the example sentence demonstrates an attributive use of the saying.

Table 3: Idioms used in *The Independent* articles.

The Independent (18,131-word corpus)	**Total:**
Phrase idioms	**15**
a big deal, a clean break, part and parcel of sth, race to the bottom, red tape, seed money, a whistle-blower state-of-the-art at/in/to the forefront (of sth), in excess (of sth), in light of sth *AmE, AustrE*, in the long/medium/short term, in a row, let alone, on the ground(s) that	
Clause idioms	**20**
(be) beyond/outside the pale, be on the brink of doing sth, (be) on tenterhooks *old-fashioned*, the bubble bursts/burst the bubble, come under fire, cut a deal (with sb), fall short (of sth), fly in the face of sth *slightly fml*, get the picture *infml*, (give sb) a dose/a taste of one's own medicine, go it alone, go public, have a hand in sth, join/combine forces (with sb), learn a lesson/learn lessons, plant/sow the seeds (of sth), play catch-up *esp. AmE*, raise the spectre of sth *BrE, AmE, AustrE*, strike a balance (between A and B), teach sb a lesson	
Total:	**35**

(Source: Own)

[1] 'A lack of protection is *part and parcel of* their employment status.' (Hannah, 2018)

[2] One of the world's top financial economists has warned that, a decade after the fall of Lehman Brothers, the '*seeds are being planted*' for the next destructive financial crisis. (Chu, 2018)

Part and parcel of sth is a noun phrase and has a function of a component [Comp (NP)]. It stands for 'an integral part of something'. (Parcel (*archaic*) means 'component of a whole'.). *Plant a seed* is a verb + direct object pattern [V + O], it is used figuratively meaning 'to do something that will cause an unpleasant situation in the future'.

Table 4: Idioms used in *The Guardian* articles.

The Guardian (18,058-word corpus)	**Total:**
Phrase idioms	**26**
sb's bottom line, a foregone conclusion, a rip off, smoke and mirrors, a think-tank, a zero-sum game below/under the radar, eyeball-to-eyeball, ham-fisted *BrE*, in the dark, tit-for-tat, of no avail, spring clean, word-of-mouth along the way, at/in/on the front line (of sth), at a snail's pace, in the long/medium/short term, in a row, let alone, on the back of sth, on the grounds of sth, on the horizon, (on the one hand…) on the other (hand)…, or so, the sky's the limit	
Clause idioms	**16**
be all talk (and not action), be in (on) the front line, be on the brink of sth, (be) out of the wood(s), cause/create a stir, come/enter into force, fight a losing battle, follow in sb's footsteps, get rich quick, have sth in one's sights, learn a lesson/learn lessons, lay sth bare, set the tone (for sth), shoot from the hip, shoot oneself in the foot, take a/its/their toll (on sb/sth)	
Total:	**42**

(Source: Own)

[1] *Smoke and mirrors*: how Trump manipulates the media and opponents. (Yuhas, 2017)

[2] Surveys last week of the construction, manufacturing and services sector showed them all expanding, but *at a snail's pace*. (Guardian, 2018)

Smoke and mirrors is a noun phrase (NP) that stands for 'something which is intended to confuse or deceive people, especially by making them believe that a situation is better than it really is'. *At a snail's pace* has a function of an adjunct and it is a prepositional phrase [A (PrepP)] that means 'very slowly indeed'. (A snail is a small animal with a shell that moves very slowly.)

There were 16 idioms in a 5,587-word corpus of *Adweek* articles and 8 idioms in a 2,975-word corpus of *Forbes* articles. Since they are the smallest ones, there is only one example sentence from each source. Articles from cnbc.com, bbc.com, and moneyunder30.com formed a 2,009-word corpus. They were not analyzed for idioms.

[1] *Wear your heart on your sleeve*… or your chest. (Natividad, 2018)

[2] Now that 17 of Gusto's 70 engineers are female, it's getting a little easier, says Gusto's HR head, Maryanne Brown Caughey. 'It's kind of *a domino effect*,' she says. 'Women know they're joining a welcoming community.' (Adams, 2018)

Wear your heart on your sleeve is a quote that stands for 'to make your feelings and opinions obvious to other people' *A domino effect* is a noun phrase (NP) and means 'the effect which a situation or event has on a series of other situations or events'. (Dominoes are a set of small, rectangle-shaped pieces of wood or plastic, marked with spots on one side. If dominoes are placed standing next to each other, each one will knock the next one over.).

To conclude, students are interested not only in management and human resources, as recommended, but also in topics from different areas of business, e.g. marketing, advertising, economy, finance, trade war, EU policies, US politics, etc.

Part 2

Sample. Altogether 97 second-year students of the Faculty of National Economy and the Faculty of Commerce of the University of Economics in Bratislava participated in the study. The experimental group was formed by 64 students and the control group by 33 students.

Methodology. Both groups of students worked with newspaper and magazine articles, however, the experimental group was involved in more activities done in LMS Moodle, e.g. doing assignments focused on improving writing skills and practising grammar tenses. This group also followed two books (core and supplementary).

In the winter semester of 2018/2019, both groups of students continued in studying idiomatic expressions and at the end of the semester, they sat for a final-term business English test and a final-term idiomatic test.

Data analysis and discussion. The main aim of this study is to test the significance of the difference between the results achieved in a final-term business English test and in a final-term idiomatic test.

To compare the difference between the grades achieved in both tests, the method of Hypothesis Testing has been chosen, namely t-Test. A Dependent Samples t-Test (or Paired Samples t-Test) assesses the significance of the difference between the sample means (Kučerová and Fidlerová, 2012).

Alternative Hypothesis (H_1): The grades achieved by students in a final-term business English test are significantly better than the grades achieved in a final-term idiomatic test.

Null Hypothesis (H_0): There is not a significant difference between the grades achieved in a final-term business English test and a final-term idiomatic test.

RESULTS

Table 5: The experimental group.

	Final-term business English test	**Final-term idiomatic test**
Expected value	1.90625	2.101563
Variance	0.364087	0.874442
Observation	64	64
Pearson Correlation coefficient	0.636033	
Hypothetical difference of expected values	0	
Difference	63	
Test statistics	-2.16519	
P(T<=t) (1)	0.017084	
t crit (1)	1.669402	
P(T<=t) (2)	0.034168	
t crit (2)	1.998341	

(Source: Own)

On the level of significance at 5% ($\alpha = 0.05$), the Null Hypothesis (H_0) is rejected since the p-value = 0.017084 ($p < \alpha$), i.e. the difference can be considered as statistically significant.

