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Investigation of Future Educators' Readiness for Distant Technologies Application in Teaching

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Abstract

This research study addresses issues of readiness and use of distant technologies in teaching. Subjects are the students of educational programs in Pedagogy. The researchers analyze different documents that set goals in computer technologies and digital education, and study theoretical and practical issues of digital didactics presented in the works of researchers worldwide. The analyzed literature has enabled the authors to clarify the concepts of distant education, distant technologies, teachers' digital competence, digital didactics, and to review different approaches for examining the structure of teachers' digital competence. Researchers have 1) administered a survey and processed the results with the methods of mathematical statistics package SPSS, 2) scrutinized which distant technologies the students are ready to implement in teaching, 3) examined students' attitude to distant and blended education, 4) probed how students assess their ICT-skills, and finally, 5) correlated all aspects of the study with one another. Researchers have concluded that despite an ultimate readiness of the students to use distant technologies in teaching, there is a contradiction between their competences' assessment and their relatively high level of skepticism towards the efficiency of distant technologies. Moreover, the students do not perceive digital technologies as a tool that demands the reinterpretation of educational principles and teachers' roles and the comprehension of specific didactics. All this has proved the necessity for purposeful and systematic training of would-be teachers for applying technologies of distant education.

Keywords: distant education, distant teaching technologies, teachers' digital competence, digital didactics, blended learning, pedagogical education, readiness for on-line teaching.

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Introduction

The COVID-19 pandemic has actualized the issues of the teachers' readiness for efficiently applying distant (remote) teaching technologies in education efficiently (Tondeur & Howard, 2021). Although the pandemic will eventually end, and face-to-face education will resume worldwide, the breakthrough in the use of distant technologies will remain paramount in education. Distant technologies have proved their effectiveness by enhancing traditional classrooms with technology in different aspects: developing school students' autonomy, personalization and the transfer of non-creative work out of classroom.

While young teachers appear to be able to incorporate competencies into curricula of secondary educational institutions, the question must be asked of novice teachers' readiness for the digital challenges of the XXI century (Howard, Tondeur & Yang, 2021). Teacher educators are aware of the necessity to systematically develop the professional competencies of the students in pedagogical educational programs, and upgrade the skills that enable novice teachers to adjust effective teaching methods and educational technologies, and apply them in distant and blended teaching and learning. The issue of amending these technologies within the content of educational programs in Pedagogy with regard to digital didactics is actively being considered by numerous Russian and foreign researchers. Questions remain, specifically regarding the concept of digital didactics (Frolova, Rogach & Ryabova, 2020).

Purpose and objectives of the study

The purpose of the study is to analyze the readiness of the graduates of educational programs in Pedagogy to apply distant technologies in their professional activities. The objectives are 1) to discover the interrelation between the students' experiences in distant learning and their readiness to replicate those experiences in their distant teaching; 2) to determine the problem areas in the educational program that need improvement.

Literature review

One of the greatest challenges of the XXI century is the unprecedented human exposure to the vast array of information technologies. This fact is evident in different international and national documents, such as the UNESCO document "A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2". This global network sets out the main aims and objectives needed for world states to achieve basic work skills in the digital information environment (Law, Woo, & Wong, 2018). In the Russian Federation the priorities of the state policy for constructing a knowledge-based economy and enhancing digital education are designated in the project "Modern digital education area in the Russian Federation".

This is a part of the Federal Project "Education". The implementation of the project "Modern digital education area in the Russian Federation" has already: 1) enhanced integration of digital technologies in secondary and higher education, 2) enabled serious steps to be taken to the effective application of digital technologies in education, and to allow more expanded access to distant educational courses of different levels (2016).

Distant education is quickly developing in vocational education and professional development. Distant teaching and learning is evident in the syllabi of higher education programs in the form of online courses. Many university and school students were exposed to distant learning during the Covid-19 lockdown. Recent past and current conditions make it apparent that distant teaching and learning will remain in education. The use of technology in the classroom has proven its effectiveness, although there are apparent weaknesses and problems.

