Do gender and teaching experience influence prospective teachers' self-efficacy in utilizing computer-based learning media?[1]

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Abstract

The development of information and communication technology (ICT) in education is very rapid. One of the developments is in the field of education. Teachers' self-efficacy in utilizing computer-based learning media needs to be raised in this study because currently learning in elementary schools is directed towards the utilization of information and communication technology (ICT), one of which is through computer-based learning media. This research examined prospective elementary school teachers' self-efficacy in utilizing computer-based media to support learning and the significant differences based on gender and teaching experiences. This research employed a quantitative descriptive approach with an online survey method. The instrument used in this study was adapted from the instrument developed by Wang and Moore-Hayes. The instrument consisted of 15 statements and was developed using a 5-interval Likert scale. The participants were 50 prospective elementary school teachers. The collected data were analyzed using EFA and CFA, descriptive statistics, and the independent sample t-test. The results show that prospective elementary school teachers have a high level of self-efficacy in utilizing computer-based media to support learning. It was found that there are statistically significant differences of prospective elementary school teachers' self-efficacy in utilizing computer-based learning media based on gender and teaching experiences.

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Keywords

Gender – Teaching experience – Prospective teachers – Self-efficacy – Computer-based learning media.

O gênero e a experiência de ensino influenciam a autoeficácia dos futuros professores na utilização de mídias de aprendizagem baseadas em computador?

Resumo

O desenvolvimento da tecnologia da informação e comunicação (TIC) na educação é muito rápido. Um dos desenvolvimentos é no campo da educação. A autoeficácia dos professores na utilização de mídias de aprendizagem baseadas em computador precisa ser levantada neste estudo porque, atualmente, a aprendizagem nas escolas de ensino fundamental é direcionada para a utilização da tecnologia da informação e comunicação (TIC), uma das quais é por meio de mídias de aprendizagem baseadas em computador. Esta pesquisa examinou a autoeficácia dos futuros professores do ensino fundamental na utilização de mídias baseadas em computador para apoiar a aprendizagem e as diferenças significativas com base no gênero e nas experiências de ensino. Esta pesquisa empregou uma abordagem descritiva quantitativa com um método de pesquisa on-line. O instrumento usado neste estudo foi adaptado do instrumento desenvolvido por Wang e Moore-Hayes. O instrumento consistia em 15 afirmações e foi desenvolvido usando uma escala Likert de 5 intervalos. Os participantes eram 50 futuros professores do ensino fundamental. Os dados coletados foram analisados usando a AFE e a AFC, estatísticas descritivas e o teste t de amostras independentes. Os resultados mostram que os futuros professores do ensino fundamental têm um alto nível de autoeficácia na utilização de mídia baseada em computador para apoiar a aprendizagem. Constatou-se que há diferenças estatisticamente significativas na autoeficácia dos futuros professores do ensino fundamental na utilização de mídia de aprendizagem baseada em computador com base no gênero e nas experiências de ensino.

Palavras-chave

Gênero – Experiência de ensino – Futuros professores – Autoeficácia – Mídia de aprendizagem baseada em computador.

Introduction

Teachers are currently experiencing challenges because of the rapid development of technology in education. They are now required to improve their digital competencies and integrate ICT into learning (Graham; Borup; Smith, 2012). Pedagogically comprehensive use of technology in the learning environment will contribute to developing learning and enabling learners to understand learning materials in a more immersive way (Caner; Aydin, 2021). Technology, pedagogy, and content are the knowledge that teachers should have. Moreover, teachers need to know how learning should be conducted with the integration of learning technologies (Durak, 2021). Intellectuals around the world generally agree that practitioners in the field of education must possess specialized knowledge and skills to achieve educational success (Caner; Aydin, 2021). In addition, teachers must dedicate themselves to effectively integrating cutting-edge, fun, and innovative technologies in the classroom to create exceptional learning environments (Caner; Aydin, 2021).

Teacher self-efficacy

Self-efficacy is conceptualized as an individual's belief in their ability to perform the actions necessary to successfully complete specific tasks in specific contexts (Bandura, 1986). Self-efficacy refers to people assessment of their own ability to organize and carry out an activity necessary to achieve a certain performance (Feng; He; Ding, 2023). For people who don't believe in their own capacity to change the outcome of anything, chances are they won't put in the effort to make it happen either. Self-efficacy focuses more on beliefs about one's competence regarding what one can do or learn. Meanwhile, in the context of educators, Tschannen-Moran & Hoy (2001) define teacher efficacy as a teacher's belief in his or her ability as a teacher (Tschannen-Moran; Hoy, 2001). Therefore, a confident teacher is one who has a strong belief that he or she can positively influence students and student learning. In education, self-efficacy helps students to achieve better performance and challenging goals, which will increase students' motivation (Kalyar; Ahmad; Kalyar, 2018). As prospective teachers, students of teacher training institutions must be well prepared during lectures to be ready to face various learning challenges in the classroom. The institutions must ensure that prospective teachers are adequately prepared in terms of teaching ability. Bandura (1997) asserts that, when teachers have a strong sense of self-efficacy, it will be more likely to influence student learning outcomes (Bandura, 1997).

