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Online Education in Hungary and Armenia during the Pandemic and Its Aftermath

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After the breakout of the COVID-19 pandemic our lives have been profoundly changed, including higher education, where a digital form has emerged as a result. This paper presents some of the results of nearly two and a half years of research conducted in two countries. The first objective was to analyse the experience of the transition to digital education, digital competencies and equipment of staff during the COVID-19 pandemic, and the second was to summarise the impact of the alternatives to digital education at universities after the pandemic. It was also aimed at describing how digital education at the universities of these two countries with very different cultures has been tackled and whether the experiences are different. The research was carried out by means of a questionnaire including 592 instructors from Hungary and 111 from Armenia. The researchers analysed the data using SPSS 28 statistical software. Univariate and multivariate analyses were conducted, including frequency, mean and standard deviation tests, cross-tabulation analysis, ANOVA, independent samples t-test, and correlation. analyse The current study suggests that the two culturally different countries did not have completely different practices, and also the smoothness of the transition to digital education has a major impact on how digital solutions are integrated into university education in the two countries in the future. To conclude, the pandemic induced the emergence of online education, which is here to stay with us in the future to supplement traditional, offline forms.

Keywords: benefits, challenges, digital competence, online education, pandemic

INTRODUCTION

Till the end of 2019 and the beginning of 2020, we were not aware how our lives would profoundly have been changed by the spring of 2020. An unprecedented situation

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resulted from the outbreak of the pandemic, which altered working and educational conditions and caused a considerable decline in the economy. Although certain limitations were removed in the summer of 2020, the economy did not begin to recover until the summer of 2021 but even up to now, COVID-19 has not yet been totally eradicated. Education is one area where the pandemic has had a big impact.

Although digital technology is now widely used in academic and educational organisations, this was not the case prior to the pandemic. The changes induced by the pandemic resulted in anxiety in different parts of the world. Le et al. (2021) state that the global spread of the coronavirus has caused schools, colleges, and universities to close, having a severe impact on students globally. Tan et al. (2024) point out that the change was imposed on the educational sector quickly and without consent.

As a result of the spread of digital education, the academic community is facing various new difficulties (Toquero, 2020). According to Akdağ Kurnaz and Arı (2024) technological challenges, lack of motivation and communication difficulties were the most frequent problems cited by students in distance education.

We must not forget about the opportunities digital education has brought along, either. Huynh and Nguyen (2024) suggest that online education has the potential to be a helpful tool for improving knowledge, methods, and abilities. Nonetheless, it is highly recommended to weigh the benefits and drawbacks of digital education and draft strategies and solutions that facilitate efficient online teaching.

The objective of the current paper is to analyse one of the areas heavily affected by changes, i.e., higher education, from the instructors' perspective with a special focus on online education, digital competencies, platforms and experience presenting both the benefits and the drawbacks, as well as the challenges. The authors hypothesise that the challenges of online education are perceived differently by various instructors and teaching staff depending on their digital competences and the technological level of their institution.

Primary research was carried out by means of questionnaires distributed in two countries: Hungary, where 681 instructors from 36 higher education institutions filled in the questionnaire in the summer of 2020 and Armenia, where the survey was conducted in 2022. Our paper can be considered unique as it strives to compare two culturally different nations with regard to their experience and methods in online education. Armenia and Hungary were selected as being culturally diverse and different: one of them situated in Asia farther from the European Union and the other in the heart of Europe. It was quite challenging to compare them, and we assumed the impacts of the pandemic on higher education would differ, as well. In addition, the Armenian National Agricultural University (ANAU) and the Hungarian University of Agriculture and Life Sciences (MATE) has been cooperating within the framework of Visegrad-4 and Erasmus projects and, last but not least, both have a focus on agriculture in their profiles.

On the one hand, the research has shown that the pandemic led to a number of difficulties in (higher) education. On the other hand, it has also highlighted the need to react quickly to altering circumstances and make the necessary adjustments.

First, the paper presents digital competence, digital technologies and the emergence of online education. This is followed by a detailed discussion of the benefits, difficulties and challenges of online education.

The discussion of the primary research is in the focus in the second half. The methodological overview is followed by the key findings and the hypothesis test to end up with the conclusions.

LITERATURE REVIEW

Online education

Online education is a type of remote education where content is delivered to students via tools of information and communications (digital) technology, online courses, and other forms of online interactions (Yilmaz, 2019).