Table 6: The control group.

	Final-term business English test	Final-term idiomatic test
Expected value	2.136364	2.212121
Variance	0.551136	0.922348
Observation	33	33
Pearson Correlation coefficient	0.68136	
Hypothetical difference of expected values	0	
Difference	32	
Test statistics	-0.6143	
P(T<=t) (1)	0.271682	
t crit (1)	1.693889	
P(T<=t) (2)	0.543364	
t crit (2)	2.036933	

(Source: Own)

On the level of significance at 5% ($\alpha = 0.05$), the Null Hypothesis (H_0) is not rejected since the *p*-value = 0.271682 ($p > \alpha$), i.e. the difference cannot be considered as statistically significant.

Table 7: The whole group (experimental and control groups).

	Final-term business English test	Final-term idiomatic test
Expected value	1.984536	2.139175
Variance	0.434654	0.884074
Observation	97	97
Pearson Correlation coefficient	0.650462	
Hypothetical difference of expected values	0	
Difference	96	
Test statistics	-2.12787	
P(T<=t) (1)	0.017955	
t crit (1)	1.660881	
P(T<=t) (2)	0.035909	
t crit (2)	1.984984	

(Source: Own)

On the level of significance at 5% ($\alpha = 0.05$), the Null Hypothesis (H_0) is rejected since the *p*-value = 0.017955 ($p < \alpha$), i.e. the difference can be considered as statistically significant.

DISCUSSION AND CONCLUSION

Discourse analysis shows a corpus of 194 idiomatic expressions identified by students with the help of their lecturer. Naturally, a larger number of idioms (218) was identified, e.g. *play a key/major/vital etc. part/role in sth*, *conflict of interest(s)*, etc. that are also used in business English. However, the analysis only covers 'pure idioms' (opaque demotivated idioms), 'semi opaque idioms' (semi-transparent, figurative idioms) and 'semi-idioms' (phraseological combinations) (Kvetko, 2006). The main aim of this task – working with articles, looking for difficult vocabulary and idiomatic expressions, and identifying their meanings – was to motivate students to learn English and achieve better study results. Fernando (1996) says that learning idioms can be an attractive

alternative to study English. Moreover, Gillet (2010) recommends learning idioms to speak business English like an American since the American workplace is full of idioms. In general, students were interested in learning this kind of vocabulary.

The main aim of the second part of the research was to test the significance of the difference between the grades achieved by students in a final-term business English test and a final-term idiomatic test. Regarding the experimental group of students, based on t-Test, it can be stated that there is a statistically significant difference between the grades achieved in a final-term business English test and the grades achieved in a final-term idiomatic test. Concerning the control group of students, based on t-Test, it can be stated that there is not a statistically significant difference between the grades achieved in a final-term business English test and the grades achieved in a final-term idiomatic test. As regards the whole group (both experimental and control groups), on the basis of t-Test, it can be asserted that there is a statistically significant difference between the grades achieved in a final-term business English test and the grades achieved in a final-term idiomatic test. Most importantly, both groups of students achieved better study results (cf. Hrdličková, 2021).

To sum up, learners need to be trained in all matters dealt with in sociolinguistic competence. Lecturers should consider what range of greetings, address forms and expletives, which politeness conventions, what expressions of folk wisdom, and which registers learners should be equipped and required to recognize, understand, and use themselves, as well as which social groups in the target community and in the international community learners should be required to recognize by their use of language. The sociolinguistic component strictly affects all language communication between representatives of different cultures, which is especially important when working across cultures or doing business internationally.

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DIGITAL PORTFOLIO, ITS HISTORY AND USE NOT ONLY IN LANGUAGE LEARNING: LITERATURE REVIEW

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Abstract

What can we imagine under the terms portfolio, digital portfolio, or ePortfolio? Butler (2006) defines a portfolio as 'a collection of evidence that is gathered together to show a person's learning journey over time and to demonstrate their abilities'. Portfolios as tools of learning and showcasing are not new to education. The initiatives to introduce language portfolios in Europe date back to the 1970s. Nevertheless, digital portfolios as learning tools were developed later and can be traced back to the beginning of the 21st century. Since then, portfolios have come a long way. They have still been in use, and now they even contribute to developing new pedagogical approaches. We can see them reach a point of maturity, and according to the High-Impact ePortfolio Practice publication, ePortfolio is already considered to be a learning catalyst in the tertiary education of the 21st century. This literature review attempts to provide readers and faculty decision-makers with an overview of portfolio and ePortfolio development in time. The authors have looked at the portfolio from the perspective of its development. Consequently, a view of a suitable tool selection for efficient portfolio implementation is applied, providing an overview of available tools, how they are assessed and selected. Finally, we address applied pedagogical approaches with an emphasis on autonomous learning and autonomous language learning. A particular chapter will be dedicated to the best practice and ePortfolio use during the coronavirus pandemic.

Keywords

Literature review. ePortfolio. Tertiary education. ePortfolio tool. Mahara. Language learning, Pandemic.

INTRODUCTION

When compiling a literature review on the topic of digital or electronic portfolio, most often referred to in the literature as ePortfolio with respect to its use, there are several published books and publications that can be utilised. The key language in this case is English, mainly because the strongest communities of ePortfolio users in education, and in our context especially in tertiary education, are traditionally the universities of the Anglo-Saxon world. They are primarily universities in the USA, Great Britain, Australia and New Zealand. In all these countries, portfolio philosophies and their functions are recognized as essential for the development of the 21st century skills, especially self-

reflection, self-assessment, lifelong learning, creativity and, last but not least, the ability to present one's own achievements in a comprehensive and logical form.

EPORTFOLIO, DIGITAL PORTFOLIO, LANGUAGE PORTFOLIO

Publications from 2006 - 2021, which deal with the ePortfolio and its application in education, as well as research that is ongoing in the field of ePortfolios, outline the main topics. The themes belonging to this category are lifelong learning that resonates with the philosophy of portfolios in general, the topic of documenting learning processes and related reflections, individual approaches to the implementation of ePortfolios in tertiary education and the impact that the use of ePortfolios has on learning itself. A comprehensive publication called Handbook of Research on ePortfolios was published on ePortfolio research in the university environment performed in the following countries: USA, Great Britain, Canada, Australia, Mexico, the Netherlands, Finland and Ireland. Studies from countries such as the USA and the United Kingdom clearly predominate, followed by Canada and Australia. The other countries mentioned are represented only in case study units. This review confirms the claim that ePortfolios are mostly used and researched in the Anglo-Saxon world. In Europe, however, a strong user community of mainly secondary education educators and managers and partly also universities are being formed in the following countries: Germany, the Netherlands, Austria and Switzerland. This is a German-speaking part of Europe, which organizes joint conferences focused on the topic of digital portfolios, however, with focus on application and implementation, the emphasis is not on research, but on sharing experience with the implementation of ePortfolios in teaching. Other countries represented in the publications are France, Croatia, Japan and China. Many such focus groups are assembled under the heading of a tool used for ePortfolios. In case of this review, it is predominantly but not solely an open source tool called Mahara, which can be further explored, downloaded and tested using the following link: mahara.org. A consistent and wide support can also be found there.

