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Research Article

Exploring pre-service teachers' ICT competence beliefs

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ABSTRACT

It is essential for pre-service teachers to hold positive beliefs about information and communication technology (ICT) and possess digital skills to integrate digital technology successfully into the teaching and learning environments. Although numerous studies have examined teachers' attitudes toward ICT, little research has examined teachers' ICT competency beliefs. This research aimed to explore pre-service teachers' ICT competence beliefs. We used an instrument developed by previous researchers for data collection. The results showed that the pre-service teachers had good ICT competence beliefs. A few gender differences were found between participants' mean scores on six dimensions of the data collection instrument. No gender differences were found for many items. It was found that there were no significant differences in the years of study of participants across five different grade levels. However, the lowest mean scores were found in analyzing and reflecting, problem-solving, and information and data literacy. Conversely, the highest mean scores were detected in communication and collaboration, digital content creation, and safety and security. Based on these findings, recommendations have been made for practice and future research.

Keywords: ICT competence beliefs, digital skills, pre-service teachers, information and communication technology, ICT

INTRODUCTION

Digital literacy and information and communication technology (ICT) skills are essential to students' future success (Bolaji & Ajia, 2023; Caingcoy, 2021; Oguguo et al., 2020). Research has revealed that using technology

in teaching can make learning more engaging and interactive for students (Adebayo & Ayorinde, 2022; Widiasih et al., 2022). In particular, teachers play a central role in integrating technology into the classroom (Garcia, 2023; Morgado et al., 2021). Their beliefs about their own ICT competencies can significantly affect their willingness and ability to use technology effectively for teaching and learning (Rubach & Lazarides, 2021). Numerous studies show that teachers confident in ICT skills use technology to enhance instruction and create engaging lessons for different learning styles (Sangkawetai et al., 2018; Wong & Daud, 2018). This confidence can lead to greater student engagement and motivation.

In addition, research has suggested that ICT-literate teachers can better prepare their students for the demands of the 21st century, including digital citizenship, critical thinking, and problem-solving using technology. Furthermore, teachers' ICT skills can help to use technology to manage administrative tasks, access and analyze educational data, and communicate more effectively with students (Yushau & Nannim, 2020). Teachers with strong ICT skills are more likely to pursue continuing education in technology. They can keep abreast of the latest educational technology and research trends, which can benefit their teaching practice and the educational environment (Rahali et al., 2022). Teachers with the necessary ICT skills can help bridge the digital divide in education (Maryuningsih et al., 2020; Rahali et al., 2022). Namely, assessing teachers' ICT competency beliefs is critical because it affects the classroom instruction quality and how well students are prepared for the digital age.

Research has shown that the beliefs that teachers hold about their competence in using ICT can serve as a predictor of their future performance (Rubach & Lazarides, 2021). Some studies have examined pre-service teachers' ICT competencies. For example, Kwaah et al. (2022) investigated the relationship between the digital proficiency of prospective educators and their stress levels. The study revealed a correlation between lower digital proficiency among prospective teachers and heightened levels of stress experienced during the period of online teaching and learning amid the COVID-19 pandemic. Johanson et al. (2022) examined variations in the professional competence of first-year teachers in using digital sharing and communication tools, employing the social constructivist learning theory. A survey was conducted among prospective educators at two universities in Norway. According to the findings, students' digital communication and interaction proficiency was largely influenced by their attitudes and experiences regarding virtual communication solutions. In addition, their emotional involvement and expertise in virtual collaboration solutions had a noticeable yet secondary impact on their digital literacy. In another study, Dai (2023) investigated pre-service English teachers' digital competency, specifically their confidence in using ICT. The study's results revealed a notable and favorable association between the self-perceived ability of pre-service English teachers to effectively use ICT and their perceptions of engaging in collaborative activities with colleagues, receiving support in terms of infrastructure, and possessing digital skills. Esteve-Mon et al. (2016) evaluated future teachers' digital competency among undergraduate education students and 22 instructors in educational technology. They concluded that effective environments should have user-friendly interfaces and interactive activities and undergo a comprehensive evaluation process.