According to Aristovnik et al. (2020), 86.7 percent of students had their in-person classes cancelled due to COVID-19 and many different online forms took place as a result such as real-time video conferencing (59.4%), followed by asynchronous lectures such sending student presentations (15.2%), video recordings (11.6%), and text-based forums and chats (11.6% and 9.1 percent, respectively).

Kim (2020) identified some of the most prevalent advantages to online learning such as students' presence is not required in the same physical area, which might increase participation rates in education. Other benefits may include the elimination of travel-related and other expenses, which saves time and money. Setyowati, Rochmat, Aman & Nugroho (2023) also highlighted the importance of virtual reality as a successful learning tool by simulating real scenarios and enhancing learning outcomes without physically visiting a location.

Digitalisation: skills, competences, technologies

In its 2020 digital action plan, the European Commission announced that before the pandemic, approximately 60% of respondents had not used distance or online learning (European Commission, 2020b). This demonstrates how unprepared students were when changes to online education were implemented.

According to the European Commission (2020a) sixty percent of respondents said the pandemic had had a positive impact on their digital abilities, and ninety-five percent said the pandemic represented a turning point in terms of how technology is used in education. As pointed out by the research of Tran and Pham (2023), social media (Facebook) feedback improved students' fluent writing skills. Students possess effective self-regulated learning techniques that enable them to autonomously navigate the online learning environment (Eva et al., 2023).

Digital competence is defined as 'the safe, critical and responsible use of and interaction with digital technologies for learning, at work and for participation in society. It

includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), security (including digital well-being and cybersecurity-related skills), intellectual property issues, problem solving and critical thinking.' (Council of the European Union, 2018:9) Digital competence comprises knowledge, abilities, and attitudes needed to use technology effectively.

The health crisis has resulted in a greater demand for ICT, the use and the creation of digital platforms (Trust & Whalen, 2020) and also forced teachers to change their educational practice quickly (Cabero, 2020; Casado-Aranda et al., 2021; Usher et al., 2021). Higher education institutions are trying to adapt teaching to a digital world (Sales et al., 2020) so digital technologies in higher education has become more prevalent than they were before (Heidari et al., 2020; Murphy, 2020).

The new scenario was regarded as a positive challenge by schools that had greater experience with digital technologies and instructional materials, and who had previously concentrated on creativity, innovation, and the development of student abilities in pedagogical methods (Monostori, 2021)

The benefits, difficulties and challenges of online education

A major concern might be the online educators' inexperience or their technical limitations (Kim, 2020). People frequently struggle with issues like not having access to the internet or the resources and knowledge necessary to use it (Kovács, 2020). Maintaining and boosting students' academic involvement is one of the challenges tertiary education institutions face while new digital practices have come to the surface (Bond, 2020; Campbell et al., 2019). On the psychological side, several emotional issues appeared with online learning during the pandemic, including an overwhelming cognitive load, academic burnout, and disengagement (Cao et al., 2020; Islam et al., 2020; Pohan, 2020).

Digital proficiency among teachers is crucial for maximizing the use of cutting-edge technologies in the classroom (Engen and Engen, 2019). Therefore, it is vital to comprehend how teachers' digital proficiency affects students' performance in online learning environments (OECD, 2019a). Throughout this pandemic period, teachers' and students' opinions of their digital capabilities have been critical since an individual's assessment of their ICT skills is a vital mediator (Winstone et al., 2021).

It has been observed that the more teachers are inclined to use ICT in their work, the higher they assess their digital competence (Sundqvist et al., 2020). Teachers are reluctant to use ICT in the classroom due to their poor ICT knowledge, especially in front of students who may be more technologically literate than they are (Arkorful et al., 2021; Huang et al., 2021; Šabić et al., 2021; Van Mechelen et al., 2021). A general feeling of discomfort, fear, anxiousness about coping with the negative outcomes of computer-related operations is known as computer (ICT) anxiety (Chang, 2005). According to Awofala et al. (2019), self-efficacy is negatively correlated with computer anxiety. Real digital capabilities can sometimes be accurately predicted by perceived digital competencies (Porat et al., 2018).

People with little experience or training may exaggerate their knowledge and abilities because they are unaware of their level of proficiency (Maderick et al., 2016). This may apply to digital competencies as well; individuals who are unaware of the information and skills they possess in this area may overestimate or underestimate their digital aptitude.