The term "distant education" is interpreted differently. Some researchers believe distant learning to be an organizational approach to enable students to receive an education through online learning (Demkin, 2010; Polat, 2005; Soldatkin, 2006), i.e., a purposeful and organized process of education aimed at forming knowledge, skills, and capabilities determined by the educational program. Other authors consider distant education to be a tool of teaching and learning management (Andreev, 2013; Akhayan, 2019). Our research is based on Polat's definition of distant education. We consider distant education a form of education in which teacher–student and student–student interaction takes place at a distance. This interaction reflects the inherent components of the educational process: aims, objectives, content, methods, organizational forms, and educational provision. These are implemented by means of the specific Internet and other distant technologies or other interactive instruments (Polat, 2005).

Online instruction and explanation involve: conducting video connections with students that enable the lecturer to give live instructions and explanations, showing a presentation, and creating smaller groups with breakout rooms, and etc. (Maher, 2020). Besides the online connection, a teacher can create educational videos with explanations or instructions (knowledge clips) that are accessible to the students who seek to go back to the lesson to refresh their understanding. In addition, if students have access, they may discover other study materials on the Internet or on social media. Using study platforms, the teacher can organize and facilitate collaboration and interaction among students that will stimulate them to work together between classes. During self-study sessions students may work together on a document, share content and have discussions, and collaborate by discussing their project work or group assignments such as virtual story-telling in real time with a virtual classroom (Caudill & Raily, 2020). Distant technologies open the doors to different ways of online and offline learning and interactions.

When having individual consultations, the teacher and the student can see each other, and also share the screen to exchange different kinds of information. By recording the session and uploading it to the course file or providing access to the recording, students can listen to it again. Some study platforms provide students with access to a digital Portfolio. Here they can save educational materials, and complete assignments to share them with fellow students and teachers (McKeeman & Oveido, 2020).

All these methods can be implemented separately. However, digital didactics offer technologies that unite these tools into algorithms aimed at achieving certain educational outcomes. These are the technologies that enable blended learning and its variant “flipped learning”. Blended learning is a pedagogical technology that unites distant (online and offline) and face-to-face learning. The standard didactical recommendation for blended learning is that up to 40% of student study time should be allocated to distant forms of education, 40% allocated to face-to-face education and 20% spent in self-study. The authors believe that blended learning promotes the development of students’ cognitive autonomy, and when technology is used in pedagogical university education, it fosters students’ capability to implement this model in their future professional activity (Lapchik, 2013; Medvedeva, 2013).

Distant technologies that are used in teaching are as effective as the level of competency of the teachers who use them. The document «A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2» defines digital literacy as “the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship. Digital literacy includes competences that are variously referred to as computer literacy, ICT literacy, information literacy and media literacy” (Law, Woo, & Wong, 2018). We consider this definition as the most overall and comprehensive regarding digital literacy for everyone. We draw special attention to the digital competence of the teacher, which is broader in scope than simply digital literacy. Our opinion is that teachers’ digital competence covers both required general digital literacy for all and the particular characteristics that prove the teachers’ commitments to their professional development and the teaching of digital technologies applications as a natural tool for students’ development.

The work of foreign and Russian researchers centers on the comprehension of teachers’ digital competence, which stems from the notion of “teachers’ ICT-competence” (beliefs regarding information, in general, and in particular, information and technology, information and computer competencies). This will continue to evolve because of constantly changing social conditions. We have analyzed different definitions of digital competence and used the definition of teachers’ ICT-competence, as stated by Strizhachenko (2011) to ground this study.

Thus, we define teachers' digital competence as an integral component of teachers' professional competence, which reflects the level of comprehension of digital didactics opportunities, the teachers' capabilities to solve different problems in professional activities by means of digital technologies, and their ability to critically evaluate the educational outcomes, as well as, define points for growth in developing professional competence.

In terms of using digital technologies, there are different approaches to teachers' professional competence. Koehler and Mishra's approach (2009) has been positively reviewed among educators. The authors offer the model Technological Pedagogical Content Knowledge (TPCK or TPACK). This model includes the interplay of content, pedagogical, and technological knowledge. The framework is regarded as a full-fledged model of integrating technology into teaching-learning process (Vijayan & Joshith, 2018). The interpretation of the approach has allowed the researchers to consider teachers' professional competence as an integral entity of their subject matter, psychological, pedagogical, instructional, and digital competencies.

According to the UNESCO Global Framework digital competence areas include:

1. Information and data literacy, which implies browsing, searching, filtering, evaluating, and managing data, information and digital content.