Mahara ePortfolio is a system designed specifically for the creation of digital portfolios and has existed on the market as an open source system since 2006. In the educational context various terms representing portfolio are still used: ePortfolio or e-portfolio, and digital portfolio can be found. For example, Zounek, Sudický (2012) use the term e-portfolio and define it as "a set of documents and other objects or learning outcomes in electronic form to show what the student has achieved or learned." Abroad, emphasis is currently placed on the last part of the definition summarized in the term "records". In translation, the expression best corresponds to the evidence or testimony of the student's learning processes. The Mahara digital portfolio creation system is not a commonly available tool, there are several commercial solutions on the market such as eFolio and freely available tools and applications such as SeeSaw application offered for both web and mobile devices, or tools collectively referred to as Google Docs., which also have functionalities enabling socialization within the system and easy sharing of learning outcomes not only within the educational institution, but also outside the institution itself, for example with parents or future employers and foreign institutions.

It is important to select a tool that best suits the needs of all the parties: students, teachers, the institution policy makers considering the requirements and financial aspects.

CHOOSING A SUITABLE ICT TOOL FOR WORKING WITH EPORTFOLIO

Educational institutions have the option of choosing from several available tools when implementing the integration of the digital portfolio into teaching. The commonly available tools, without the need to install any software, are Google Sites, Evernote, Wordpress and also the SeeSaw application, suitable especially for primary education. Colleges and universities often opt for installing paid or open-source software solutions suitable for creating digital portfolios, however, many institutions choose paid solutions, such as Blackboard or eFolio. This choice is supported primarily by the integration of the system into the university environment, the stability and security of the system and the possibility of its adjustment according to the individual requirements of the institution.

In the years 2008 - 2014, research and publications in the field of ePortfolios focused on the selection of a suitable environment for the creation of digital portfolios, evaluation and comparative studies of available systems and feedback obtained from students and tutors who became users of these tools. Such trend was related to the development of eLearning at educational institutions and integration of individual tools and applications into university environments. The authors of such works include Balaban, Bubas (2009, 2010, 2013), Lopez-Fernandez (2009), Peacock et al. (2010), Tzeng (2011), Queirós (2011), ChanLin (2014) and Wakimoto (2014). Comparative studies on the choice of ePortfolio creation tool show that Mahara ePortfolio is a suitable software for integration into the university environment.

After the stage, which was devoted to the implementation of suitable tools, i.e. mainly the technical aspect, the period emphasizing the pedagogical aspects of working with digital portfolios begins and is reflected in research and publications. After keywords such as integration, tool, ePortfolio system, Mahara, and evaluation system come in conjunction with ePortfolio keywords such as reflection, student activation, assessment, learning outcomes, and autonomous learning.

PEDAGOGICAL ASPECTS OF EPORTFOLIO IMPLEMETATION

In the period 2006 - 2017, which was running in parallel and also subsequently after the ePortfolio implementation phase, the research focuses mainly on the pedagogical aspects of the use and philosophy of digital portfolios. Comprehensive publications such as Handbook of Research on ePortfolios (2006), Eportfolios for Lifelong Learning and Assessment (2010), Documenting Learning with ePortfolios A Guide for College Instructors (2012) and High-Impact ePortfolio Practice A Catalyst for Student, Faculty, and Institutional Learning (2017) already with their names outline the trend and key areas in the field of higher education pedagogy, which are influenced by digital portfolios. All these publications were published in the USA, one of the leading countries in the field, where the ePortfolio is implemented in more than half of higher education institutions. Many publications present associated case studies, popular in the American context and key to the further development of the use of this ICT tool. There is also a peer-reviewed, open source journal published on regular basis in the United States called the International Journal of ePortfolio, which is freely available online and whose mission is to support ePortfolio practice and theory. The electronic journal is published with a six-month period and again includes research studies at universities, especially in the USA. Developers of Mahara ePortfolio software publish a newsletter on a quarterly basis, which informs

mainly about cases of good practice in the implementation of Mahara ePortfolio software in all areas of education and across the world.

In the field of research related to electronic portfolios, in the publication Handbook of Research on ePortfolios we can find the definition of the roles that ePortfolio plays in education. These are the roles of creating artifacts, setting goals, self-directed learning, the roles of assessment, reflection, construction, planning, organization of learning, interdisciplinary learning, and last but not least, creating examples of good practice. Other research studies focus on the impact of ePortfolio on the curriculum. In this context, it is mainly the so-called "paradigm shift" - a paradigm shift in education - the transition from teacher to student, the so-called "ownership of learning", active learning, lifelong learning, self-reflection, etc.

Many research studies mention the so-called ePortfolio philosophy and the challenges that teachers and students encounter when switching to learning with ePortfolio. The conclusion is that for the successful implementation of ePortfolio it is necessary to prepare and teach students to work with ePortfolio and particularly to understand the philosophy of ePortfolio, only then it is possible to measure the effectiveness of ePortfolios and implement them successfully. Another study deals with teaching reflection to students, which is an essential part of working with ePortfolio. Other case study deals with the use of ePortfolio in order to prepare for a future career. At the end of the study, the role of the portfolio as an organizational principle for students' learning processes and outcomes is highlighted. The final part of the publication provides an overview of specific case studies from various areas of higher education, from the training of future teachers, where the role of portfolio is historically irreplaceable, through technical and medical disciplines, to cross-curricular and strategic implementations of ePortfolio at the institutional level.

The publication Eportfolios for Lifelong Learning and Assessment is already focused more specifically. The author is the co-leader of the International Coalition for Electronic Portfolio Research with sixty teams in tertiary education institutions in six countries. The author himself has experience with ePortfolio from the period of his PhD studies and devotes a large part of the theoretical part of his book to authenticity in the field of education.

