Cypriot Journal of Educational Sciences

Volume 17, Issue 8, (2022) 2709-2719

www.cjes.eu

Educating future primary schoolteachers to create a communication culture through educational technologies

Zhenisgul Sharipkhojayeva [a*] Abai Kazakh National Pedagogical University, Dostyk ave 13, Almaty 050010, Kazakhstan https://orcid.org/0000-0001-9788-3118

Amina Amirova [b] Abai Kazakh National Pedagogical University, Dostyk ave 13, Almaty 050010, Kazakhstan https://orcid.org/0000-0001-8298-8419

Abilkhairova Zhanar [c] Korkyt Ata Kyzylorda University, Department of Pedagogy and Teaching Methods, Kyzylorda 120012, Kazakhstan https://orcid.org/0000-0001-9147-5439

Bainazarova Tursynay [d] Kazakh National Women's Teacher Training University, 99 Aiteke bi Street, Almaty 050000, Kazakhstan https://orcid.org/0000-0001-7250-6113),

Yerkinbekova Meirimgul [e], Kainar Academy, Almaty 050013, Kazakhstan https://orcid.org/0000-0002-8351-4546

Komekbayeva Lyazzat [f] Kainar Academy, Almaty 050013, Kazakhstan https://orcid.org/0000-0003-4679-1816

Suggested Citation:

Sharipkhojayeva, Z., Amirova, A., Zhanar, A., Tursynay, B., Meirimgul, Y., & Lyazzat, K. (2022). Educating future primary schoolteachers to create a communication culture through educational technologies. *Cypriot Journal of Educational Science*. *17*(8), 2709-2719. https://doi.org/10.18844/cjes.v17i8.7827

Received from April 10, 2022; revised from June 11, 2022 ; accepted from August 12, 2022.

Abstract

The purpose of this research is to get the opinions of teacher candidates to train future primary schoolteachers to create a communication culture through educational technologies. This study was created with the qualitative research method. The study group of the research consists of 40 teacher candidates studying in the primary school teaching department at various universities in Kazakhstan. Research data were collected with a semi-structured interview form developed by the researchers. As a result of the research, while the majority of primary schoolteacher candidates found themselves sufficient in using technology, they found themselves moderately competent in using educational technologies. In addition, the vast majority of teacher candidates consider themselves inadequate in providing education through educational technologies. The majority of primary schoolteacher candidates participating in the research stated that educational technologies have a positive effect on creating a communication culture. Primary schoolteacher candidates stated that programmes related to educational technologies and creating a communication culture should be developed in universities. It is necessary to implement the suggestions of pre-service teachers on improving the communication culture and to organise the education given at universities in this direction.

Keywords: Communication culture, educational technologies, primary schoolteacher candidates;

* *ADDRESS FOR CORRESPONDENCE: Zhenisgul Sharipkhojayeva, Abai Kazakh National Pedagogical University, Dostyk ave13, Almaty 050010, Kazakhstan
E-mail address: jeniskul_8970@mail.ru

1. Introduction

Within the scope of 21st-century teacher skills, while determining teacher competencies, the competencies of teachers to use communication technologies effectively are also included in this scope. With each passing day, new trends in education are on the agenda of student teachers and teacher candidates, and it is a big step in improving the quality of education. The use of information and communication technologies in education is of great importance in terms of increasing the efficiency of basic teacher competencies (Voogt & Roblin, 2012). Students' ability to use information and communication technologies effectively and efficiently is directly related to the integration of these technologies into learning and teaching environments. For this reason, the fact that future primary schoolteachers have these competencies has the functional power to increase the quality of education and student success.

1.1. Theoretical and conceptual framework

The rapid developments in science and technology in recent years have also shown their effectiveness in the field of education, deeply affecting the dynamic structure of learning and teaching processes, and it has become an important area in the development of teachers' professional skills (Devedzic & Devedzic, 2019). To create a society consisting of individuals with information and technology skills, it is expected that teachers and teacher candidates should have the qualifications to set an example for students in the use of technology and to provide education by using these technologies (Chou, Hsiao, Shen, & Chen, 2010; Luu & Freeman, 2011; Tan & Wang, 2011).