2. Communication and collaboration, which encompasses interacting, sharing, engaging in citizenship, collaborating through digital technologies, and netiquette and managing digital identity.

3. Digital content creation, which means developing, integrating and re-elaborating digital content.

4. Safety, which includes protecting devices, personal data and privacy, health and well-being and protecting environment.

5. Problem solving, which include solving technical problems, identifying needs and technological responses, creatively using digital technologies, and identifying digital competence gaps (Law, Woo, & Wong, 2018).

Based on this structure researchers describe the components of the teachers' digital competence. Thus, Sorochinskiy and Nikulina distinguished four groups of skills in the structure of teachers' digital competence: skills of search and critical evaluation, communication skills, creativity and flexibility, and safety (2020).

Strizhachenko highlighted different aspects of teachers' personalities and their professional activities and defined the following components: motivation- and value-based; cognitive and operational; reflection- and foresight-oriented. Each component has its descriptors that reflect the required, sufficient, and optimal levels of the teachers' digital competence (2011). The teachers' digital competence components proposed by Lapyonok are also based on the teachers' professional activity. He addresses cognitive and organizational aspects and offers gnostic, foresight, design, management, communication, and innovation components (2011). Despite differences in describing components, most researchers agree that 10-15 years ago teachers' ICT-competence mostly involved skills of confident computers use. Now, digital competence goes beyond PC boundaries and incorporates mobile learning, augmented reality, and other virtual tools (Yachina & Fernandez, 2018).

Methodology

This research has applied the data from surveys taken by students who study in teacher training educational programs. The goal of the survey was to find out the students' attitude regarding use of distant technologies and their readiness to incorporate these technologies into their teaching. One hundred and ninety six students from three higher educational institutions participated in study and filled out the questionnaire. The participating universities are Pskov State University (116 students, 59.2% of all participants), Russian State Pedagogical University named after A.I. Herzen and located in St.-Petersburg (72 students, 36.7%), Narva College of the University of Tartu, Estonia (8 students, 4.1%). Among all questioned students 165 people (84.2%) studied in bachelor degree programs and 31 people (15.8%) studied in master degree programs.

The questionnaire contained 30 questions divided into the following groups: 7 questions asked about the students' readiness and desire to use distant technologies in their pedagogical activity; 13 questions in which students were expected to express their degree of agreement with the statements about blended and distant education; 1 question asking students to rank teachers' competences according to their importance for education efficiency; and 2 questions in which students chose the distant education technologies they were familiar with and had been used by instructors in teaching them at the university.

For processing the results of the questionnaire were used the methods of mathematical statistics, SPSS package, in particular.

Results

The students answered 30 different questions. Researchers analyzed the answers that were most relevant to the theme of the research study. One of the questions that determined the readiness to use digital technologies is the ranking of teachers' competences according to their importance for teachers' professional work in school today. The results are presented in Table 1.

The results show that judging by competences significant for effective teaching, students on average ranked teachers' digital competence fifth out of six positions. However, one should note that individual answers for digital competence was assigned different ranks: digital competence was ranked 1st by 9.2% of respondents, ranked 2nd by 11.7%, ranked 3rd by 18.4%, ranked 4th by 20.9%, ranked 5th by 17.9%, ranked 6th by 21.9%.

Table 1. Results of ranking teachers' competences.

Importance position	Teachers' competences	Average rank
1-2	Ability to use methods and techniques adequate to teaching objectives	2,83
1-2	Awareness of psychological peculiarities of school students and ability to apply them in education	2,85
3	Ability to make a quick decision in extreme psychological and pedagogical situations	3,68
4	Capability to define/distinguish a professional problem and offer solutions to it.	3,75
5	Digital competence (ICT-skills)	3,92
6	Ability to communicate effectively with colleagues, parents, and others.	3,97

Researchers believe results of the rankings may be explained as follows. Among the sub-competences, which the umbrella of the teachers' professional competence shelters, the ability to use methods and techniques adequate to teaching objectives, as well as, the awareness of psychological peculiarities of school students and the ability to apply them in educational practice, appear the most essential. The fact that the students didn't rank the teachers' digital competence high shows that the students deem the teachers' digital competence as a set of skills to use digital technologies rather than a particular didactics.