The third publication, Documenting Learning with ePortfolio, addresses the important role of portfolios in recording and documenting learning processes and outcomes through ePortfolios. It is a guide on how to effectively implement ePortfolio into teaching through case studies and is a summary of theoretical models connecting pedagogy with the ePortfolio tool.

The latest publication High-Impact ePortfolio Practice A Catalyst for Student, Faculty, and Institutional Learning already presents ePortfolio as a tool for higher education in the 21st century and even considers it a catalyst for learning. Thus, it is possible to observe the entry of the ePortfolio into the period of maturity, when it moved from the time of searching for a suitable ePortfolio tool, through the implementation period and searching or shaping pedagogical approaches that apply in the implementation of ePortfolio suitable for students, faculties and entire institutions. The main premise for the use of ePortfolios is the fact that these environments make learning visible to students themselves, their peers, but also to faculties and, last but not least, to external recipients. The authors proceed from the statement that if the ePortfolio tools are correctly applied, we can observe at least three basic benefits associated with the implementation of digital portfolios. The first added value is the support of student success, the second is the

visibility of learning, support for reflection, integration and the field of deep learning. Last but not least, the ePortfolio is considered by the authors of the above-mentioned publication to be a catalyst for institutional changes emphasizing learning and its central importance.

The importance for students is further described in detail in asking the right questions, which can be found in many other publications related to the pedagogical concept of portfolio. These questions are: 'Who am I?' 'Who do I become?' And 'Who would I like to be?' in the course of learning process and our whole lives.

Through working with ePortfolio, the faculty, its staff and the entire institution can then get answers to the questions 'Who are our students?' 'What experience are they bringing with them?' and thus the institution can become an organization with integrated and adaptive learning. (LaGuardia Community College, 2016)

LEARNING AUTONOMY, AUTONOMY IN LANGUAGE EDUCATION AND RELATED RESEARCH

Leading figures in the field of autonomy research, such as Little (1998) and Benson & Voler (1997) and Benson (2011), date the beginnings of interest in the concept of autonomy in language education to the 1960s. The report for the Council of Europe is considered a key document, in which Holec (1981) places the concept of autonomy in a social and ideological context, where in developed Western countries the definition of the so-called social program shifts from the characteristics of so-called material security to ensuring the so-called 'quality of life'. Associated with this trend is the increasing emphasis on lifelong learning and the related need for taking responsibility for one's own learning. Independent learning has been defined as learning during which the setting of learning objectives, progression and assessment of learning are in the hands of the students themselves. With these words Holec (1981) defines the concept of autonomy. David Little in Gathercole (1990) and in Little in Swarbrick (2002), defines autonomy as a negative definition in Chapter 9 by listing the sub-points describing what autonomy is not: it is not just learning without teacher guidance, in a classroom environment it is not a situation where all responsibility is transferred from the teacher to the student to let them be on their own, autonomy is not a teaching method, it is not a single, easily defined type of behavior, autonomy is not a certain goal to be achieved by students. When knowing what cannot be called autonomous learning, how can we characterize an autonomous student? According to Holec (1981), an autonomous student should be able to take the initiative in the learning process and be responsible for the partial steps that this initiative includes: setting goals, defining progress, choosing methods of reaching a goal, managing and supervising learning, evaluation of goal achievement.

Between 1971 and 1981, the European Council initiated and implemented a project called the "Modern Languages Project". Its main goal was the development of European mutual understanding, cooperation and mobility, and one of the researched aspects of lifelong learning was also student autonomy. According to Benson (2012), the concept of autonomy has been closely associated with the individualization of learning in progress since the 1970s. A higher ratio of individualization of learning is considered desirable even today. In language education, we also come across the term "Independent user" or independent user of the language, and all learning of a foreign language should aim at achieving this desired state. As an independent language user, the CEFR user is defined from level B1 according to Little (2009). However, for independent scientific work of

university students, it is necessary to achieve the level of the so-called "Proficient User", i.e. level C1. Another available tool to support the individualization and autonomy of foreign language students is the European Language Portfolio (ELP) and the Common European Framework of Reference for Languages (CEFR) project proposed in 1991. For the needs of autonomous learning, the ELP is equipped with the so-called Self-Assessment Table available in (Brychová et al., 2012), which contains descriptors for individual speech skills and thus facilitates self-assessment and goal setting for students, possibly in all available language skill categories.

Another concept associated with the development of autonomy in the researched topic is the concept of portfolio. Currently, the concept of the digital portfolio is often discussed as a support tool for the development of self-reflection and self-assessment, setting one's own learning objectives and gathering so-called learning evidence. The above-mentioned steps can be applied in the development of autonomy in foreign language students, and the skills acquired in this way can be further transferred to other subjects and spheres of study that university students go through.

In the field of language education, the Czech language portfolio web application is available to Czech students in six language versions. The above-mentioned digital portfolio environments thus become not only a repository, but also a virtual learning environment for creating a personal learning environment, the so-called PLE. Through the assigned tasks, the educational institution can assist in creation of the graduate's future portfolio and thus contribute to their higher employability, as well as the educational institution can remain in contact with graduates through the system it manages and thus maintain a network of so-called alumni - university graduates. This also applies to all other types of schools and institutions of formal and non-formal education.

One of the reasons, but not necessarily the most important, for the introduction of the ePortfolio in the teaching that institutions state, is the use of portfolio as an assessment tool, both summative and formative. According to Barrett, the so-called "evaluation portfolio" was introduced into teaching as early as in 1980s. The emphasis was mainly on the evaluation itself, more (Barrett, 2007). Paulson & Paulson then devised conflicting frameworks for two models of the evaluation portfolio: the so-called positivist and constructivist paradigms.

The positivist portfolio, also called the 'evidence portfolio' in our context, has the mission of evaluating learning outcomes that are defined externally. 'Positivism assumes that meaning remains unchanged across users, contexts, and purpose — so the portfolio functions as a container that comprises of examples of students' work and it is possible to infer what and how students have learned.' (Paulson & Paulson, 1994)

A constructivist portfolio, which can also be called a professional portfolio. according to the methodology for teachers published by NIDV (2015), in contrast to the positivist concept of portfolio, is a learning environment in which students themselves create content, they are the carriers of meaning. Thus, it can be assumed that the meaning changes according to its creators, over time and according to its purpose. As reported by Barrett (2007) and Paulson & Paulson (1994), the constructivist portfolio is a process, a record of the learning process and is used to assess progress in personal achievements whilst acquiring externally defined general skills.