Technology efficacy

Technology introduces various opportunities in the context of education, thus providing more options for allocating educational resources and personal development for teachers and students, objectively supporting the sustainability of education, and enabling self-directed and continuous learning (Feng; He; Ding, 2023). Digital technology is defined as a set of electronic technologies used in formal and informal settings by individuals for educational, social, and/or entertainment purposes. It includes hardware and software, such as a) desktop computers; b) mobile devices; c) digital recording devices;

d) data logging equipment and its supporting devices; e) interactive whiteboards; f) web 2.0 and other online resources; and g) various other instructional software (Syuhada *et al.*, 2023). Digital technology used in the classroom has been shown to make students more motivated to participate in learning activities. The students are not only more productive but also more active than when no technology is used in the classroom. In addition, it is believed that students who are active, productive, and interactive have better learning achievement (Syuhada *et al.*, 2023).

Hatlevik & Bjarnø (2021) evaluate teachers' digital competencies and ICT use in the school context by identifying self-efficacy and ICT strategies (Hatlevik; Bjarnø, 2021). Research has shown that users' psychological aspects (cognitive style, personality, self-efficacy, demographics, situational variables, etc.) may cause different levels of influence on users' technology acceptance (Holden; Rada, 2011). However, the most important points are knowing the suitability of the technology to the material and the knowledge and skills in using the right technology in the learning environment (Caner; Aydin, 2021). Thus, improving self-efficacy during teacher education programs leads to the development and integration of technology in learning (Abbitt; Klett, 2007).

The International Society for Information Technology and Teacher Education (ISTE) defines technology integration as the integration of technology with the educational process in the context of content in the field (Durak, 2021). Teacher education programs have been criticized for not preparing teachers to integrate technology into the classroom (Barmore, 2015)(Brown; Warschauer, 2006). However, the ever-evolving technology makes it difficult for educational institutions to prepare for it. In addition, inadequate facilities and negative views about teaching using technology become obstacles in preparing teachers to integrate technology into the classroom (Zipke; Ingle; Moorehead, 2019). Teachers should have a deep understanding not only of the subject matter and types of activities which are best at promoting learning but also of what and how technology should be integrated to best promote learning for the students (Setyawan, 2019).

Prospective teachers may look at their teachers and lecturers as role models in using technology in teaching. However, many teachers have not used technology effectively or integrated technology with classroom learning (Zipke; Ingle; Moorehead, 2019). Prospective teachers' competency in integrating technology is related to determining the suitability of technology with the material, knowledge, and skills to use appropriate technology in the learning environment (Caner; Aydin, 2021). Some empirical studies show that teachers can increase student engagement in learning not only by using ICT in the classroom but also by encouraging students to use the internet and multimedia (MaloshonoK, 2016). Bandura (1977) stated that self-efficacy beliefs play an important role in the thoughts and actions taken by a person (Bandura, 1977). Therefore, the self-efficacy perceived by prospective teachers, which focuses on the assessment of personal ability about technology integration, is valuable to shape a learning innovation.

Computer-based learning media

The impact of new technologies on subjects affects both the content of the subject and the form of learning that takes place (Örtegren, 2014). Successful teaching with technology

requires the confidence to create, maintain, and re-establish a dynamic balance among all components (Koehler; Mishra; Cain, 2013). Digital media can be embedded in a deeper way through various parts of the learning material (Marner, 2013). Self-efficacy is a high confidence in predicting outcome expectations in a specified performance (Bandura, 1997). Related to linking self-efficacy and computer-based learning media with perceived usefulness, self-efficacy towards learning media is the belief of prospective teachers in the ability to use learning media in achieving learning goals (Lee; Ryu, 2013). Therefore, self-efficacy towards computer-based learning media can be one of the important determinants, so learners should have certain perceptions about their ability to use learning media. In addition, computer skills and developing learning media are factors that influence self-efficacy (Lee; Ryu, 2013).

Teacher training institutions should actively promote educators who utilize technology in learning (Zipke; Ingle; Moorehead, 2019). Technology integration is a challenge when prospective teachers transition from students of teacher education programmes to becoming first-year teachers. Teacher training institutions play an important role in enhancing technology capabilities for student teachers. It is imperative that student teacher programmes are designed with technology as a foundation for the teaching and learning process (Giles; Kent, 2016). The institutions must also arrange courses where students can practice directly to develop and utilize learning media. Developments in media and technology have improved the quality of media for various purposes. In the context of education, teachers use learning media as supplementary materials to illustrate scientific phenomena because media can improve the transition from abstract representations to concrete ones (Wu; Yamanaka, 2013). More specifically, media, such as educational videos, can present information to students with its various components (audio, text, images, animation, etc.).