Maderick et al. (2016) compared prospective teachers' assessments regarding subjective self-assessment and objective assessment in seven domains of digital literacy in United States. Results showed that participants inaccurately assessed their digital competencies. ElSayary et al. (2022) examined the impact of social/emotional, cognitive, and behavioral engagement on the development of digital literacy among pre-service teachers. The study findings revealed a notable and favorable association between the engagement levels in social/emotional, cognitive, and behavioral aspects, which consequently contributed to the enhancement of digital literacy skills among pre-service teachers. Fuchs et al. (2022) examined the level of digital readiness among pre-service teachers. The study revealed that pre-service teachers assessed their digital preparedness as high and did not exercise control over their learning in the online setting. Quast et al. (2023) studied pre-service teachers' professional digital competence beliefs. The study revealed that pre-service teachers possessed the highest level of digital competence. Urakova et al. (2023) conducted a study to assess the digital skills of university students. The results indicate that students possess high levels of digital skills, and overall, their skills are well-developed.

However, when the studies above are analyzed, it is clear that no previous empirical study in Russia or other countries investigated pre-service teachers' ICT competency beliefs. In addition, the existing studies in the literature have examined pre-service teachers' digital competencies (Cebi & Reisoglu, 2020; Tomczyk et

al., 2023), digital skills (Kwaah et al., 2022; Urakova et a., 2023), and the 21st century skills as digital skills (Karakoyun & Lindberg, 2020). Because of this reason, there is a gap in examining pre-service teachers' ICT competency beliefs. Hence, an empirical study is needed to address this research gap, as teachers have increasingly used ICT. Therefore, this research aimed to explore pre-service teachers' ICT competence beliefs.

Measuring pre-service teachers' ICT competency beliefs is important for identifying areas, where pre-service teachers may lack confidence or proficiency in using ICT tools and technologies. Thus, educators and policymakers can develop targeted training programs to address these gaps and improve their skills by understanding their beliefs about ICT competencies. Pre-service teachers' ICT competency beliefs can help identify factors influencing their attitudes and intentions to use technology in their future classrooms. By understanding these factors, teacher education programs can provide appropriate support and training to increase prospective teachers' confidence and motivation to use ICT in their teaching practice. In addition, measuring pre-service teachers' ICT competency beliefs can provide insight into the effectiveness of current ICT courses and training programs in preparing them for their future roles as educators.

METHOD

The study used a survey design to assess prospective teachers' digital skills. Data was collected in June 2023. Participants completed the questionnaire online. To collect the data, the researchers emailed the questionnaire to faculty at two universities and asked them to share it with their students so they could answer the questions in the survey. The researchers designed the questionnaire in Google Forms and sent the link to the lecturers. The link was also shared with lecturers at two universities via WhatsApp. The researchers asked the lecturers for voluntary participation from the students. In the first section, the researchers asked the participants about their willingness to participate in this study. 163 students completed the questionnaire after the data collection stages.

Participants

Of the participants, one hundred ten were female (67.5%) and 53 were male (32.5%). Of them, 38.7% were enrolled in the first year of university, 25.8 were in the second year. 19.0% were third-year students and 12.9% were fourth-year students. A smaller percentage (3.7%) were in their fifth year of university. Most participants (86.5%) were Kazan National Research Technological University students. A minority of participants (13.5%) were enrolled at Kazan Federal State University. The participants were prospective teachers from teacher education programs at two universities.