The 21st-century teacher profile and the definition of the teaching profession include the ability to use educational technologies equipped with information and communication technologies. Teachers need to be aware of their educational needs and be open to change and development. In this direction, teacher training policies are designed to meet and create the teacher qualifications of the 21st century (Tutkun & Aksoyalp, 2010). Teaching and applying information and communication technologies in schools requires technologically competent teachers (Boshuizen & Wopereis, 2003). Therefore, it is of great importance to train teachers who know information and communication technologies and can use educational technologies (Panagiotis, Adamantios, Efthymios, & Adamos, 2011). The importance of these experiences in teacher education programmes is increasing because the experiences of teacher candidates about technology in teacher education programmes affect their future performance (Lambert & Gong, 2010). Teacher training policies not only enable future teachers to be well-equipped and equipped to meet their educational needs but also enable individuals who shape society to be trained by teachers with this equipment (Hamilton & Pinnegar, 2000).

It is the primary duty of teacher training universities and teacher training programmes to evaluate the basic knowledge, skills and competencies of teacher candidates on computer technologies and their use, to develop policies to improve them and educate them about their inadequacies (Flowers & Algozzine, 2000; Rysbek et al., 2022). The application of information and communication technologies in primary schools is seen as a modern necessity. The achievements of primary school students through educational technologies are an important step towards keeping up with the age of technology (Alakurt, Ozturk, Karademir, & Alper, 2017).

The benefits of educational technologies in the education process should be evaluated and the use of primary school students should be expanded to meet their educational needs. For this reason, the educational technologies' perceptions of teachers and teacher candidates, who play a leading role in the regulation of the education and training process by taking advantage of the advantages of educational technologies, play a key role in many countries. Thanks to teacher training programmes equipped with educational technologies in universities, the competencies of future teachers in using educational technologies have increased. However, it is not possible to say that teachers and pre-service teachers have information and communication skills at the desired level by using educational technologies (Stuve & Cassady, 2005).

1.2. Related research

When the studies in the field are examined, it is seen that many studies emphasise the importance of bringing national educational technology standards to teacher candidates (Evans, 2006; Hall, 2006; Judge & O'Bannon, 2007;). There are also studies in which the technological competencies of pre-service teachers are investigated; the effect of demographic variables on technological competencies is tried to be determined; and suggestions are developed for the development of pre-service teachers' technological competencies (Gunduz & Odabasi, 2004; Haydn & Barton, 2007).

In studies investigating pre-service teachers' attitudes towards using educational technologies, it was stated that pre-service teachers' attitudes directly affect the level of technology acceptance and the success of teaching through technology (Levin & Wadmany, 2008; Sanders & Morrison-Shetlar, 2001). In some studies, the computer self-efficacy of teachers and teacher candidates was evaluated. In these studies, the importance of pre-service and in-service training in developing computer self-efficacy of teachers and prospective teachers is emphasised (Yan & Piper, 2003; Yildiz, & Baltaci, 2017). In their study, Ma, Andersson, and Streith (2005) investigated pre-service teachers' perceptions of educational technologies. As a result of the research, it has been revealed that the attitudes of teacher candidates towards educational technologies are related to their use of computers and their beliefs about finding them useful.

There are also studies emphasising that the communication skills of teachers and prospective teachers are effective in the student's success and perception of the classroom environment and that effective communication is an important advantage for students and teachers (Claus, Booth-Butterfield, & Chory, 2021; Myers, Martin, & Mottet, 2002). In addition, some studies have shown that teachers' ability to use effective communication methods in solving classroom problems plays an important role in solving problems (Eisenberg, Johnson, & Berkowitz, 2010; Greenwood, Carta, & McConnell, 2011). Golonu and Karci (2010) stated that communication skills are skills that can be learned and developed. In the research, it is emphasised that the communication skills adopted and possessed by the teacher will be effective in the quality of teaching, classroom management and attracting students' interest in the lesson.

1.3. Purpose of the research

The purpose of this research is to get the opinions of teacher candidates to train future primary schoolteachers to create a communication culture through educational technologies. For this purpose, the following sub-objectives have been developed:

1. What are the primary schoolteacher candidates' views on their educational technology competencies?

2. What are the views of primary schoolteacher candidates on the creation of a communication culture through educational technologies?

3. What are the suggestions for educating primary schoolteacher candidates to create a communication culture through educational technologies?

2. Method and materials

In this section, information about the method of the research, the study group, data collection tools, the data collection process and the transformation of the data into findings are given.