The students were also offered the opportunity to express their degree of agreement with some statements about blended and distant education. The results are presented in Table 2.

The survey showed that a considerable number of students (23.4%) did not see the advantages in blended learning. Thirteen students completely agreed with the statement "I do not see advantages in blended learning".

The majority of them (9) pointed out that they would like to solely teach face-to-face, whereas 3 students would rather teach face-to-face using distant technologies, where appropriate, and 1 student is willing to teach in a blended format. The answers of these 13 respondents became even more varied when evaluating their readiness for implementing distant education: 6 students were completely ready (in their opinion), 1 student was mainly ready, and the options “not ready”, “mainly not ready”, and “no view” were chosen by 2 students each. Such a contradiction between an absolutely negative attitude to blended learning, and a positive evaluation of the readiness to implement distant technologies in education demonstrates that the students (although only few of them), do not entirely comprehend blended learning as a complex education technology, and are not aware of all its capabilities for being incorporated in face-to-face teaching.

Table 2. The degree of agreement with the statements about blended and distant education.

Statements	Degree of agreement			
	Completely agree	Mainly agree	Mainly disagree	Completely disagree
Statements about blended learning				
1.1. Distant learning is a real opportunity to carry out teaching in situations challenging for face-to-face education.	46,4 %	46,4 %	5,6 %	1,5 %
1.2. Blended learning is effective only for some disciplines.	36,7 %	41,3 %	19,4 %	2,6 %
1.3. High-quality education is hardly possible in blended learning.	29,6 %	28,6 %	33,7 %	8,2 %
1.4. Blended learning can be implemented as an opportunity to work with gifted children or children with special educational needs.	33,2 %	48,0 %	14,3 %	4,6 %
1.5. Blended learning open doors for involving experts who can participate exclusively at a distance.	57,7 %	34,2 %	7,1 %	1,0 %
1.6. Blended learning is a more flexible, variable, and individualization-oriented technology in comparison with traditional ones.	36,2 %	41,3 %	15,3 %	7,1 %
1.7. I do not see any advantages in blended learning.	6,6 %	16,8 %	38,8 %	37,8 %
Statements about distant learning				
2.1. In distant education, students’ involvement in learning is lower than in face-to-face education format.	34,2 %	34,7 %	27,6 %	3,6 %
2.2. In distant education, students’ involvement in learning depends on applied digital technologies.	24,0 %	49,5 %	21,4 %	5,1 %
2.3. In distant education, students’ involvement in learning depends on the teacher’s proficiency in terms of distant educational technologies	25,0 %	54,6 %	16,8 %	3,6 %

application.				
2.4. Nowadays distant learning entirely provides teacher-student interaction.	10,7 %	41,8 %	36,7 %	10,7 %
2.5. Most teachers efficiently use distant technologies in education.	9,7 %	28,6 %	51,5 %	10,2 %
2.6. Implementing distant learning causes students' overload.	26,5 %	35,2 %	31,1 %	7,1 %

The majority of respondents (68.9%) consider that in distant education students' involvement in learning is lower than in a face-to-face education format. The students believe that the involvement depends on applied digital technologies and on the teachers' proficiencies in terms of using distant educational technologies. Moreover, the teachers' proficiencies affect students' involvement in learning more than applied technologies. Findings note that more than 60% of respondents do not agree with the statement that most teachers efficiently use distant technologies in education.

Almost 69% of respondents indicate low students' involvement in distant learning. Researchers believe that this fact is determined by the respondents' lack of awareness of distant technologies' opportunities, both in communication and interaction. For the majority of students, distant technologies provide teachers' instructions, monologues and enable students to submit assignments electronically. Teachers' insufficient knowledge of distant education's communication and collaboration methods was noted by quite a few respondents. They also emphasize students' overload in distant learning and a low level of the teachers' digital competence.

The questionnaire revealed the students' opinion on their level of ICT-skills and their readiness to use ICT in pedagogical activity. The results are presented in Figure 1.