Data Collection Instrument

In this research, an instrument developed by Rubach and Lazarides (2021) was used to collect the data. The instrument was translated into Russian by four experts, who were researchers in the faculty and had a good knowledge of both English and Russian. Three scholars in the educational sciences field evaluated the instrument the experts translated. An expert opinion was then obtained from three scholars in educational science. The Russian versions of the scales were translated back into English by two English teachers. When the back-translated forms were later compared with the original form of the scale, it was found that both forms were similar. In the next step, the final version of the scales translated into Russian was checked for suitability for the Russian language by researchers from the department of education sciences. Once the final version of the scale was available, a pilot study was conducted with fifteen prospective teachers who had not participated in this research. The researchers asked the prospective teachers for feedback to check the readability and comprehensibility of the final form of the scale. After ensuring the scale was appropriate, the researchers decided to use it in the present study.

Rubach and Lazarides (2021) developed the instrument in six dimensions. Firstly, there are two sub-factors of the dimension 'information and data literacy': searching and storing/organizing. This dimension includes the capacity to effectively locate and retrieve information from online sources, critically analyze and evaluate the information obtained, and the aptitude for effectively managing, retrieving, and relocating files and data.

The "communication and collaboration (COMM)" competence dimension encompasses the skills that teachers need to effectively use digital technology for COMM with others. This involves following proper

etiquette and ethical practices in digital environments, as well as actively engaging in social networks. Another competence dimension is "digital content creation," which refers to educators' ability to use digital technology to create, modify, and combine diverse digital information and data formats.

The fourth component of competence, known as "safety," pertains to the abilities of educators to comprehend and contemplate the advantageous and disadvantageous features of digital environments. Moreover, it involves the capacity to use tactics that safeguard personal well-being and privacy while also utilizing ICT in an ecologically responsible manner. The fifth dimension of competence is called "problem-solving" and can be broken down into two main factors: operation and utilization and comprehension and enhancement. The first subfactor is the ability to effectively use, implement, and customize digital solutions to meet individual needs. The second subfactor involves acquiring skills and knowledge related to digital technologies' fundamental principles and functionalities. It also encompasses comprehending and applying knowledge-based solutions for addressing technological difficulties.

The sixth dimension of competence is referred to as "analyze and reflect" and consists of two subfactors:

(1) analyzing distribution and risks and

(2) studying business operations.

The first sub-factor involves the ability to critically evaluate the impact and spread of digital media on a broad scale and assess specific content. The second sub-factor pertains to proactively examining a company's activities within digital environments. In addition, the authors asked demographic questions about gender, study of year, and university in the data collection tool. The items in the instrument had a 5-Likert type, 5=strongly agree to 1=strongly disagree. Since the research took place in Russia, the items were translated into the Russian language.

Data Analysis

The researchers utilized descriptive statistics to examine the responses to subscale items based on gender. In addition, the researchers performed an independent samples t-test to ascertain any significant disparities in ICT competence beliefs between male and female participants. Furthermore, a Kruskal-Wallis H test was conducted to ascertain differences among the students' years of study, specifically focusing on the five different years. The effect size was determined using Cohen's d, where effect sizes of 0.2, 0.5, and 0.8 were classified as small, medium, and large, respectively. Data analysis was conducted using SPSS version 29, a statistical software package for the social sciences.

RESULTS

Pre-Service Teachers' Digital Skills According to Gender

We evaluated the digital skills of pre-service teachers using a five-dimensional scale and 32 items. Descriptive statistics, p-values, and effect sizes are presented in **Table 1**. Overall, pre-service teachers demonstrated good digital skills considering the overall mean (3.60-3.94) for the five dimensions. Regarding the information and data literacy (INFO) dimension, the males had a better mean score (mean [M]=3.77, standard deviation [SD]=.84) than the females (M=3.72, SD=.73). The item "I can use my search strategies in digital environments." received the highest mean scores for both females and males (M=3.97, SD=0.98 and M=4.02, SD=0.99, respectively). The lowest scores were found for females and males for the item "I am critical about information, sources, and data in digital environments." (M=2.96, SD=1.05 and M=3.17, SD=1.06, respectively). An independent samples t-test revealed no significant differences between males (M=3.77, SD=.84) and females (M=3.72, SD=.73), t(161)=-.37, and p>0.05. The difference in the mean values between females and males was very moderate (by effect size) (d=.77).