2.1. Research method

This study was created with the qualitative research method. Qualitative research is based on an in-depth analysis of human perceptions and events in social reality and their natural environment (Hatch, 2002). Qualitative research, rather than the generalisation or universal dimension of the information,

is about the details and depth of the information, and the fact that it expresses the examined phenomenon in the best way (Connelly, 2016). From this point of view, in this study, the opinions of prospective teachers, taken to train future primary schoolteachers to create a communication culture through educational technologies, were evaluated following the qualitative research method.

2.2. Participants

In qualitative research, to present an accurate and detailed theory, the number of samples that the researcher will use in his study should consist of at least 20–30 people (West, 2001). Accordingly, in this study, it was deemed appropriate that the study group consisted of 40 pre-service teachers. This issue provides ample opportunities for the identification of themes within the context of the cases covered, while also enabling cross-case analysis. The study group of the research consists of teacher candidates studying in the primary school teaching department at various universities in Kazakhstan. The pre-service teachers constituting the study group of the research were selected among those who voluntarily agreed to participate in the research. 7 of the pre-service teachers participating in the research study were in the 1st grade, 9 in the 2nd grade, 14 in the 3rd grade and 10 in the 4th grade. Of the pre-service teachers participating in the research, 23 are girls and 17 are boys.

2.3. Data collection tools

Research data were collected with a semi-structured interview form developed by the researchers. The questions in the semi-structured interview form are parallel to the purpose and sub-objectives of the research. The questions in the semi-structured interview form are as follows:

1. What are your views on your educational technology competencies?

2. What are your views on the creation of a communication culture through educational technologies?

3. What are your suggestions for educating primary schoolteacher candidates to create a communication culture through educational technologies?

2.4. Data collection process

The semi-structured interview form developed to collect the research data and the information form regarding the research content was sent to the study group of the research via email. It took about 2 weeks for the research participants to fill in the semi-structured interview forms with the researchers.

2.5. Data collection analysis

The research data were converted into findings following the content analysis method. Content analysis requires a more detailed examination of the collected data and reaching the concepts, categories and themes that explain this data. Content analysis focuses on collected data; codes are extracted from the events and facts that are frequently repeated in the data set or that the participant emphasises heavily. One can go to categories from codes and to themes from categories. In short, data (codes) that are found to be similar and related to each other are interpreted by bringing them together within the framework of certain concepts (categories) and themes. In content analysis, the content of participants' views is systematically separated (Bengtsson, 2016). The answers given by the primary schoolteacher candidates to the questions in the semi-structured interview form were divided into codes created by the researchers following the content analysis method. Then, categories and themes were created.

Direct quotations from the answers given by the primary schoolteacher candidates to the questions in the semi-structured interview form are given in the findings section, keeping the personal information of the participants. The research findings were arranged by creating tables in which frequency and percentage calculations were made.

3. Results

The research findings were created by organising the answers given by the primary schoolteacher candidates to the questions in the semi-structured interview form.

In Table 1, the views of the primary schoolteacher candidates participating in the research on your educational technology competencies were evaluated.

Table 1. Opinions of primary schoolteacher candidates on educational technology competencies

Category	Theme	Opinions of teacher candidates	*F*	%
Using technology	Sufficient	I find myself sufficient in using technological tools.	29	72.5
		I am interested in computer technologies, so I can say that I am at a sufficient level.		
	Moderately sufficient	I'm not very good with technology. Medium-level.	9	22.5
		Since my technology usage knowledge is at a medium level, I do not feel fully equipped in this regard.		
	Insufficient	Mastering the use of technology in education is about mastering computer technologies. I am not competent.	2	5
		Mastering the use of technology in education is about mastering computer technologies. I am not competent.		
Using educational technologies	Sufficient	I am both willing and knowledgeable about using educational technologies.	14	35
		I think that using educational technologies increases the quality of education. I find myself sufficient.		
	Moderately sufficient	I do not think that I am fully equipped in this field.	21	52.5
		I can partially use educational technologies.		
	Insufficient	The education we receive should enable us to gain the ability to use more educational technologies. I find myself inadequate.	5	12.5
		I find myself very lacking in this area.		
Ability to provide education through Educational Technologies	Sufficient	I'm confident about this.	7	17.5
		I think that I can provide education through educational technologies.		
	Moderately sufficient	I think that I have the competence to provide medium-level education by using educational technologies.	11	27.5
		I can partially provide such training. However, I do not find myself very adequate.		
	Insufficient	Even though I have a medium level of proficiency in using educational technologies, I am very inadequate in providing education in this way.	22	55
		I do not feel ready to teach in such an environment.		

