Experiences with e-learning as a challenge for the effective training of future generations of teachers

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Abstract: The paper presents experiences with e-learning among students of educational studies in the biggest Polish pedagogical university that prepares future teaching staff. The research was conducted in May and June 2019 in a group of 450 students (average age=22.660, with st. dev.=4.232). The goal of the study was to present the set of indicators that coexist with the use of distance education platforms by Polish pre-service teachers. Through triangulation of the research tools, eight survey questionnaires of high internal coherence (0.925) were used. Based on the data collected, it was noticed that the respondents have little experience in applying different forms of distance education. Last year, only 8.4% of the students were using paid platforms to develop their interests and knowledge. It was also observed that students who are highly active online (who use different e-services very often or often) show much more interest in online training. Financial status and gender do not determine student engagement in distance education. Participation in one form of e-learning very often coexists with other forms. The key factor indicator of involvement in paid and free e-learning courses is respondents' activity in cyberspace.

Keywords: teachers, pre-service teachers, e-learning, digital literacy, needs, experiences, Poland

1. Introduction

The last two decades have brought a series of new insights into e-learning. For years, the number of publications on the conditions of distance education at different levels has been growing systematically. These changes have been enforced by the development of the information society in which many offline activities are transposed into cyberspace. An exemplification of this are the increasingly advanced solutions being created to support e-learning or blended learning (Oyelere et al., 2018). In many cases, modern education is also imposed by modernisation processes within institutions, which are introduced intentionally (by following complex recommendations and the principles of the development of e-learning in certain countries) as well as randomly. This last category becomes particularly important when transferring certain activities from the offline into the online world becomes a necessity. An example of such circumstances is the global transformation of stationary teaching into e-learning due to the COVID-19 pandemic (Ting et al., 2020; Pyżalski, 2020). Intentional activities introduced over many years (research, implementation of new platforms, deployment of existing mediated learning environments, digital education methodology improvements) have resulted in e-learning becoming an integral part of academic education and some forms of professional development or formal (school-based) learning. Despite these circumstances, there are many questions regarding effective e-learning, be it planned or forced on institutions by unexpected conditions (Heba et al., 2014).

Appropriately-prepared teaching staff play a crucial role in the popularisation of e-learning. It is teachers who, in the first place, are expected to operate all of the effective and available means, forms and methods that support e-learning and teaching, and to do so with ability and confidence. In the information society, some of the main tools are, undoubtedly, online applications and websites. However, in order to use the most recent solutions, one needs to have certain resources which allow an understanding of how new media can be used effectively, as well as skills to introduce these solutions into one's didactic and educational activities. Education is being modernised through computerisation (in this case, the introduction of e-learning) and this is taking place as a result of several important

factors (Tomczyk et al., 2019). Leaving aside the global circumstances, some of these important indicators are environmental and individual conditions. The first category is less dependent on the teacher and is in the first place connected with the institution he or she works in. Support for teachers, regular introduction into digital learning and teaching environments with the active participation of parents and students, ensuring participants' wellbeing during e-learning, and using proven solutions are some of the main environmental factors that determine effective distance education (Kuzmanović et al., 2019). But there is another group of indicators within the individuals who introduce or should introduce new technologies to educational processes. In the case of active teachers, the situation is quite simple because this group is closely tied with the processes that take place in schools (Stošić, & Stošić, 2015; Fedeli, 2017). Thus, many incorporate e-learning into organizational and methodology changes, and receive intense support in many forms. A group which seems less explored are pre-service teachers, that is, students of pedagogical specialisations. This group has limited experience as creators of e-learning. Such students are mainly users of distance education solutions (Istenič Starčič, & Lebeničnik, 2020). Based on the existing research, it is believed that there are gaps in the system of preparing pre-service teachers. There are many studies into the existing generation of educators both working in K12 and higher education systems. Representing the generation raised in the information society as digital natives, the new teaching staff face diverse expectations. Stereotypically, it is this generation - current students - that is seen as possessing well-developed digital literacy and rich experience of using ICT. Such assumptions not only create expectations regarding the changes in the ways new media are implemented in education but also raise questions about the preparation of this next generation of teachers, who will face global challenges we can now observe thanks to global computerization, among other phenomena (Oyelere et al., 2020).