Regarding COMM dimension, the females had a better mean score (M=3.94, SD=.84) than the males (M=3.85, SD=.93). The highest mean scores for females and males were obtained for the item "I can edit files and documents collaboratively with others using digital media" (M=4.05, SD=0.95 and M=3.89, SD=1.08, respectively). An independent samples t-test revealed no significant differences between females (M=3.94, SD=.84) and males (M=3.85, SD=.93), t(161)=.58, and p>0.05. The difference in the mean values between females and males was high (by effect size) (d=.87).

Table 1. Results of participants' responses for items & dimensions according to gender

	Female		Male		S	ES
	M	SD	M	SD		
Information and data literacy (INFO)						
I identify & use appropriate sources in digital environments on my information needs.	3.76	1.00	3.83	1.06		
I can use my search strategies in digital environments.	3.97	.98	4.02	.99		
I am critical about information, sources, and data in digital environments.	2.96	1.05	3.17	1.06		
I can store digital information and data securely.	3.67	.99	3.91	1.04		
I can retrieve the information that I have stored.	4.01	.93	3.89	1.10		
I can retrieve information that I have stored from different environments.	3.97	.94	3.83	1.05		
Overall mean	3.72	.73	3.77	.84	.71	.77
Communication and collaboration (COMM)						
I can communicate using different digital media.	4.04	.92	3.79	1.09		
I can cite information and files from digital environments.	3.86	1.01	3.85	1.04		
I can edit files and documents collaboratively with others using digital media.	4.05	.95	3.89	1.08		
I can apply behavioral rules in digital interactions and collaborations.	3.92	.94	3.89	1.03		
I can actively participate in society using digital media.	3.94	.90	3.89	.95		
I can share my experiences with digital media in interactions with others.	3.84	.92	3.83	.99		
Overall mean	3.94	.84	3.85	.931	.55	.87
Digital content creation (CREAT)						
I can use familiar apps and programs according to my needs.	4.09	.92	3.92	1.10		
I can design my digital products in various formats.	3.78	.96	3.81	1.02		
I can edit and merge digital content in different formats.	3.93	.91	3.92	.97		
I can present digital content in different formats.	3.89	.95	3.83	1.03		
Overall mean	3.92	.83	3.87	.95	.73	.87
Safety and security (SAFE)						
I know about the dangers and risks in digital environments and consider them.	3.92	.94	3.96	.98		
I can protect my privacy in digital environments through appropriate measures.	3.84	.93	3.74	1.12		
I can regularly update my security settings.	3.81	.93	3.77	1.01		
I can use digital technologies in a healthy and environmentally sound way.	3.77	.90	3.83	1.03		
Overall mean	3.83	.85	3.82	.94	.95	.88
Problem solving (PROBL)						
I can use digital tools and platforms according to my needs.	3.89	.89	3.68	1.12		
I can adapt digital tools for personal use.	3.92	.85	3.83	.97		
I can independently use digital learning opportunities and appropriate tools.	3.86	.91	3.83	1.05		
I can organize digital learning resources independently.	3.69	.91	3.68	1.01		
I can develop solutions for technical problems.	3.40	1.03	3.66	1.09		
I know about the functioning and basic principles of digital systems.	3.55	1.04	3.66	.97		
I identify algorithmic structures in the tools I use.	3.44	1.02	3.53	.93		
Overall mean	3.67	.80	3.69	.89	.90	.83
Analyzing and reflecting (ANALY)						
I can analyze the effect of media in digital environments.	3.75	.99	3.73	.99		
I can evaluate interest-driven dissemination & dominance of topics in digital space.	3.60	.97	3.54	.95		
I can reflect on the opportunities and risks of media use for my own media use.	3.72	.97	3.58	.99		
I can analyze the benefits of business activities and services in digital environments.	3.56	.98	3.63	.92		
I can analyze the risks of business activities and services in the digital space.	3.53	1.02	3.56	.99		
Overall mean	3.63	.89	3.60	.85	.87	.88