In Table 1, the opinions of the primary schoolteacher candidates participating in the research on educational technology competencies were evaluated in the categories of using technology, using educational technologies, and providing education through educational technologies. 72.5% of the teacher candidates found themselves sufficient in using technology, 22.5% found it moderately sufficient and 5% found it insufficient. 35% of the teacher candidates found themselves sufficient in using educational technologies, 52.5% found it moderately sufficient and 12.5% found it insufficient. 17.5% of the teacher candidates found themselves sufficient in providing education through educational technologies, 27.5% found it moderately sufficient and 55% found it insufficient.

In Table 2, the views of primary schoolteacher candidates participating in the research on creating a communication culture through educational technologies were evaluated.

Table 2. Opinions of primary schoolteacher candidates on the creation of a communication culture through educational technologies

Category	**Opinions of teacher candidates**	***F***	**%**
Educational technologies have a positive effect on creating a culture of communication	Creating a culture of communication through educational technologies is in my opinion to the advantage of teacher candidates.	32	80
	I find it positive. It can be effective training.		
Educational technologies have no effect on creating a communication culture	I don't think it will have any effect. I also do not think that educational technologies support communication.	5	12,5
	I think it is difficult to create a communication culture with educational technologies.		
Educational technologies have a negative effect on creating a communication culture	A communication culture cannot be created through educational technologies. On the contrary, I believe it will create a negative communication environment.	3	7.5
	Technology can harm communication in some cases. So it will have a negative effect.		

In Table 2, the views of primary schoolteacher candidates participating in the research on creating a communication culture through educational technologies were evaluated in three categories: educational technologies have a positive effect on creating a communication culture; educational technologies have no effect on creating a communication culture; and educational technologies have a negative effect on creating a communication culture. 80% of the primary schoolteacher candidates answered that educational technologies have a positive effect on creating a communication culture. 12.5% of the teacher candidates answered that educational technologies have no effect on the creation of a communication culture. 7.5% of the teacher candidates stated that educational technologies have a negative effect on creating a communication culture.

In Table 3, the suggestions for educating the primary schoolteacher candidates participating in the research in a way to create a communication culture through educational technologies are evaluated.

Table 3. Recommendations for raising primary schoolteacher candidates to create a communication culture through educational technologies

Category	***F***	**%**
Programme contents related to educational technologies and communication culture should be created.	34	85
Programme contents should be created that will enable prospective teachers of communication culture to be effective in sustainability in the profession.	27	67.5
Programme contents that combine technological pedagogical content knowledge and communication culture should be created.	21	52.5
Programme contents should be created to eliminate the factors that prevent the creation of a communication culture.	18	45
Programme contents should be created to comprehend the importance of communication culture in the primary school teaching profession.	13	32.5
Programme contents that teach methods and practices that support the creation of a communication culture should be created.	9	22.5
To create a communication culture through educational technologies, programme contents including case studies should be created.	7	17.5
Programme contents that reveal the effect of communication culture on student development and student success should be created.	3	7.5

In Table 3, the suggestions show that 85% of the teacher candidates stated that the content of both educational technologies and communication technologies should be created. 67.5% of the pre-service teachers stated that the content of the communication culture should be created to enable the pre-service teachers to make sustainability in the profession effective. 52.5% of the teacher candidates suggested that curriculum contents that combine technological pedagogical content knowledge and communication culture should be created. 45% of the teacher candidates stated that programme contents should be created to eliminate the factors that prevent the creation of a communication culture. 32.5% of the pre-service teachers answered that programme contents should be created to comprehend the importance of communication culture in the primary school teaching profession. 22.5% of the pre-service teachers stated that the curriculum content should be created in which methods and practices that support the creation of a communication culture are taught. 17.5% of the pre-service teachers answered that programme contents including case studies should be created to create a communication culture through educational technologies. 7.5% of the teacher candidates stated that programme contents should be created to reveal the effect of communication culture on student development and student success.