This paper joins a series of reports from research into the common points in pre-service teacher training, the development of e-learning, and the analyses of the determinants of the implementation of new media in academic and formal education. It presents the key determinants of using e-learning platforms, such as the individual educational experiences of students connected with e-learning, the self-evaluation of digital literacy level, the diagnosis of attitude towards new media, the evaluation of the quality of new technologies available at university, individual online activity, and ways in which mobile devices are used. According to specialists collaborating within an international project carried out in parts of Latin America, Europe and the Caribbean, the abovementioned variables are responsible for the effective implementation of e-learning solutions. They are crucial regardless of the geographical location of schools and universities.

2. Methodology

2.1 Research objective

The goal of the research was to show the relationship between the variables which determine the e-learning experiences of students of pedagogical studies. The dependent variable were experiences regarding e-learning during the last year, in particular participation in obligatory courses, searching for information connected with completing online classes, participation in paid and free online courses, and participation in self-learning groups held online. The above listed variables were compared with the following independent variables: attitude towards new media in education, subjectively perceived ease of use of ICT, quality of ICT available at the university, interest in online training, individual online activity, the means of use of mobile devices for different purposes, and self-evaluation of digital literacy. The following research questions are formulated in this paper: 1) What kind of experiences are characteristic of students of pedagogical faculties in the field of e-learning? 2) To what extent are the experiences of different forms of online learning linked? 3) Is participation in paid and free e-learning courses related to the attitude towards new media?

2.2 Research procedure and characteristics of the research sample

The research was conducted in the biggest state-owned Polish university that focuses on educating pre-service teachers - the Pedagogical University of Cracow. The study was carried out in May-June 2019 among the students of full-time, teacher studies in the Pedagogical Faculty. The research was part

of the international project Smart Ecosystem for Learning and Inclusion – SELI ERANet17/ICT-0076, financed by the National Centre for Research and Development (Tomczyk & Sunday Oyelere, 2019). The study was conducted in compliance with the appropriate ethical standards. The final version of the tool and the procedure were approved by researchers who represent nine countries participating in the SELI project. The respondents were informed about the research objectives and data processing procedures. Every respondent was able to withdraw from participating in the research at any time. The data collected were coded to prevent the identification of the persons completing the questionnaire. The study was conducted by researchers with many years of experience in social research. There were 450 respondents. The average age of the students was 22.660, with standard deviation of 4.232. The median was 21 years. The sample consisted of 395 (87.778%) women, 52 (11.556%) men and 3 individuals who did not declare their gender (0.667%). The data collected allow only for the generalization of research results for the population of students of the Pedagogical University of Cracow (Pedagogical Faculty).

2.3 Research tool

The tool was developed by a team of experts involved in the SELI project. The triangulation of approaches, experiences with e-learning, and the research sectors (IT and education) led to the final version of the tool which consisted of the following scales: attitude to new media (9 indicators) (Tomczyk et al., 2017); the perception of ease of use of ICT (4 indicators, description of SELI project), technical infrastructure at University – self-evaluation (7 indicators, description of SELI project), interest in future online courses offered in SELI (8 indicators, description of SELI project); use of the internet (including social networks and instant messaging apps) (9 indicators) (Eger et al., 2018); usage of internet for learning (5 indicators – original design); usage of mobile devices (5 indicators – original design); perception about the level of ICT skills (5 indicators) (Taubert, 2006; Petuhova et al., 2010). The whole tool was very coherent with Cronbach's $\alpha = 0.925$.