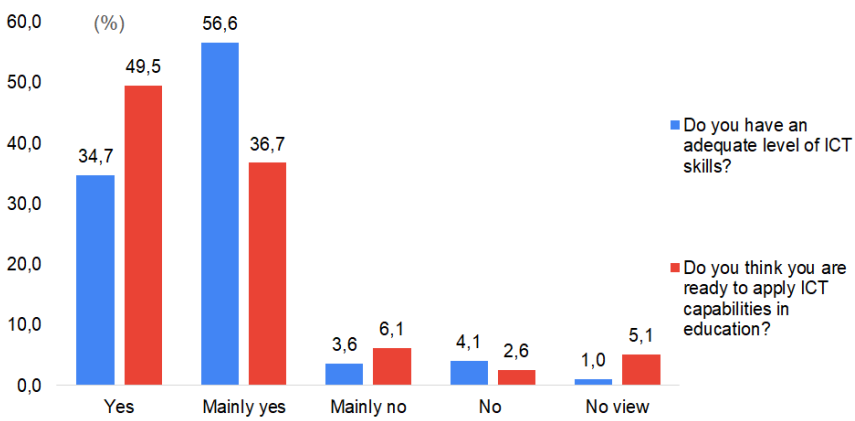

Figure 1. Students' opinion on the level of their ICT skills and the readiness to apply them effectively in their pedagogical activity

One can see that the overwhelming majority of the respondents assess positively their level of ICT-skills. However, there is a slight disparity between the number of respondents who are completely sure in their ICT-skills (34.7%) and those who are completely sure in their ability to apply ICT capabilities in education (49.5%). The survey shows that the number of those who are completely sure of their ability to apply ICT skills is greater than those who assess positively their ICT skills. It is difficult to imagine that the ability to use computer technologies in education can be provided without adequate ICT-skills.

In one of the survey's questions, the students were asked to evaluate their readiness for, and desire to implement, distant education. The results are presented in Figures 2 and 3.

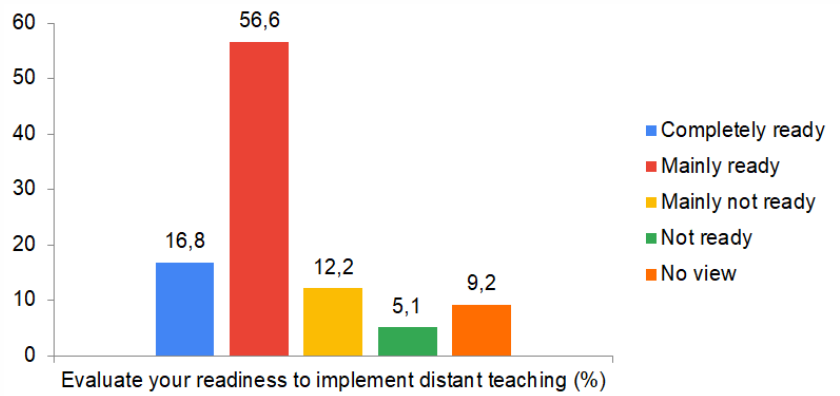

Figure 2. Students' readiness to implement distant teaching

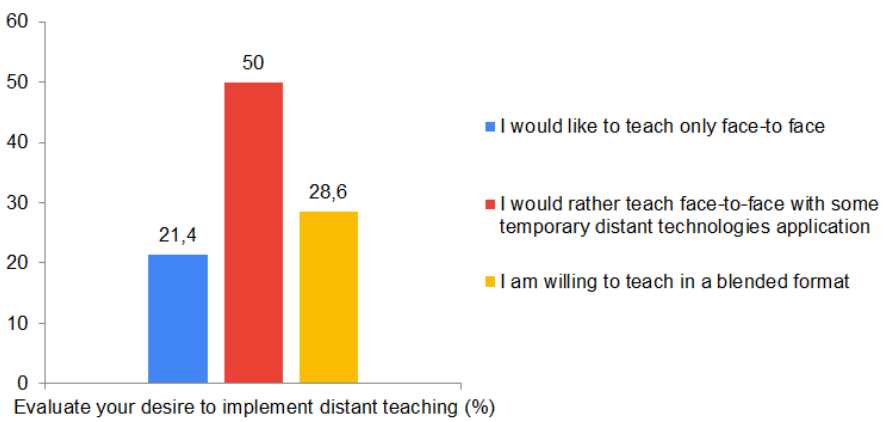

Figure 3. Students' desire to implement distant teaching

When comparing the respondents' answers to these two questions, one notices that the number of the students who positively evaluate their readiness to implement distant teaching does not correspond to the number of the students who are willing to implement distant teaching, when appropriate. Such a disparity may question the readiness to implement distant teaching, as readiness presupposes positive attitude to the relevant activity.