4. Discussion

The opinions of primary schoolteacher candidates participating in the research on educational technologies were on using technology, using educational technologies and being able to provide education through educational technologies. While the majority of pre-service teachers found themselves sufficient in using technology, they found themselves moderately competent in using educational technologies. The majority of primary schoolteacher candidates found themselves inadequate in the category of being able to provide education through educational technologies. The majority of primary schoolteacher candidates participating in the research stated that educational technologies have a positive effect on creating a communication culture. The suggestions for educating the primary schoolteacher candidates participating in the research in a way to create a communication culture through educational technologies were evaluated. Creating programme contents related to

educational technologies and communication culture, creating programme contents that will enable pre-service teachers of communication culture to be effective in the profession, and creating programme contents that combine technological pedagogical content knowledge and communication culture are among the suggestions developed by the majority of teacher candidates.

When the studies on the level of use of educational technologies and the tendency to create a communication culture of teachers and teacher candidates are examined, it is seen that there are studies in parallel with the results of this research. Russell, Bebell, O'Dwyer, and O'Connor (2003) stated in their research that teachers' and pre-service teachers' attitudes and beliefs towards technology directly affect their effectiveness in using technology in education. Al-Zaidiyeen, Mei, and Fook (2010) similarly stated in their research that the use of educational technologies by teachers and teacher candidates is one of the important predictors of success in education. Similar to the findings of this study, Sang, Valcke, Van Braak, and Tondeur (2010) revealed that although pre-service teachers have the competence to use technology, they are insufficient to provide education using technology. Brush, Glazewski, and Hew (2008), on the other hand, concluded in their research that information and communication technologies skills are at a low level.

5. Conclusion

Educational technologies are seen among the new trends in education. In recent years, educational technologies have emerged as a new learning tool in education for teachers, teacher candidates and students. For this reason, this research aimed to get the opinions of teacher candidates to train future primary schoolteachers to create a communication culture through educational technologies. As a result of the research, while the majority of primary schoolteacher candidates found themselves sufficient in using technology, they found themselves moderately competent in using educational technologies. In addition, the vast majority of teacher candidates consider themselves inadequate in providing education through educational technologies. The majority of primary schoolteacher candidates participating in the research stated that educational technologies have a positive effect on creating a communication culture. Finally, primary schoolteacher candidates have developed suggestions for educating them to create a communication culture through educational technologies. Among these suggestions, creating programme contents related to educational technologies and communication culture emerges as a suggestion developed by the majority of teachers.

6. Recommendations

The findings obtained from the study found that primary schoolteacher candidates' technology use proficiency is high; their level of use of educational technologies is medium; and their level of providing education with educational technologies is low. In this direction, intensified education programmes should be organised in universities to increase the educational technology competencies of primary schoolteacher candidates. Pre-service teachers who believe that a communication culture can be created through educational technologies should implement the suggestions they put forward to improve the communication culture and the education given at universities should be organised accordingly.

References

Alakurt, T., Ozturk, T., Karademir, T., & Alper, A. (2017). How to assess information and communication technology knowledge and skills of the students. *Global Journal of Information Technology: Emerging Technologies, 7*(2), 55–64. https://doi.org/10.18844/gjit.v7i2.2229

Al-Zaidiyeen, N. J., Mei, L. L., & Fook, F. S. (2010). Teachers' attitudes and levels of technology use in classrooms: The case of Jordan schools. *International Education Studies, 3*(2), 211–218. Retrieved from https://eric.ed.gov/?id=EJ1066020

Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. *NursingPlus Open, 2*, 8–14. https://doi.org/10.1016/j.npls.2016.01.001

Boshuizen, H. P. A., & Wopereis, I. G. J. H. (2003). Pedagogy of training in information and communications technology for teachers and beyond. *Technology Pedagogy and Education, 12*, 149–160. Retrieved from https://www.researchgate.net/profile/Henny-Boshuizen/publication/228538981_Pedagogy_of_training_in_information_and_communications_technology_for_teachers_and_beyond/links/0fcfd5109111fc997c000000/Pedagogy-of-training-in-information-and-communications-technology-for-teachers-and-beyond.pdf

Brush, T., Glazewski, K. D., & Hew, K. F. (2008). Development of an instrument to measure preservice teachers' technology skills, technology beliefs, and technology barriers. *Computers in the Schools, 25*(1–2), 112–125. https://doi.org/10.1080/07380560802157972