Note. S: Significance & ES: Effect size

Digital content creation (CREAT) dimension, the females had a better mean score (M=3.92, SD=.83) than the males (M=3.87, SD=.95). The highest mean scores for females and males were obtained for the item "I can use familiar apps and programs according to my needs" (M=4.09, SD=0.92 and M=3.92, SD=1.10, respectively). The lowest scores for females and males were obtained for the item "I can design my digital products in various formats (M=3.78, SD=.96 and M=3.81, SD=1.02, respectively). According to the results of an independent samples t-test, there were no significant differences found between female (M=3.92, SD=.83) and males (M=3.87, SD=.95), t(161)=.34, and p>0.05. The difference in the mean values between females and males was high (by effect size) (d=.87).

Concerning safety and security (SAFE) dimension, females (M=3.83, SD=.85) and males (M=3.82, SD=.94) had very close mean scores. The item "I know about the dangers and risks in digital environments and consider them" received the highest mean scores for both females and males (M=3.92, SD=0.94 and M=3.96, SD=0.98, respectively). Other three items had very close mean scores. An independent samples t-test revealed

no significant differences between males (M=3.83, SD=.85) and females (M=3.82, SD=.94), t(161)=.05, and p>0.05. The difference in the mean values between females and males was high (by effect size) (d=.88).

Regarding the problem-solving (PROBL) dimension, the mean scores between females and males were very close. Males had a better mean score (M=3.69, SD=.89) than females (M=3.67, SD=.80). The items "I can adapt digital tools for personal use." and "I can independently use digital learning opportunities and appropriate tools." received the highest mean scores for both females and males (M=3.92, SD=0.85 and M=3.83, SD=0.97 and M=3.86, SD=0.91 and M=3.83, SD=1.05, respectively). The lowest scores were found for females and males for the item "I identify algorithmic structures in the tools I use" (M=3.44, SD=1.02 and M=3.53, SD=.93, respectively). An independent samples t-test found no significant gender differences (males: M=3.69, SD=0.89; females: M=3.71, SD=0.99), t(161)=-.12, and p>0.05. The difference in the mean values between females and males was high (by effect size) (d=.83).

The mean score of females (M=3.63, SD=0.89) was slightly higher than that of males (M=3.60, SD=0.85) in the Analyzing and Reflecting (ANALY) dimension. The item "I can analyze the effect of media in digital environments." received the highest mean scores for both females and males (M=3.75, SD=0.99 and M=3.73, SD=0.99, respectively). The lowest scores were found for females and males for the item "I can analyze the risks of business activities and services in the digital space" (M=3.53, SD=1.02 and M=3.56, SD=.99, respectively). An independent samples t-test revealed no significant differences between females (M=3.63 SD=.89) and males (M=3.60, SD=.85), t(161)=.15, and p>0.05. The difference in the mean values between females and males was high (by effect size)((d=.88).

Table 2 displays the results regarding the study of year and students' mean scores for each dimension of the questionnaire. According to the results in **Table 2**, the Kruskal Wallis H test results were performed for the students' years of study to determine the differences between the five years of study.

As appeared in **Table 2**, the results showed no significant differences between grade levels. Thus, it is clear that participants' year of study at the university does not impact their ICT competence beliefs.