3. Results

The vast majority of the pre-service teachers interviewed have no regular experiences with e-learning. Most often, students of pedagogical specializations search for information online to prepare for their classes or find materials they can use in their projects (46.2% of the young people do this often of very often). More than one in four pre-service teachers (27.2%) have participated in obligatory online courses often of very often. However, these courses are most frequently health and safety, library orientation, or general open lectures (chosen by the students). Very rarely, distance courses are completed as part of methodology training. Until the COVID-19 pandemic, e-learning was used occasionally for courses preparing future teaching staff.
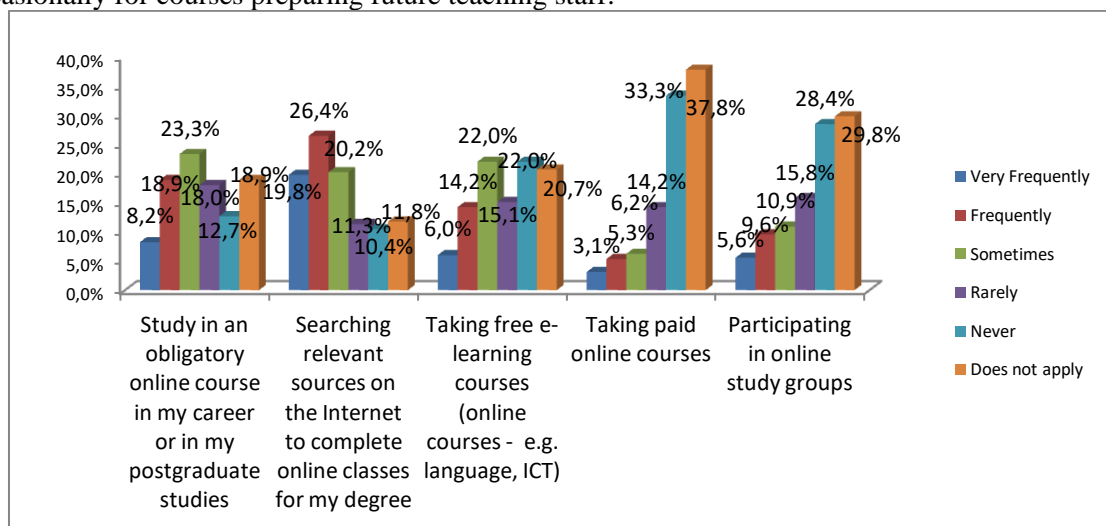

Figure 1. Experiences of pre-service teachers with e-learning.

One in five respondents (20.2%) has participated in free e-courses often or very often. The vast majority have never taken part in paid online training. Only 8.4% often or very often participate in courses that involve additional fees. Thus, e-learning is not a popular solution used by pre-service teachers to develop their interests or, more widely, to improve their human capital. As for ICT-based self-learning groups, the students also engaged very rarely. Only 15.1% had regular experiences in this area. Based on the data collected, one can notice that e-learning is not the leading means of acquiring academic knowledge or developing individual interests. It is rather a form or an environment for teaching and learning only occasionally used by pre-service teachers. The detailed distribution of answers is presented in Figure 1.

When analysing the data, it was found that participation in one form of distance education very often coexists with other forms of e-learning. Thus, individuals who actively acquire knowledge on the Internet try to benefit from the variety of opportunities provided in this process. This coexistence is confirmed in the analyses using Pearson's linear correlation coefficient, the results of which are presented in Table 1. However, one must remember that the strength of these relationships is average. Thus, there must be some intermediate variables between the simple relationships, thanks to which the e-learning process is influenced by the series of other factors.

Table 1. Correlations between different forms of remote education

	1	2	3	4
1. Study in an obligatory online course in my career or in my postgraduate studies	-			
2. Searching relevant sources on the Internet to complete online classes for my degree	0.604 ***	-		
3. Taking free e-learning courses (online courses - e.g. language, ICT)	0.477 ***	0.426 ***	-	
4. Taking paid online courses	0.326 ***	0.235 ***	0.486 ***	-
5. Participating in online study groups	0.366 ***	0.308 ***	0.468 ***	0.579 ***

$* \, p < .05, \; ** \, p < .01, \; *** \, p < .001$

In order to illustrate the correlations between the variables that form the set of indicators of engagement in e-learning activities, individual and environmental indicators were included in the research model. Individually tested, each of these elements shows a positive linear correlation (due to volume limitations a detailed table of linear correlations between the indicators is not included here). However, given the total compilation of variables in the model with seven variables and the selected indicators of ICT-related experiences, it turns out that only one variable changes noticeably. This is the "use of the Internet" variable. The regularity involves both experiences with paid and free courses. The predictors in the research model adopted explain from several to a dozen or so percent (Table 2). Thus, these correlations do not allow us to draw clear conclusions about the individual and environmental factors that influence participation in e-learning. However, the adopted research model has statistical limitations, as it explains only 11.2% of cases (free online courses) and 6.2% (paid online courses).