The question "Which difficulties and challenges do you see in implementing distant teaching in your pedagogical activity?" was answered in the following way: 56.3% of respondents marked their "inability to adequately provide an educational technology in a distant format", 45.7% pointed out the lack of material resources (computers, the Internet) as a problem, 37.6% noted the shortage of ready-made digital educational resources, 27.4% marked their ill-developed digital skills, and only 18.3% did not see any difficulties. Beside the options proposed in the questionnaire, the students could come up with their own answers. Two respondents saw low students motivation as a difficulty to overcome, 2 other students stated lack of personal contact in learning, 3 respondents regarded permanent work at the computer as a drawback, and 1 student saw individual students' characteristics as a challenge for implementing distant learning. Two respondents expressed their disapproval of distant education, in general: "I consider distant Mathematics teaching absolutely ineffective. I am not ready to use these technologies".

Discussion

In assessing the readiness of the students of educational programs in Pedagogy for distant technologies application in teaching in general, we can state that only 34 students indicated that they were not ready (10 respondents) or mainly not ready (24 respondents). Among those were mostly undergraduate students, but there were 8 graduates (19% of all questioned graduates) who evaluated their readiness as inadequate. Thus, according to the survey almost every fifth graduate is not ready or mainly not ready for implementing distant teaching. At the same time, the results appear to be optimistic, as the majority of students (73.4%) consider themselves ready for distant technologies application.

We find significant a mention of the components of the educational process that the students believe themselves to be able to implement in a distant format. The results are presented in Table 3.

Findings indicate that 48 students (24.5%) are able to implement all five items. The first three components of education noted were able to be implemented by 90 students (45.9%). It is worth mentioning, that the least the students were able to do was to arrange group interactions and to conduct a meaningful values dialogues with school students. This fact corresponds to the previously stated idea that the respondents are not enough aware of the interaction and collaboration capabilities of distant technologies.

Table 3. Students' readiness to implement components of education in a distant format.

You are ready to implement in a distant format	Answers	
	yes	no
Explaining new material	85,7	14,3
Developing skills	59,7	40,3
Assessing educational outcomes	63,3	36,7
Arranging students' group interaction	52,0	48,0
Conducting a meaningful values dialogue with school students	55,1	44,9

The answers of the students from the different universities about applicable technologies did not vary greatly. Most Narva College students stated that during their learning they were exposed to technologies of shared document creating and small group discussions. Only 88% of Estonian respondents and 45.7% of Russian universities students indicated the same. All Estonian students stated that they were able to apply these methods in their teaching, while 62.2% Russian students assert the same.

In evaluating all the answers to the questionnaire, one should observe a contradiction between the general readiness of the students to apply distant technologies in teaching and the relatively high level of skepticism towards using them: reluctance to teach in a blended format, although blended learning can be effectively incorporated in face-to-face education enhancing its efficiency through personalization; disbelief that high-quality education is possible in a blended format. Beside attitude inconsistencies, the results showed that the students do not perceive digital technologies as a tool that demands the reinterpretation of educational goals, principles, and teachers' roles, and the comprehension of specific didactics.

Conclusion

This timely study enabled researchers to conclude the need and necessity for would-be teachers to engage in purposeful and systematic training in applying the technologies of distant education. We believe it is crucial to introduce a discipline "Digital Didactics" for the master degree programs in Pedagogy and a similar module in the discipline "Methods of Teaching" for bachelor degree programs. Developing the discipline and the module will demand systematizing all numerous data related to distant technologies, blended learning, and digital didactics. All this will give impetus to upgrading educational programs and to new approaches and ideas in theoretical and practical pedagogy.

The research findings indicated that better comprehension of distant technologies applications are achieved when students are exposed to them when those technologies are implemented in their university courses. That is why we support more active implementation of distant technologies using a blended format in university education.

If at least 2-3 disciplines of an educational program in Pedagogy incorporated distant technologies in their content, it would facilitate students' awareness of their advantages and will improve educational outcomes of the program.

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