Table 2. Analysis of students' mean scores according to their study year

	Study year	n	Mean rank	df	χ^2	p-value
Information and data literacy (INFO)	1	63	79.25	4	1.912	.75
	2	42	87.96			
	3	31	79.61			
	4	21	86.50			
	5	6	65.67			
Communication and collaboration (COMM)	1	63	76.38	4	3.688	.45
	2	42	88.17			
	3	31	86.73			
	4	21	86.26			
	5	6	58.50			
Digital content creation (CREAT)	1	63	77.76	4	3.442	.48
	2	42	86.90			
	3	31	88.97			
	4	21	81.69			
	5	6	57.25			
Safety and security (SAFE)	1	63	77.32	4	6.918	.14
	2	42	88.24			
	3	31	89.29			
	4	21	84.45			
	5	6	41.25			
Problem solving (PROBL)	1	63	73.24	4	8.919	.06
	2	42	93.01			
	3	31	87.27			
	4	21	88.62			
	5	6	46.50			
Analyzing and reflecting (ANALY)	1	63	71.90	4	8.227	.08
	2	42	92.62			
	3	31	86.11			
	4	21	88.81			
	5	6	53.50			

DISCUSSION

This research aimed to assess pre-service teachers' ICT competence beliefs. The results showed that the pre-service teachers had beliefs at a good level regarding their ICT competence beliefs. A few gender differences were found between participants' mean scores on six dimensions. No gender differences were found for many items. There were no significant differences noticed throughout the duration of education among participants in the five different grade levels. The analyzing and reflecting, problem-solving, and information and data literacy skills had the lowest mean scores. On the other hand, the highest mean scores were found for COMM, digital content creation, and safety and security. The results of this study differ from those of Kwaah et al. (2022), who discovered that prospective teachers had mean scores that were slightly below average. Kwaah et al. (2022) also suggested that the digital skills of prospective teachers were not up to par with what is expected in the 21st century. Kwaah et al. (2022) also found that female prospective teachers had lower basic digital skills in Microsoft Office and on the Internet than their male counterparts. Furthermore, The study's findings differ from Cebi and Reisoglu's (2020) observation that male pre-service teachers had stronger digital skills than females. Furthermore, the results are not similar to those of Kwaah et al. (2022), who also found that female teachers had less knowledge of internet skills compared to their male counterparts. On the other hand, the results regarding gender differences are similar to those of Urakova et al. (2023).

On the other hand, our findings are similar to previous studies. Fuchs et al. (2022) found that pre-service teachers were well-prepared for digital learning, while Quast et al. (2023) reported that pre-service teachers exhibited strong digital competence. Similarly, Urakova et al. (2023) observed that students had advanced digital skills, and overall, their proficiency was well-developed. The results of this study align with those of Karakoyun and Lindberg (2020), who discovered that Sweden and Turkey's pre-service instructors have the 21st century skills, particularly in technology, digital citizenship, communication, and information literacy. The findings are also similar to those of Urakova et al. (2023), who have found that university students have excellent digital skills.

Regarding the INFO dimension, the males had a better mean score than the females. However, these differences are not significant. In particular, an item about using search strategies received the highest mean scores by both females and males. This result provides evidence to support Lei's (2009) claim that pre-service teachers are commonly known as "digital natives" and firmly believe that technology is a crucial aspect of their lives and a societal need. This finding corroborates Lei's (2009) argument and sheds light on why the pre-service teachers in this study performed well in information and data literacy. Kumar and Vigil (2011) state that pre-service teachers belong to the network generation and possess extensive knowledge of current technological advances. They can use these technologies for personal use and educational activities such as group projects and communication. Our study suggests that these teachers have digital knowledge and skills independently.

COMM dimension assessed the digital COMM skills needed by pre-service teachers. The results showed that the highest mean scores for females and males were obtained about editing files and documents collaboratively. The results align with the findings of Karakoyun and Lindberg (2020), indicating that a majority of prospective teachers in two distinct nations concur on the importance of the 21st century skills within the educational sphere, particularly in terms of fundamental technological proficiency. The findings align with the study conducted by Cebi and Reisoglu (2020), which revealed that pre-service teachers exhibited higher proficiency in information and data literacy, COMM, and safety when responding to digital literacy items.