According to Pavić and Černja (2019), persons who have low levels of digital skills are aware of this and do not overestimate their own abilities as much as those who are aware of having higher levels of digital abilities. Consequently, we would anticipate that younger instructors will score higher on the digital competence scale than their more experienced counterparts although the age of the instructor has no impact on how they use ICT, according to other studies (Drossel et al., 2017; Gil-Flores et al., 2017), which also revealed no significant association between age and the instructors' self-assessed digital competence.

In the primary research, the following research questions (RQ) were raised.

RQ1: Is there a difference between the two countries in terms of what digital tools were used by instructors before and after the pandemic and how they, their colleagues and students rated their digital literacy?

RQ2: How was online education in the two countries managed and how were students involved in the education?

RQ3: Can any correlation be identified between who experienced online education, how they experienced it and how they perceived the future of online education?

Due to space limitations, the authors test the following two hypotheses in the current study.

Hypothesis 1: We assume that the digital competence of the participants in the research and the digital tools, platforms and environment provided by the university were different in the two countries (Hungary and Armenia).

Hypothesis 2: We assume that respondents in the sample who perceived digital education as positive are of the opinion that digital education will complement or even replace traditional offline education in the future.

METHOD

Research design

At the beginning of the COVID pandemic in 2020, the Agri-Research Team in Hungary (MATE) launched a research project to see how colleagues in higher education were coping with the challenges of digital education posed by the pandemic. The research involved, among others, the institution's teaching staff. The Hungarian survey was designed to be as representative as possible, so with the support of the Hungarian Rectors' Conference, the online questionnaire was sent to some Hungarian higher education institutions. 36 higher education institutions in Hungary agreed to participate in the survey and 681 teachers and researchers answered the online questions.

In Hungary, the following institutions participated in the survey: 25% of the respondents were from the former Szent István University, the legal predecessor of the current Hungarian University of Agriculture and Life Sciences (MATE), 11.01% from Budapest Technical University (BME), 10.57% from the University of Miskolc (ME), 9.99% from the University of Sopron (SE), 5.58% from Pázmány Péter Catholic University (PPKE), 4.26% from Kaposvár University (KE), 3.67% from National University of Public Service (NKE) and 3.47% from Semmelweis University of Medicine (SOE). The field of study ranged widely across agricultural, technical, economic and natural sciences, as well as social sciences.

As a continuation of the research in Hungary, studies were also conducted at MATE's Armenian partner institute, the Armenian National Agrarian University (ANAU) in 2022, which lasted almost a year. Here, respondents were asked to fill in the Armenian version of the Hungarian questionnaire and a questionnaire was also sent out among colleagues. In this case 111 respondents answered the questions.

The main aim of the researchers was to see if there were differences between the two culturally very different countries in terms of how instructors coped with digital challenges during the COVID-19 and their perceptions of the impact of digital skills acquired on education after the pandemic. As can be seen, the two sample sizes are quite different, so the authors performed the same analyses on the samples separately and compared the results. Since there were some positions in the Hungarian practice that were not interpretable in Armenia, for example, there were positions such as master teacher, language teacher, etc. in Hungary, the authors removed them from the Hungarian sample for the sake of interpretability, leaving 592 respondents in the Hungarian sample.

The research model is presented by Figure 1.

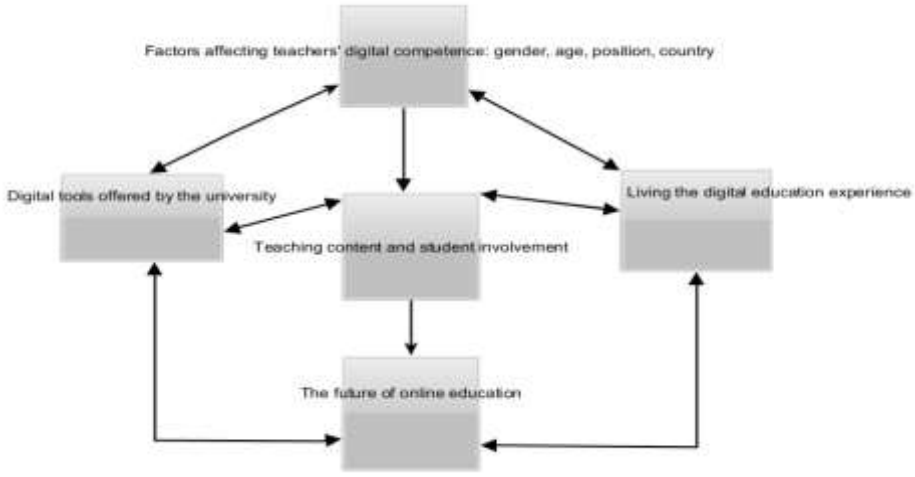

Figure 1
Research model

Source: authors' own research

In the model, the authors investigate how the digital competence of teachers is influenced by independent factors such as gender, age, position and country. These competences influenced which digital tools instructors used when teaching and, of course, the use of these tools also influenced the development of teachers' digital literacy. The strength of digital competence influenced how instructors experienced digital education. All of the factors mentioned above were related to the content of the lessons and the way in which the teachers engaged students in digital lessons. Finally, the model presents an important question about which variables may have influenced respondents' views on how they see the future of online education.