Chou, C. M., Hsiao, H. C., Shen, C. H., & Chen, S. C. (2010). Analysis of factors in technological and vocational school teachers' perceived organizational innovative climate and continuous use of e-teaching: Using computer self-efficacy as an intervening variable. *Turkish Online Journal of Educational Technology-TOJET, 9*(4), 35–48. Retrieved from https://eric.ed.gov/?id=EJ908070

Claus, C. J., Booth-Butterfield, M., & Chory, R. M. (2012). The relationship between instructor misbehaviors and student antisocial behavioral alteration techniques: The roles of instructor attractiveness, humor, and relational closeness. *Communication Education, 61*(2), 161–183. https://doi.org/10.1080/03634523.2011.647922

Connelly, L. M. (2016). Trustworthiness in qualitative research. *Medsurg Nursing, 25*(6), 435. Retrieved from https://www.proquest.com/openview/44ffecf38cc6b67451f32f6f96a40c78/1?cbl=30764&pq-origsite=gscholar

Devedzic, V., & Devedzic, M. (2019). Technology-enhanced assessment at universities and in schools: An initiative. *International Journal of Learning and Teaching, 11*(3), 89–98. https://doi.org/10.18844/ijlt.v11i3.4319

Eisenberg, M., Johnson, D., & Berkowitz, B. (2010). Information, communications, and technology (ICT) skills curriculum based on the Big6 skills approach to information problem-solving. *Library Media Connection, 28*(6), 24–27. Retrieved from https://static1.squarespace.com/static/59a303936a49631dd51f9a7d/t/5b92e343b8a045c01cc38a21/1536353091802/LMC_Big6-ICT_Curriculum_LMC_MayJune2010.pdf

Evans, S. A. (2006). *A validation study of a measurement of technology integration skills for pre-service teachers* (Doctoral dissertation). The University of North Carolina at Charlotte. Retrieved from https://www.proquest.com/docview/304943831?pq-origsite=gscholar&fromopenview=true

Flowers, C. P., & Algozzine, R. F. (2000). Development and validation of scores on the basic technology competencies for educators inventory. *Educational and Psychological Measurement, 60*(3), 411–418. https://doi.org/10.1177%2F00131640021970628

Golonu, S., & Karci, Y. (2010). Examination of communication skill levels of communication vocational high school students (Ankara province sample). *Journal of Communication Theory and Research,* (31), 123–140. Retrieved from https://app.trdizin.gov.tr/publication/paper/detail/TVRFNU9ERXhNUT09

Greenwood, C. R., Carta, J. J., & McConnell, S. (2011). Advances in measurement for universal screening and individual progress monitoring of young children. *Journal of Early Intervention, 33*(4), 254–267. https://doi.org/10.1177%2F1053815111428467

Gunduz, S., & Odabasi, F. (2004). The importance of instructional technologies and material development course in the education of teacher candidates in the information age. *TOJET: The Turkish Online Journal of Educational Technology, 3*(1). Retrieved from http://www.tojet.net/articles/v3i1/317.pdf

Hall, L. (2006). Modeling technology integration for preservice teachers: A PT3 case study. *Contemporary Issues in Technology and Teacher Education, 6*(4), 436–455. Retrieved from https://www.learntechlib.org/p/21929/

Hamilton, M. L., & Pinnegar, S. (2000). On the threshold of a new century: Trustworthiness, integrity, and self-study in teacher education. *Journal of Teacher Education, 51*(3), 234–240. https://doi.org/10.1177%2F0022487100051003012

Hatch, J. A. (2002). *Doing qualitative research in education settings*. Suny Press. Retrieved from https://muse.jhu.edu/book/4583

Haydn, T. A., & Barton, R. (2007). Common needs and different agendas: How trainee teachers make progress in their ability to use ICT in subject teaching. Some lessons from the UK. *Computers & Education, 49*(4), 1018–1036. https://doi.org/10.1016/j.compedu.2005.12.006

Judge, S., & O'Bannon, B. (2007). Integrating technology into field-based experiences: A model that fosters change. *Computers in Human Behavior, 23*(1), 286–302. https://doi.org/10.1016/j.chb.2004.10.013