The pre-service teachers' skills in utilizing diverse digital formats to generate, modify, and combine digital information and data were revealed by the results. According to the results, the highest mean scores for females and males were obtained for an item related to "I can use familiar apps and programs according to their needs. This result is similar to those of Cebi and Reisoglu (2020). The results are very similar to those of Tomczyk et al. (2023), who found that pre-service teachers in two countries (Italy and Poland) most often use software for their needs. Also, the results showed that the lowest scores for females and males were obtained for an item regarding designing digital products. This result supports the results of Cebi and Reisoglu (2020) and Tomczyk et al. (2023), who found that pre-service teachers were not better at digital content creation, such as editing videos or building course material. In addition, this result is very similar to the research of

Urakova et al. (2023), who found that content creation and usage are lower than in other dimensions in a study with higher education students.

Concerning the SAFE dimension, the skills of pre-service teachers to comprehend and contemplate the advantages and disadvantages of digital environments. The results revealed that the females and males had very close mean scores. This result means that the pre-service teacher knows the advantages and disadvantages of digital environments. This finding confirms the results of Cebi and Reisoglu (2020) and Tomczyk et al. (2023). Cebi and Reisoglu (2020) conducted a study that revealed that pre-service teachers excelled in matters pertaining to safety. Similarly, Tomczyk et al. (2023) found that pre-service teachers from Poland possessed more theoretical knowledge about e-risks and the potential of the digital world.

Regarding PROBL dimension, the results revealed good mean scores. This dimension examined the skills regarding proficiency in utilizing, implementing, and customizing digital solutions to diverse individual requirements and knowledge related to the fundamental architectural principles and functionalities underlying digital technologies. In this dimension, the lowest scores were found for females and males for the item "I identify algorithmic structures in the tools I use." And "I can develop solutions for technical problems.". This result parallels Cebi and Reisoglu (2020), who found a relatively lower response average than in other areas. Similarly, the research of Tomczyk et al. (2023) indicated that pre-service teachers in two countries had technical issues, such as controlling software and installing some applications.

ANALY dimension examined the capacity to critically assess the influence and dissemination of digital media and the proactive examination of activities in digital environments. The item that received the highest mean score was "I can analyze the effect of media in digital environments," which is similar to the results of Cebi and Reisoglu (2020). The results indicated that there are no significant differences between grade levels.

CONCLUSIONS & RECOMMENDATIONS

The COVID-19 pandemic has compelled higher education and other educational stakeholders to develop learners' digital skills and beliefs about ICT, which have become indispensable for all educational institutions. These beliefs and skills are essential in the 21st century, as they are synonymous with literacy in our rapidly changing technological world. The present research found that pre-service teachers have good beliefs regarding ICT competence beliefs. This finding highlights promising results for using ICT in preparing future teachers and trainee teachers in teacher education programs. In several nations, digital literacy and ICT competency are essential skills that all future teachers must possess to be effective teachers upon completing their education. The results of this research support this idea.

We agree that pre-service teachers should use digital technologies to improve their digital literacy while conducting activities. However, there may be some inadequacies regarding slow internet connections and infrastructure to develop ICT competence beliefs and digital skills among pre-service teachers. Thus, we suggest that educational institutions organize workshops to enhance their students' and faculty's ICT competency beliefs and digital skills, enabling them to confidently utilize various digital technologies like YouTube, webinars, etc. Developing the beliefs and skills of pre-service teachers regarding ICT and technological infrastructure, such as internet access, Wi-Fi connections, and smart devices for students, is crucial for continued learning in uncertain times.

Limitations

The study's data were collected through a survey, which limits its scope. Therefore, it may be useful to focus future studies on different data collection instruments to evaluate pre-service teachers' ICT competence beliefs. Second, the analyses were conducted based on gender and study of year variables. Researchers should consider this limitation in further studies while examining teachers' ICT competence beliefs. Thus, more information related to pre-service teachers' ICT competence beliefs can be obtained regarding the cause-and-effect basis. Third, this research was conducted with the participants who enrolled in two universities in one country. Future research should consider this limitation.

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