Research sample

The characteristics of the sample by country are presented in Table 1.

There were 592 respondents from Hungary and 111 respondents from Armenia.

Table 1
Sample specification (%)

Specification	Country	
	Hungary	Armenia
Gender	Male: 55.2% Female: 44.8%	Male: 69.4% Female: 30.6%
Age	Under 25: 0.3% 25-35 years: 13.9% 36-45 years: 32.4% 46-55 years: 29.7% between 56-65 years: 17.1% Over 65: 6.6%	Under 25: 1.8% 25-35 years: 22.5% 36-45 years: 30.6% 46-55 years: 28.8% between 56-65 years: 14.4% Over 65: 1.8%
Position	Teaching assistant: 18.9% Senior lecturer: 23.0% Associate professor: 44.6% Teacher: 11.7% Professor emeritus: 1.9%	Teaching assistant: 28.8% Senior lecturer: 18.0% Associate professor: 39.6% Teacher: 11.7% Professor emeritus: 1.8%

Source: authors' own research

In the Hungarian sample, 45.7% of men were over 45 years of age, compared to 48.8% of women.16.3% of men were teaching assistants, 20.6% were senior lecturers, 46.3% were associate professors, 14.4% were teachers and 2.5% were professor emeritus. Of the women, 22.7% were teaching assistants, 26.2% were senior lecturers, 42.3% were associate professors, 8.1% were teachers and 0.8% were professor emeritus. The largest proportion of those under 35 were teaching assistants (65.9%), while the largest proportion of those aged 36-45 were associate professors (46.4%), similar to those aged 45 and over (over 50%).

Also looking at the Armenian sample, the highest proportion of men were aged 45 and over (51.7%), while women aged 36-45 years accounted for 44.1%.29.9% of men were teaching assistants, 23.4% were senior lecturers, 33.8% were associate professors, 10.4% were teachers, while 2.6% were professor emeritus. Of the women, 26.5% were

teaching assistants, 5.9% were senior lecturers, 52.9% were associate professors and 14.7% were teachers. The largest proportion of those under 35 (over 60%) were teaching assistants, while the majority of those over 35 were associate professors. Overall, in both countries, the largest proportion of respondents were male, aged between 36 and 45, and associate professors.

Data collection techniques

As mentioned earlier, respondents in both countries were asked to answer questions with the same content. The questions were mostly closed in nature and were based on a nominal and metric Likert scale of 5 points. In general, the Likert scale had no characteristics at all as a value of one, and full characteristics as a value of five. The questionnaire consisted of three major groups of questions.

The first set of questions contained the sample specification, i.e., the gender of the respondent, their age, educational experience and job title.

The second set of questions focused on the experience before COVID-19, i.e. what the characteristics of digital working in education before the pandemic were and what were the digital competences of teachers at that time.

The third set of questions focused on experiences during the COVID-19 pandemic, education and future opportunities for digitalisation. Thus, among other things, the questions referred to the advantages and disadvantages of online education and the possible impact of the experience gained now on university education after the pandemic.

Data analysis

The researchers analysed the data using SPSS 28 statistical software. Univariate and multivariate analyses were conducted, including frequency, mean and standard deviation tests, cross-tabulation analysis, ANOVA, independent samples t-test, and correlation.

FINDINGS

Differences in the Impression of Digital Education during the Pandemic in Hungary and Armenia

In the first part of the study, we wanted to know what the teachers' impressions were at the time of COVID-19, how they rated their own and their environment's digital readiness and the digital development of education. They were asked to rate the statements on a scale of one to five, with one being unsatisfactory and five being excellent. We analysed whether there were any significant differences by gender, age and position between the variables across countries. Where differences were found, it was noted which variable had the highest mean and standard deviation. The analysis was performed using a t test and ANOVA (Table 2).