Another term mentioned above is the concept of self-assessment. The European language portfolio assumes that the student will be able to apply self-assessment and will also perform a self-assessment at the beginning of the work with portfolio. Boud (1995) considers self-assessment to be a basic skill necessary for lifelong learning, a skill that

needs to be developed in university courses and which is a prerequisite for real learning. Self-evaluation occurs in a certain context, with regard to certain cognitive domains and with the awareness of individual goals. Michelson & Mandell (2004) consider self-assessment to be an important part of portfolio creation. According to Oscarson (1989), self-assessment brings students the following benefits: it helps students assess the effectiveness of their learning and communicative competencies; helps to increase students' awareness of the learning process and stimulates students to access and evaluate the content of the course critically; raises students' awareness of the possible goals of language learning, giving them more control over their own learning as well as course learning; last but not least, it expands the evaluation criteria with special competencies such as self-analysis of one's own needs and the streamlining of the learning process. Authors such as Holec (1981), Thomson (1996), Gardner and Miller (1999) consider self-evaluation an integral part of autonomous learning, although not always as a conscious part.

Benson (2011) and Little, Dam (2017) publications focus on autonomy in language education and relevant research. Both publications from leading figures in the field of autonomy and language education provide valuable input for defining the concept of autonomy related to the current educational context, as well as an attempt to determine the degree of autonomy and whether this direction is desirable. Last but not least, they provide a set of research studies in the field, especially action research and case studies.

At the University of Pardubice, as well as at many other institutions in the world, where the portfolio is used as a teaching tool, the positivist theory of portfolio use is applied. The portfolio serves mainly as another environment for collecting learning outcomes, the outputs are not worked on after evaluation and reflection and self-reflection are not included. Mahara ePortfolio tool in such a case represents an environment similar to LMS Moodle, only with a greater emphasis on creation by the student. This procedure is already progressive on the part of the institution in terms of shifting the focus from the teacher to the student, but in addition to developing creativity, there is no support for other 21st century skills and it is not a form of study and teaching supporting autonomous and reflective learning. Likewise, the types of assessment are rather formal at most, with the possibility of incorporating formative assessment. Through a research intervention implementing ePortfolio tool together with the above-mentioned pedagogical approaches, it should be possible to expand and strengthen the existing approaches to learning at the University of Pardubice and possibly at other institutions leading to transformation of education.

EPORTFOLIO IN THE PANDEMIC TIMES

In the past two years we, as mankind, have been undergoing unprecedent times. All levels of educational systems including tertiary education have been forced to adopt emergency remote teaching and all students worldwide had to learn how to cope with emergency remote learning. Both parties including the institution managements and parents were obliged to learn new strategies under new conditions and in a limited amount of time. There was no preparation time available. One of the biggest challenges of all educators seems to be the area of assessment. There are not many studies related to the pandemic and ePortfolio use available yet. From the studies already published we can assume the institutions who decided to newly adopt ePortfolio have done so to obtain new assessment tools. Tertiary institutions in search for alternative methods of online assessment were facing the issues of self-assessment and autonomy. (Devarajoo, 2020).

A study published by Indonesian colleagues in the time of pandemic states increased levels of autonomy and writing competency when ePortfolio together with project-based learning were applied. 'The result of the study found that there was a significant effect of e-portfolio in project-based learning toward students' learner autonomy and writing competency.' (Ariningsih et al., 2021). Another study presenting successful results of ePorfolio implementation in Radiology students was performed in the Blackboard LMS and published in Scopus. It concludes with a recommendation: 'The departments should consider the student's comments and suggestions to improve e-portfolios' future utilization in learning and assessment.' (Abuzaid et al., 2021). Apart from stating high interest of students in ePortfolio use, it also proves its role in assessment not only during pandemic. Other recently published study reveals the importance of ePortfolio implementation with emphasis on proper guidance during the introductory phase of ePortfolio to students. This phase seems to play the key role in successful adoption of every new tool. In this study a Wiki based portfolio utilizing a module available in LMS Moodle was used. The researchers claim 'that the results of this research show that e-portfolios are considered less practical as a learning tool. This result can happen because students first find it difficult to operate the Wiki application as an e-portfolio support on the Moodle platform.' (Muchlas, 2020). ePortfolio implementation was not only affected by the pandemic in search for the best remote teaching support solution but pandemic also affected already planned ePortfolio introduction which can be seen in a bold and large project EPICA presented by the Spanish university where four partner universities implementing ePortfolio in their teaching and learning were affected by the changes and especially by technological challenges during the time of pandemic, despite that, the project was successful. (Guardia et al., 2021)

SUMMARY

The history of ePortfolio has been long and intriguing. Through research, implementation and development of pedagogical approaches reflecting changes in society and technology, it has established its role in all levels of current education. There are certain pedagogical terms closely related to the use of portfolio: namely construction, planning, organization of learning, self-directed learning, self-reflection, evidence-based learning, autonomy, lifelong learning and of course assessment. The institution policy makers and educators need to keep in mind the need for technological support and pedagogical guidance and significantly higher demands on assessment and reflection processes. Despite the fact that ePortfolio implementation can bring certain challenges, it definitely has a potential for innovation and change in traditional educational systems. Together with remote teaching and learning challenges the level of autonomy in both teaching and learning has risen immensely in the time of pandemic. A combination of autonomy enhancement and ePortfolio adoption seems to be a viable solution for all types of teaching and learning: face to face, distant, remote and emergency teaching and could also be a suitable option for the future hybrid forms of education brought by the pandemic times.

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THE ADVANCEMENT OF MEDICAL TEACHING IN UNIVERSITIES VIA THE USE OF MOVIES CUTS FOR ASSOCIATIVE LEARNING

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Abstract

The research goal was to investigate and analyse the potential of audio-visual material from popular movies and well-known videos used for online teaching in medical studies. The movie's material is a vivid tool produced by professional artists and actors who can demonstrate certain illnesses and their symptoms very accurately and obviously. The "General Surgery" discipline for 3rd year medical students was taken as a case. The novelty was introduced into different teaching materials (recorded videos, presentations design, and online lectures and practical classes) aiming at building a sustainable visual and audio association between the symptoms and syndromes and their theoretical description in academic texts. The material selection and application methodology have been pilot tested by the group of 25 Ph.D. medical students of Sumy State University (Ukraine) in 2020-2021 with extremely positive results. The results of the testing and its analysis, backed up by a comprehensive literature review are presented in the paper. The material is planned to be largely used during the autumn 2021 semester for academic groups of students. These developments can be applied as one of the key elements of students associative thinking during online learning. The paper results can be applied by the medical educators at the universities, colleges, and for adults learning.