Table 2. Multilinear regression analysis - dependent variables: Taking free and paid e-learning courses

N=447	Taking free e-learning courses (online courses - e.g. language, ICT) R= .335; R^2= .112; F(7,439)=7.96, p<0.001				Taking paid online courses (online courses - e.g. language, ICT) R= .250; R^2= .062; F(7,439)=4.196 p<0.001			
	β	SE	t	p	β	SE	t	p
Attitude to new media	0.084	0.053	-1.861	0.062	0.079	0.054	1.457	0.145
The perception of ease of use of ICT	-0.013	0.056	1.582	0.114	0.041	0.058	0.710	0.478

Technical infrastructure at University	-0.030	0.046	-0.231	0.817	0.011	0.047	0.250	0.801
Interest in future online courses	0.084	0.048	-0.657	0.511	0.012	0.049	0.258	0.796
Use of internet	0.146	0.057	1.740	0.082	0.145	0.058	2.470	0.013
Usage of mobile devices	0.087	0.060	2.560	0.010	-0.016	0.062	-0.266	0.789
Autoevaluation ICT skill	0.092	0.054	1.453	0.146	0.079	0.056	1.411	0.158

4. Discussion and summary

The data collected shed new light on the education of students of pedagogical studies in the biggest Polish university that prepares future teaching staff in modern schools. Of course, the sample does not enable generalisations of the whole student population in Poland but, as shown in other research, these data provide an illustration which may be useful for those who are responsible for the preparation of new teaching staff to function in the information society and enable the verification of the processes of implementation of obligatory academic courses like media in education or IT (Kędzierska & Wnęk-Gozdek, 2015; Arteaga et al., 2020). One must be aware that the data are now historical due to the fact that since March 2020, all academic education-related processes in the university studied were moved into cyberspace. On the one hand, the data are historical but on the other hand they enable further, more complex and longitudinal research in the same sample.

During the research, the students of pedagogical specializations reported having had little experience with e-learning. The vast majority did not participate in paid online courses and only one in five used free forms of e-learning (Eger, 2015). Despite Poland being considered a country where information society services (banking, shopping, news services) are developing rapidly, e-learning is still not attractive for students. One question raised by the interpretation of the results is, what indicators block participation in e-learning? Based on the data collected, it was noticed that the issue is not connected with the respondents' attitude to new media or to university infrastructure. The key indicator for different forms is the way in which digital services are used. Students who are active in cyberspace not only use typical services but benefit from the variety of opportunities provided by the Internet. Based on the results of the previous research, this group may be characterised as techno-optimists who recognise the power of media influence, very often experiment with the new media, and are aware that ICT may increase the quality of life (Wątróbki et al., 2018; Ziemba, 2017). The results indicate that financial wellbeing does not influence the frequency of participating in e-learning, and this is particularly interesting. At present, Polish students do not differ in this area from their peers in neighbouring countries (Eger et al., 2018). They use devices that perform well, and have smartphones with data packages that enable them to stay online anywhere and anytime. Thus, the indicators of the frequency of participation in e-learning should be sought in other areas, not necessarily related to the self-evaluation of digital literacy or attitude towards new media but rather in the means of using new media, which does not have to be connected with the respondents' ability to use traditional software (for example office packages) (Tomczyk, 2019).

The results presented herein give grounds for further research into the individual and environmental factors that facilitate the development of digital literacy among the students of pedagogical specializations. Due to the changes taking place in the education system, it is the younger generations of teachers that will shape the image of schools in the next few years. Today, academic centres are particularly responsible for the effective preparation of this generation of teachers so that they can create online and traditional (offline) learning environments with methodological correctness and as a response to modern challenges, by combining the potential of both solutions.

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References

Arteaga, M., Tomczyk, Ł., Barros, G., Sunday Oyelere, S. (2020). *ICT and education in the perspective of experts from business, government, academia and NGOs: in Europe, Latin America and Caribbean*. Ecuador: Universidad del Azuay.

Eger, L. (2015). Is Facebook a similar learning tool for university students as LMS?. *Procedia-Social and Behavioral Sciences*, 203, 233-238.

Eger, L., Klement, M., Tomczyk, Ł., Pisoňová, M., & Petrová, G. (2018). Different user groups of university students and their ICT competence: evidence from three countries in Central Europe. *Journal of Baltic Science Education, Journal of Baltic Science Education*, 17(5).

Fedeli, L. (2017). School, curriculum and technology: the what and how of their connections. *Education Sciences & Society-Open Access Journal*, 8(2).