Table 2
Impression of digital education during the COVID-19 (p:0.05)

		Hungary	Armenia
My own digital readiness	Gender	t: 2.188 sig.:0.029 Men M: 3.90 SD: 1.832	No difference
	Age	No difference	F: 8.246 sign:0001 Over 65 years M:5 SD:0.00
	Position	No difference	No difference
Digital readiness of students	Gender	No difference	t: 2.158 sign:.017 Male M:3.44 SD:0.910
	Age	No difference	No difference
	Position	No difference	No difference
Digital literacy of my direct colleagues	Gender	No difference	t: 2.746 sign:.004 Male M:3.68 SD: 0.966
	Age	No difference	F: 2.615 sign:.012 Over 65 years M:4.5 SD:0.707
	Position	F: 3.351 sig.:0.01 Professor emeritus M:3.91 SD:1.136	No difference
Supply of institutional equipment	Gender	No difference	No difference
	Age	No difference	No difference
	Position	No difference	No difference
My methodological background in online education	Gender	No difference	No difference
	Age	No difference	F: 2.402 sign:.027 25-35 years M:3.88 SD:0.833
	Position	No difference	No difference
The quality of my online learning materials	Gender	t: -2.132 sig.:0.17 Women M:4.00 SD: .0681	t: 2.002 sign:.024 Men M:3.79 SD:0.848
	Age	No difference	F: 5.105 sig.:0.001 Over 65 years M:4.5 SD:.707
	Position	No difference	No difference

Source: authors' own research

The data in the table show that age, gender and position can have an impact on a number of factors by country. In Hungary, there are basically smaller differences, more by gender and in one case by position. The Armenian sample shows that there are gender differences in the perceptions of digital readiness and the online learning material produced by students and direct employees. Typically, men have a more positive perception of the variables. They also differ by age in their perceptions of the digital readiness of the teaching material, methodological prior knowledge and the digital readiness of the instructors. In these cases, those aged 65 and over and those aged 25-35 tended to be the most satisfied with the variables.

In Hungary, universities typically provided PCs (358 students), laptops (264 students), microphones (62 students) and webcams (49 students) for teaching. In Armenia, PCs (74 people), laptops (53 people), smartphones (32 people) and microphones (30 people) were provided by institutions.

In Hungary, teachers used e-mail (565 people), Google Drive (349 people) and Teams (262 people) for teaching.

In Armenia, Google Drive (58 people), Google Classroom (36 people), Mentimeter (42 people) and Teams (91 people) were the most common communication platforms for instructors in education during the pandemic.

The research also asked what form of educational activity the research participants had undertaken during the COVID-19. In Hungary, 8.9% of teachers uploaded pre-recorded audio lecture material, 6.5% used pre-recorded video, 54.4% held webinars, 24.7% offered modular distance learning, while 5.6% emailed educational materials. Based on gender, age and position, there were only differences in the modes of delivery for gender (Chi-square test 10.701 df:4 sig.:0.030 $p<0.05$).

In Armenia, webinars were the most common (51.8%), 31.8% of trainers opted for modular distance learning, 7.3% pre-recorded and played back the training materials, while 9.1% uploaded pre-recorded audio lecture material. In Armenia, no differences were identified by gender, age and position in the types of education provided.

The Impact of Digital Education during the Pandemic in Hungary and Armenia

In the second part of the survey, the authors analysed how respondents perceive their digital education experiences during the pandemic. They were asked to rate the definitions on a five-point Likert scale, where 1 meant not at all typical and 5 meant completely typical as presented by Table 3.

Table 3
Transition to online education during the COVID-19 (M, SD)

Statements	Hungary		Armenia	
	Mean	Std. deviation	Mean	Std. deviation
The transition to online education went smoothly for me.	3.49	1.061	3.27	0.990
The transition to online learning has been smooth for students.	3.48	1.011	3.01	0.968
The transition to online education has been smooth for the institution.	3.27	1.149	3.09	0.848
More students attended online classes than in the classroom.	2.48	1.375	3.14	1.124
The online training has given me a better understanding of online communication.	3.94	1.126	3.07	1.150

Source: authors' own research

The average values show that, with the exception of student participation, the transition was smoother in Hungary than in Armenia. There is a very large difference in the averages for the two groups of respondents in the two countries in terms of acquiring online communication skills. It is true that, especially in the case of Hungarian responses, high values of dispersion can be seen, showing that respondents were not unanimous in their answers.