Lambert, J., & Gong, Y. (2010). 21st century paradigms for pre-service teacher technology preparation. *Computers in the Schools, 27*(1), 54–70. https://doi.org/10.1080/07380560903536272

Levin, T., & Wadmany, R. (2008). Teachers' views on factors affecting effective integration of information technology in the classroom: Developmental scenery. *Journal of Technology and Teacher Education, 16*(2), 233–263. Retrieved from https://www.learntechlib.org/p/22950/

Luu, K., & Freeman, J. G. (2011). An analysis of the relationship between information and communication technology (ICT) and scientific literacy in Canada and Australia. *Computers & Education, 56*(4), 1072–1082. https://doi.org/10.1016/j.compedu.2010.11.008

Ma, W. W. K., Andersson, R., & Streith, K. O. (2005). Examining user acceptance of computer technology: An empirical study of student teachers. *Journal of Computer Assisted Learning, 21*(6), 387–395. https://doi.org/10.1111/j.1365-2729.2005.00145.x

Myers, S., Martin, M., & Mottet, T. (2002). Students' motives for communicating with their instructors: Considering instructor socio-communicative style, student socio-communicative orientation, and student gender. *Communication Education, 51*(2), 121–133. https://doi.org/10.1080/03634520216511

Panagiotis, G., Adamantios, P., Efthymios, V., & Adamos, A. (2011). Informatics and communication technologies (ICT) and in-service teachers' training. *Review European Studies, 3*, 2. Retrieved from https://heinonline.org/HOL/LandingPage?handle=hein.journals/rveurost3&div=5&id=&page=

Rysbek, M., Rymshash, T., Bayan, A., Gulbaram, M., Axaule, B., & Karas, K. (2022). Developing the research potential of a social teacher in the context of digital technologies. *Cypriot Journal of Educational Sciences, 17*(3), 971–980. https://doi.org/10.18844/cjes.v17i3.7004

Russell, M., Bebell, D., O'Dwyer, L., & O'Connor, K. (2003). Examining teacher technology use: Implications for preservice and inservice teacher preparation. *Journal of Teacher Education, 54*(4), 297–310. https://doi.org/10.1177%2F0022487103255985

Sanders, D. W., & Morrison-Shetlar, A. I. (2001). Student attitudes toward web-enhanced instruction in an introductory biology course. *Journal of Research on Computing in Education, 33*(3), 251–262. https://doi.org/10.1080/08886504.2001.10782313

Sang, G., Valcke, M., Van Braak, J., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviors with educational technology. *Computers & Education, 54*(1), 103–112. https://doi.org/10.1016/j.compedu.2009.07.010

Stuve, M., & Cassady, J. (2005). A factor analysis of the NETS performance profiles: Searching for constructs of self-concept and technology professionalism. *Journal of Technology and Teacher Education, 13*(2), 303–32432. Retrieved from https://www.learntechlib.org/p/26102/

Tan, X., & Wang, H. (2011). Information technology in teacher's professional skill training application. In *2011 6th international conference on computer science & education (ICCSE)* (pp. 365–369). IEEE. https://doi.org/10.1109/ICCSE.2011.6028656

Tutkun, O. F., & Aksoyalp, Y. (2010). Dimensions of teacher training program in the 21st century. *Journal of Selcuk University Social Sciences Institute,* (24), 361–371. Retrieved from https://dergipark.org.tr/en/pub/susbed/issue/61801/924630

Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies, 44*(3), 299–321. Retrieved from https://eric.ed.gov/?id=EJ969718

West, W. (2001). Beyond grounded theory: The use of a heuristic approach to qualitative research. *Counselling and Psychotherapy Research, 1*(2), 126–131. https://doi.org/10.1080/14733140112331385168

Yan, W., & Piper, D. (2003). The relationship between leadership, self-efficacy, computer experience, attitudes, and teachers' implementation of computers in the classroom. In *Society for information technology & teacher education international conference* (pp. 1057–1060). Association for the Advancement of Computing in Education (AACE). Retrieved from https://www.learntechlib.org/primary/p/18094/

Yildiz, A., & Baltaci, S. (2017). Reflections from the lesson study for the development of techno-pedagogical competencies in teaching fractal geometry. *European Journal of Educational Research, 6*(1), 41–50. Retrieved from https://dergipark.org.tr/en/pub/eujer/issue/35126/389536