Heba, A., Kapounová, J., & Smyrnova-Trybulska, E. (2014). Theoretical conception and some practical results of the development of mathematical competences with use of e-learning. *International Journal of Continuing Engineering Education and Life Long Learning* 3, 24(3-4), 252-268.

Istenič Starčič, A., & Lebeničnik, M. (2020). Investigation of University Students' Perceptions of Their Educators as Role Models and Designers of Digitalized Curricula. *Human Technology*, 16(1), 55–91. doi:10.17011/ht/urn.202002242163

Kędzierska, B., & Wnęk-Gozdek, J. (2015). Modern didactics in contemporary education. *International Journal of Electronics and Telecommunications*, 61(3), 251-260.

Kuzmanović, M., Anđelković Labrović, J., & Nikodijević, A. (2019). DESIGNING E-LEARNING ENVIRONMENT BASED ON STUDENT PREFERENCES: CONJOINT ANALYSIS APPROACH. *International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE)*, 7(3), 37-47. https://doi.org/10.5937/IJCRSEE1903037K

Oyelere, S. S., Qushem, U. B., Jauregui, V. C., Akyar, Ö. Y., Tomczyk, Ł., Sanchez, G., ... & Motz, R. (2020). Blockchain Technology to Support Smart Learning and Inclusion: Pre-service Teachers and Software Developers Viewpoints. *World Conference on Information Systems and Technologies* (pp. 357-366). Springer, Cham.

Oyelere, S. S., Suhonen, J., Wajiga, G. M., & Sutinen, E. (2018). Design, development, and evaluation of a mobile learning application for computing education. *Education and Information Technologies*, 23(1), 467-495.

Petuhova, L. E., Osipova, N. V., & Kushnir, N. O. (2010). Actual Problems Of Implementing Ecdl Course In The Training Of Teachers. *Information Technologies in Education*, (8), 17–22. doi:10.14308/ite000198

Pyżalski, J. (red.) (2020). *Edukacja w czasach pandemii wirusa COVID-19. Z dystansem o tym, co robimy obecnie jako nauczyciele*. Warszawa: EduAkcja

Stošić, L., & Stošić, I. (2015). Perceptions of teachers regarding the implementation of the internet in education. *Computers in Human Behavior*, 53, 462-468.

Taubert, M. (2006). European Computer Driving Licence (ECDL). *BMJ*, 332(7540), s89.1–s89. doi:10.1136/bmj.332.7540.s89

Ting, D. S. W., Carin, L., Dzau, V., & Wong, T. Y. (2020). Digital technology and COVID-19. *Nature medicine*, 26(4), 459-461.

Tomczyk, Ł. (2019). What Do Teachers Know About Digital Safety? *Computers in the Schools*, 36(3), 167–187. doi:10.1080/07380569.2019.1642728

Tomczyk, Ł., Eliseo, M. A., Costas, V., Sánchez, G., Silveira, I. F., Barros, M. J., ... & Oyelere, S. S. (2019). Digital Divide in Latin America and Europe: Main characteristics in selected countries. *2019 14th Iberian Conference on Information Systems and Technologies (CISTI)* (pp. 1-6). IEEE.

Tomczyk, Ł., Szotkowski, R., Fabiś, A., Wąsiński, A., Chudý, Š., & Neumeister, P. (2017). Selected aspects of conditions in the use of new media as an important part of the training of teachers in the Czech Republic and Poland - differences, risks and threats. *Education and Information Technologies*, 22(3), 747–767. doi:10.1007/s10639-015-9455-8

Tomczyk, Ł., & Sunday Oyelere, S. (2019). *ICT for Learning and Inclusion in Latin America and Europe. Case Study From Countries: Bolivia, Brazil, Cuba, Dominican Republic, Ecuador, Finland, Poland, Turkey, Uruguay*. Cracow: Pedagogical University of Cracow.

Wątróbski, J., Ziemba, E., Karczmarczyk, A., & Jankowski, J. (2018). An Index to Measure the Sustainable Information Society: The Polish Households Case. *Sustainability*, 10(9), 3223. doi:10.3390/su10093223

Ziemba, E. (2017). The Contribution of ICT Adoption to the Sustainable Information Society. *Journal of Computer Information Systems*, 59(2), 116–126. doi:10.1080/08874417.2017.1312635