The researchers also looked at how respondents felt about whether online learning would be used more in the future. This statement was also measured on a five-point Likert scale by the study authors, similar to the statements in Table 3. 53% of Hungarian respondents agreed with this statement (M: 3.69 SD: 1.183), while 36% of Armenian respondents agreed (M:3.07 SD:1.158).

The researchers also analysed whether there was a correlation between the smoothness of online transition, student participation, proficiency in online communication, and whether respondents believed that they would use online education more often in the future (Table 3). The study was conducted using correlation analysis by the authors. Analysing significant correlation values stronger than 0.3, the researchers found that the smoother the transition to online education was for Hungarian instructors, the more they believed that this mode of instruction would be used more often (r: 0.309).

A similar view was held by Hungarian respondents who had gained greater proficiency in digital communication (r: 0.322). Looking at Armenian responses, all variables had a strong significant positive relationship with the existence of a possible future online education. This relationship was particularly strong for stronger digital communication (r: .583) and for more student involvement (r:.433).

82.3% of the Hungarian respondents thought that traditional education would be supplemented by online education in the future, while 12.3% thought that classroom education would return. 5.1% of respondents believed that online education would complement traditional education, while less than half a percent believed that exclusively online education will be the future. These proportions were different for Armenian respondents. That is, 9% thought that only online education will remain in the future, 11.7% believed in a traditional classroom-only solution, while the rest believed in a blended solution.

DISCUSSION

In the first part of the study, we wanted to know what the teachers' impressions were, how they rated their digital readiness and the digital development of education. We analysed the differences by gender, age and position between the variables across countries. We also examined the platforms (forms) and tools (means) used in digital education.

As we could see from the research, different attitudes to online education were only partially identifiable on the basis of the competences, forms and means of presentation examined, and the authors therefore only partially accept their first hypothesis. This is also in line with the research of Suyadi et al. (2023) who concluded that learning loss depended on the students' abilities and skills. Moreover, Aslam and Sonkar (2021) pointed out that educational innovation was boosted by new methods. However, the attitude to online education correlates with the participants' competencies with online tools (Chakraborty et al., 2021; Pokhrel & Chhetri, 2021).

In the second part of the survey, the authors analysed how respondents perceive their digital education experiences during the pandemic. The researchers also looked at how respondents felt about whether online learning would be used more in the future. It can

be seen that, in the light of the results, those who perceived the transition to digital education as positive do not exclude the possibility of digital education complementing traditional education and possibly even replacing classroom education with digital education. On this basis, the authors accept their second hypothesis.

To sum it up, the literature review and our research demonstrate that infrastructure, ICT devices in the classroom, training in digital applications and platforms, cognitive and digital skills, school environment, academic engagement, and appropriate ongoing technical support affect teachers' acquisition of skills for use in online environments. These factors are supported by effective lifelong learning systems (OECD, 2019b,c,d; Hatos, 2019; Akmal et al., 2021). Digital education proved to be beneficial, but it would not eventually replace traditional offline education, rather, supplement it (Haleem et al., 2022; Dhawan, 2020; Selvaraj et al., 2021).

CONCLUSION

The aim of the current paper was to present higher education from the instructors' point of view, with a focus on online education, digital competencies, platforms, and experience—detailing both the advantages and disadvantages as well as the difficulties.

The authors postulated that, based on their level of digital competency and the IT infrastructure of their institutions, different instructors and teaching staff would perceive the challenges of online education in different ways.

Overall, based on the competencies, forms, and presenting methods, differences were only partially discernible, and as a result, the authors' first hypothesis was only partially accepted.

The authors examined respondents' perceptions of their experiences with digital education during the pandemic in the second part. Additionally, the researchers analysed whether there was a relationship between respondents' perceptions of their likelihood to use online education more frequently in the future, student participation, smoothness of the online transfer, and skills in online communication.

To sum up, it can be inferred that respondents who expressed the shift to digital education positively do not rule out the potential of digital education enhancing traditional education or even taking the place of classroom instruction. On this basis, the second hypothesis is accepted. The practical implications of the research stressed that the pandemic induced the emergence of online education, which is here to stay with us in the future to supplement traditional, offline forms.

Research has shown that the best practice for students and teachers depends on a number of factors, so there is no single successful solution.

In this study, the authors conducted the analyses in two countries with different cultures. It would certainly be worthwhile to increase the number of countries studied and analyse the similarities and differences. Furthermore, one possible direction for the research could be for the authors to extend the study to the area of impact of AI , as this factor should also be considered in the future.

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COMPETING INTERESTS

The authors declare that there are no competing interests.

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