Keywords

Higher education. On-line teaching. Medical studies. Associative learning. Movies. Videos. Digitalization.

INTRODUCTION

The issue of improving the quality of education remains relevant today. In the age of digital technology, the student is faced with a large amount of educational information from a variety of sources. The information comes in different formats and portions, leaving different impacts, not always positive or those expected by its creators. Sometimes due to diverse subjective and objective reasons it is difficult to extract the truly necessary information and save it in memory. Coronavirus quarantine conditions created an additional burden in the processing of digital information for the learner, these include technostress, extra time in front of the computer for simple communication, barriers in comprehending information and many more. This, respectably, poses certain challenges for today's educators.

Medicine is a field that requires a high level of knowledge and professionalism which should be demonstrated under any conditions of stress or urgency as this safe lives. Also, in addition to theoretical knowledge, students must have the practical skills, e.g. to communicate with patients,

colleagues, be able to respond correctly in unusual situations (Tsai et al., 2007), keep professional ethical standards, decision-making and problem-solving skills, promotion of health, etc. The presentation of medical information during training is characterized by its volume, formality, and dominance of specific terminology. Terminology itself due to its number and complexity set additional challenges for comprehending the educational material online, especially for foreigners. However, all this does not reflect the application of educational material in real life and communication with patients. These experiences are often based on face-to-face experiences, impressions, sensed like smells or sounds, and so on. Therefore, we are faced with **the question:** how to effectively convey to the student the peculiarities of the interaction of doctor and patient in real life, which is extremely relevant during distance learning in the conditions of COVID-19. The research question for further elaboration will be how to present an online learner to the complex set of experiences of not just interaction with a patient but determining the illness by a number of factors that are difficult to be described by texts or images. In fact, the paper contributes to the research in the field **of cinemedicine**, the term that was introduced not so long ago and opens a new chapter in the medical education. Cinemedicine may be considered in the context of teaching psychosocial aspects to the students using learning by observation and fuelling motivation for learning. (Kadivar et al., 2018) There is an introduction of a term "Cinemeducation" (Alexander et al., 1994) which, however, did not get accepted for us as cinemedicine.

One of the effective methods to increase interest in professional information is to tailor it in an interactive way and to include a variety of media content such as presentations, audio and video. Nowadays, young people tend to consume content and acquire new knowledge through such resources as Google, YouTube, Facebook, Instagram, TikTok and many more. Watching movies, videos and scrolling through social networks is one of the top activities of medical students in their free time. (bin Abdulrahman et al., 2021) Video is an effective tool for transmitting audio-visual information, displaying complex and voluminous to explain phenomena, concepts, processes. It may cause faster recognition of the real-life objects or phenomena than the text through visual and sound association, or their complex. It is known that a person tends to form stable associative connections with the events he/she sees on the screen and what is happening around. Especially, when it comes to one's favourite movies and TV shows. In regard to the current generation of digital nomads who consume loads of information online, the most appropriate are short videos that illustrate the basic information, expand and supplement its content. (Daher-Nashif, 2021)

In fact, the educators working in this field were searching for relevant solutions even before the COVID pandemics that locked them inside their homes in front of the laptop screens. At different moments of the medical education history the educators noticed that video, music and recordings, illustrations and artworks bring brighter experiences for the students which are easier to be remembered. The first mentions about watching the videos with the further discussion in the field of psychiatry residency education were recorded in 1970s. (Fritz, Poe, 1979) Therefore the use of the commercial cinema has a long tradition in the medical education both for the pre-graduate and postgraduate medical training. Some of the educators get even more creative not only demonstrating the existing videos or clips but encouraging the students to create their own amateur films to highlight or present a certain anatomy or physiology concept. (Nillos, 2009) There are even successful cases of organising whole events for presentation of such solutions using philosophical, literature, musical and cinema artworks. (Initiative, 2021) There is even a whole collection of Cinemedical tracks on the Soundcloud, initiated by ABC News Health Radio Series. As a logical continuation of the proved positive records, some medical colleges have introduced the courses containing such terms as "medicine", "cinema" and/or "literature", while General Medicine and Psychiatry are known for the wider application of commercial movies. (Loscos et al., 2006; Kadivar et al., 2018)

Additionally, there was another reason for the interest to additional information formats: some diseases/cases are so rare that one may find their description only in books. And one more argument in favour of this kind of alternative/additional tools of medical education is based on the

complex specifics of the speciality: bio-psycho-social-spiritual aspects of health care, which lead to a wide use of movie clips or whole movies in medical education. Sometimes the historic and humanistic elements stand out as crucial for understanding the background of certain human behaviour or life circumstances that lead to a certain disease or even pandemic. It is also important to strengthen the fundamental and universal value of medical professionalism as an ideal procured by medical practitioners (Klemenc-Ketis et al., 2011), therefore the educational and awareness-raising function of the movies is supplemented with the discursive one.

Of course, for educators it is equally important that the elaborated tool is not only entertaining and solves a complex training issue, but also brings relevant educational value and makes an impact. Different experiences have demonstrated that cinemedicine works well as a teaching method in most cases. Some authors even shared specific impacts determined after applying the method: e.g. the students better learned about patients' care and communication with them, especially in the context of breaking bad news, also about ethical issues. (Klemenc-Ketis, Kersnik, 2011) All of them stress on the strong emotional power of the movies. That is why this direction of considering the human aspect while teaching medicine is named "medical humanities" and is recognised to have the future for development. (Shankar, 2019) Back in 2005 and later Prof. Dr. González-Blasco, among other authors, referred to the value of Humanism in Medicine in the context of strengthening it via the use of Commercial, which he was intensively promoting in Brazil. (Blasco et al., 2005; Blasco et al., 2006; Blasco et al., 2010; Blasco et al., 2010)

In terms of methodology, it should be mentioned that a sole watching the selected movies will not have the expected educational impact, as education is a complex process where the more learner is engaged the better. Therefore, not only the movies are selected carefully, sometimes even the short clips are tailored, but also the educator designs a set of additional activities, making the learner to reflect, analyse, synthesise, present the thoughts, etc. Individual work, written essay, public presentation of results with a further or prior controlled group discussion are the usual tools employed to dive a learner into reflection and analysis. (Alonso Ortiz, 2018)

Another point is that some students comprehend material delivered purely orally or by text, but a lot of them cannot be able the same. They note the difference in perception and understanding of the material in relation to what they must see in real life. These include the peculiarities of the symptoms and course of certain diseases, their social and psychological aspects, stressful adjustment to the doctor at critical moments. The material taught in formal language does not give a complete picture of the whole picture. Therefore, sometimes there are misunderstandings and differences in vision of the same situation. There is a problem in the application of acquired knowledge in practice, even in highly trained students.

The research goal was to investigate and analyse the potential of audio-visual material from popular movies and well-known videos used for online teaching in medical studies. For the purposes of this study, we adopted the conceptual framework of using short video cuts implemented into the lectures, presentations to achieve the aim of recognisability and memorization. Therefore, **the research thesis was** to check what exactly kind and characteristics of videos provide the most learning effect, to what extent they support the learning process and how exactly being used they make the impact the most. The answer to these questions will help to find the best solutions for reinforcing the necessary skills of the medical students by reshaping undergraduate medical curriculum. Our developments on the method of teaching are of particular interest to medical students who find it difficult to understand and master all the socio-psychological aspects of the doctor, individual features of the disease, the reflection of the disease in the psychological state of the patient. Also, watching movies allows students to psychologically immerse themselves in the life of a doctor and observe changes in their vision of the situation, values, and beliefs. (Kemenc-Ketis and Kersnik, 2011) The high level of interest and empathy for the heroes attracts the student to the healing process and forms the basic principles of humanism. (Kadivar et al., 2018)

METHODS

The comprehensive view of the state-of-the-art can be achieved only through a literature review that allows defining the main achievements, trends and perspectives in the field. To achieve the research goal the authors designed a mixed-method approach that combines the literature review with analysis of the evidential case. During the planning, conducting, and reporting phases the authors have investigated about 50 publications (English and Ukrainian language) of different nature which allowed tracking down the evolution of the cinemedicine term and the concept application in medical educational institutions. Those were journal and conference papers, social media (Facebook), research papers, projects and surveys reports, official websites). That allowed tailoring the research thesis and question and the surveying strategy as a real-life connection to the set question. The intention was to compare the results of the PhD students' feedback and those stated in the literature. The accumulated information was later processed via deductive and inductive approaches. As a result, several conclusions was received on the aspects of effective online training of the medical student with the focus on peculiarities of the interaction of doctor and patient in real life.

During lockdowns in 2020 and early 2021, the need to teach online such disciplines as General Surgery, Paediatrics, Therapy has pushed the educators to search for better solutions to bring the whole value of the subjects to the learners comprehensively. Our work, as of medical educators and of a medical practitioner, was aimed at forming associative thinking in third-year medical students in the discipline of "General Surgery" with the help of short cuts movies using the free access on the Internet. It is worth noting that this discipline is basic for medical students and lays the foundations of clinical thinking. The video material selection and application methodology has been pilot tested by the group of 25 Ph.D. medical students at Sumy State University (Ukraine) in 2020-2021 with extremely positive results. The results of the testing and its analysis are presented in this paper.

Among others, the course had the following learning objectives:

1. To demonstrate clear understanding of the theory and a critical, creative and problem-solving point of view, which a students must be able to clearly communicate.

2. To consciously incorporate the human values, legal responsibilities, and professional ethics into the practice of medical profession.

3. To obtain, organise, interpret, communicate and use clinical and biomedical information professionally and critically, and in a patient-centred manner.

The selection of video for inclusion in the database of materials was based on the logical affinity of nosological material and included the principle of "recognizability" of characters and actors who portrayed a situation. We also considered the maximum correspondence of the depicted material to the real situation in life, yet each movie served different purposes, not only those related to the General Surgery precise topic. The literature review allowed accumulating a data base of the existing experiences and even the list of videos with certain selected cuts. Among the selected feature films that are recognizable, were chosen, for example, the following:

- "House M.D." (2004-2012),
- "Awakenings" (1990),
- "The Sister's Keeper" (2009),
- "Scrubs" (2001-2010),
- "Patch Adams" (1998),

- "Flatliners" (1990),
- "Bubble Boy" (2001),
- "Wit" (2001),
- "Lorenzo's Oil" (1992),
- "Something the Lord Made" (2004),
- "The Doctor" (1991) etc.

The following topics were supported by the selected material:

- ethics and deontology in the practice of medicine,
- resuscitation,
- acute traumatic soft tissue injuries,
- some malignant tumors,
- anaphylactic conditions,
- Patient care.

Basing on the structure of the group (background, age, skills) the following pedagogical approach was chosen:

- short videos were built into lectures and practical classes with comments from the teacher and further discussion in class;
- the discussion was moderated by the teacher and peer-reviewed in the end from the point of view of the professionalism and practical value;
- whole feature films were provided as supplementary material and, to a lesser extent, as homework for the weekend, after which students wrote a short report on a specific topic. Examples of essays topics: "Resuscitation measures: frequent mistakes and shortcomings"; "Features of care for patients with skin burns"; "The main symptoms of chronic vascular insufficiency"; "The prevalence of malignant tumours, and the relevance of cancer treatment today".
- As an option for the next group, we consider a variation of the task that will be even more engaging and creative: to shoot a video presenting a chosen topic, using the colleagues as actors with a further "Cannes Festival" show with peer-reviewing and awards.

The form of essays to present the students' observations was chosen due to the specifics of the participating learners: they are all foreigners mostly from India who prefer to present their thought in a written form. Also, it allowed motivating them to put their thoughts in a structured order, summarizing what they heard from the peers during the in-class discussion and repeating the material once again, which adds to better remembering. Working over the essay also presented the students once again to the form and requirements to the academic text, which is an important issue for them. Therefore, the essays had classical academic structure (introduction, main text, and conclusions), however the was a list of points that had to be developed by the author in it:

1) Core features presenting the chosen topic – all possible aspects including gender, age, professional background, relations, etc.
2) Behaviour analysis of the health professional (professionalism demonstration, communication, consultation, critical thinking, problem-solving) and its consequences for the patient, the working team, the employing hospital, the patient family, etc. Both positive and negative aspects with clear reasoning and conclusions for each point.
3) Comparison with own experiences or those the student witnessed in real life.

4) The students' emotions – from the most general ones towards personal and professional, including own beliefs, values, and feelings. Those students that felt that they do not want to share this publicly, were allowed not to present this during discussions but were encouraged to present it in a written essay.
5) Forecasting own behaviour – both how they know they would behave in reality and how they think they should behave, with the analysis of the reasons, consequences and potential solutions.

The assessment of essays was done by the teacher using the 1-5 scale for each set question, thus in total each student could get up to 25 points. The students were asked voluntarily to make a plenary presentation of the question 3 in the class to enrich the experiences of others, this activity was not graded. During the course the students were also motivated to search for the movies or clips on their own and present in the class with their justification according to the list of questions above, why they though the movie/clip are useful for their colleagues. During the next class the audience were asked to judge if the suggested movie/clip was useful according to the set criteria. This practice did not go well as the students confessed that even if they found something useful, they were too lazy to work on the justification.

One of the seminars was dedicated to an experimental pedagogical tool – a theatre performance – when the student was asked to improvise a conversation with a doctor demonstrating the symptoms and behaviour of the patient struggling with the chosen diseases or state. The topic coincided with their essay to make it easier for the first-time experiment. Not all the students wanted to present, most of the explanations related to natural shyness. A short reflection was made in the end of the class.

In the end of the course, to answer the set research question a questionnaire was offered to find out the student's perception of the chosen approach and the movies/clips, as well as their recommendations (as an open-ended question). To measure the attitudes the answers were offered as "completely agree," "agree," "no idea," "disagree" and "completely disagree" according to the 5-point Likert scale. The Google Form was used as a digital instrument to ask the questions anonymously. Three colleagues from the Department were requested to review the questionnaire to raise the content quality avoiding formulations that caused difficulties in understanding.

RESULTS

The "General Surgery" discipline for 3rd year medical students was taken as a case. The novelty was introduced into different teaching materials (recorded videos, presentations design, and online lectures and practical classes) aiming at building a sustainable visual and audio association between the symptoms and syndromes and their theoretical description in academic texts. The material is planned to be largely used during the autumn 2021 semester for academic groups of students. The material selection and application methodology have been pilot tested by the group of 25 Ph.D. medical students of Sumy State University (Ukraine) in 2020-2021 with extremely positive results.

After the demonstration during 60 min, ethical issues related to medicine addressed in the movie were discussed and analyzed by experts and students who participated at the session (60–90 min). A faculty member led group discussion emphasizing argumentation and questioning. During each session, we also provided the opportunity for students to engage in group discussions and reflect on the movie and state what they had learned, to try someone's shoes as well. At the end of the course, the moderator summarized the educational tips (15 min). (Kadivar et al., 2018)

The analysis of the survey results has demonstrated that:

- 84,5% of students strongly agreed that the cinemedicine approach is important both for theoretical, practical and philosophical points;
- 91% reflected that the moderated discussions along with the other activities scope were a valuable tool to dive them deeper into the topic details;
- Only 19% of the respondents admitted that it was difficult for them to comprehend the connections between the offered movie and the selection of medical issues offered for analysis;
- The patient care/patient-centred approach topic was admitted by 86% of the respondents as the easiest to be studied via movies and clips;
- 73% of those who participated in the theatre performance experiment confirmed that it is an additional experience related to analysis of the selected topic, as it forces a student to reflect on how he/she would react/behave in a certain situation;
- 74,6% of the PhD students reflected that under the online studies conditions, the use of the movies and their discussion with the references to own experiences helped them to ground the theory to the real world cases;
- 92% of the respondents mentioned that it was important to discuss and present not only the impressions and opinions, but also to analyse positive and negative moments related to the professional activities, e.g. professional jargon use, openness in communication, empathy, etc.

In the open comments section, the most often comment was admitting that the use of the movies and their cuts strongly added to the course interactive character, made it more interesting and engaging. Some mentioned, that after this their view to the movies has changed as they started to analyse them with the "doctor's eyes". The other comments stated that wish there were official/academic sources and channels with the targeted content like the one was used during the course.

From the educator's practice point of view, it should be mentioned that the movies and their cuts should be carefully pre-selected, reviewed personally and the learners must be theoretically well-prepared beforehand. Otherwise, there is a percent (10-30% depending on the difficulty of the topic) of those who find it difficult to recognize the previously provided theory with what they see on the screen. The other important observation is that emotional engagement from the full-length movie is higher than from the short clip and that influences the general interest of a student. The higher personal interest due to the emotional engagement, more additional research on the topic the student will make. One of the provocative questions addressed to an emotionally engaged student can be: "If the patient did or did not do this/took this medicine/did not have this additional disease, etc, would have he/she survived/lived more comfortably, etc?". In 2 cases our of 6 this kind of conversation lead to a deeper research and further discussion.

DISCUSSION AND CONCLUSION

The paper is devoted to investigation and analysis of the potential of audio-visual material extracted from popular movies and well-known videos used for online teaching in medical studies. The research was conducted within the "General Surgery" discipline for 3rd year medical students during the COVID pandemic. The movies material was used due to professional artists and actors ability to demonstrate certain illnesses and their symptoms very accurately. These movies and clips were introduced into different teaching materials (recorded videos, presentations design, and online lectures and practical classes) and were aimed at a sustainable visual and audio association between the symptoms and syndromes and their theoretical description in academic texts.

To sum up, the video material may be highly engaging and that is why causes empathy, personal attitude and, therefore, is better remembers. It is also worth noting that the selection of the material must be supported with previous sessions to get the student ready. The research outcomes highlight the human-centred nature of the medical profession; therefore, the movies and clips can serve a perfect tool for learning more about human values, professional empathy, medicine, and patient care. The wisely chosen movie in connection to a certain topic motivates strong natural emotions in students, which leads to further research. However, if the student stays an outside observer and is not motivated to reflect on own potential behaviour, emotions and deeds, the effect from this approach drops dramatically. Yet, most of the students who were engaged in the movie sessions appreciated the experience and noted that the opportunity to reflect on own feelings, values, attitudes, behaviour tracks was an important experience for their professional conscious growth. Once again, this research has demonstrated that medical colleges may use cinemedicine at the central level as part of the general pedagogical toolkit to strengthen the humanistic perspective of doctoring.

The designed material is planned to be largely used during the autumn 2021 semester for academic groups of students. These kinds of developments can be applied as one of the key elements of students' associative thinking during online learning. The paper results can be applied by the medical educators at the universities, colleges, and for adults learning.

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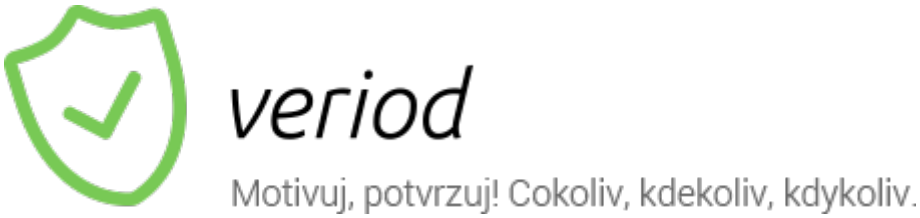

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