Self-efficacy of prospective elementary school teachers in utilizing computer-based media to support learning

Existing research is more focused on prospective teachers' self-efficacy for teaching with technology (Giles; Kent, 2016). In addition, most studies focusing on the use of technology imply that before getting into the teaching profession, prospective teachers should be educated and encouraged to use technology (Caner; Aydin, 2021). As stated by Kirschner & De Bruyckere (2017), technology integration in the learning environment is needed to support 21st-century education (Kirschner; De Bruyckere, 2017). Technological self-efficacy is a creditable indicator of prospective teachers' ability to use instructional technology throughout their careers (Giles; Kent, 2016). Thus, pre-service teacher education programs are aimed at increasing the acceptance and use of technology in the current education system (Holden; Rada, 2011). In addition, the self-efficacy of prospective teachers will lead to the successful integration of technology in the future (Abbitt; Klett, 2007).

The importance of teachers' knowledge of technology integration is theoretically motivated by the TPACK framework. TPACK is a framework for designing new learning models through the combination of three main aspects: technology, pedagogy, and content knowledge (Koehler; Mishra; Cain, 2013). The TPACK framework suggests that an integrated knowledge of technology, pedagogy, and content is of critical importance

for effective and innovative learning in the classroom using technology (Abbitt, 2011). The TPACK concept includes seven knowledge areas: 1) content knowledge (CK), 2) pedagogical knowledge (PK), 3) technological knowledge (TK), 4) pedagogical content knowledge (PCK), 5) technological content knowledge (TCK), 6) technological pedagogical knowledge (TPK), 7) technological, pedagogical, content knowledge (TPACK) (Thohir; Jumadi; Warsono, 2022). The utilization of computer-based learning media to support learning in this study is also included in the TPACK knowledge area.

The TPACK framework can serve as a guide in revising teacher education programmes to ensure that teachers integrate technology in the classroom (Şen, 2022). Prospective teachers' self-efficacy towards technology integration is an important predictor of TPACK. Research by Şen, (2022) showed it is possible that technological pedagogical content knowledge in context (TPCKCx) will influence teachers' self-efficacy in learning processes that utilise new technologies and applications in a positive way. Teachers' computer proficiency can provide a positive and significant prediction of technology integration beliefs in learning.

Beside TPACK framework, the Digital Competence Framework for Educators (DigCompEdu) is also related to this study. DigCompEdu framework distinguishes six different areas: 1) Professional Engagement, 2) Digital Resources, 3) Teaching and Learning, 4) Assessment, 5) Empowering Learners, 6) Facilitating Learners' Digital Competence (Redecker, 2017). Based on the DigCompEdu framework, the utilization of computer-based learning media to support learning in this study falls under areas 2,3,4,5, and 6.

Based on DigCompEdu framework, prospective teachers' digital competencies include knowledge of digital technologies in learning, self-efficacy, and positive or negative beliefs towards technology. These aspects have been empirically investigated and found to be important predictors of teacher technology integration-the focus of intervention studies in pre-service teacher education and in-service teachers' professional development (Bertram et al., 2023). Haşlaman; Atman Uslu; Mumcu, (2024) showed that prospective teachers can select, create, and organize digital resources by considering learning objectives, context, pedagogical approaches, and students' needs.

Teachers' self-efficacy in utilizing computer-based learning media needs to be raised in this study because, currently, learning in elementary schools is directed towards the utilization of information and communication technology (ICT), one of which is through computer-based learning media. Therefore, it is important for prospective teachers to have competence in utilizing ICT through the development of computer-based learning media. Moreover, it is necessary to explore teachers' confidence so that prospective teachers' educational institutions can provide a learning process that improves these competencies through lectures.

Related to previous studies, self-efficacy research in utilizing computer-based media to support learning remains underexplored. Previous studies found by the author are mostly the self-efficacy of prospective teachers on technology integration, which is very general and has not led specifically to the utilization of computer-based learning media. Therefore, research into prospective teachers' self-efficacy perceptions of technology integration in the classroom seems to be contributive to teacher education. However, none of these studies have explored the self-efficacy of prospective elementary school teachers in utilizing computer-based media to support learning, which is a form of technology in learning in elementary schools. With these facts in mind, the questions of this research are:

1- What is prospective elementary school teachers' level of self-efficacy in utilizing computer-based media to support learning?

2- Is there a statistically significant difference in prospective elementary school teachers' self-efficacy in utilizing computer-based learning media based on gender?

3- Is there a statistically significant difference in prospective elementary school teachers' self-efficacy in utilizing computer-based learning media based on teaching experience?

Method

This research employed the quantitative descriptive approach with the survey method. Data were collected by means of questionnaires filled out online. The sample was determined using purposive sampling. The sample participants represented in the study had a unique characteristic, namely prospective elementary school teachers who had received courses in computer education, learning innovation, and media development, were currently taking microteaching courses, and would continue to take the teaching practice course in the next semester. The sample participants that met these criteria were 50 students (10 males and 40 females) in the Elementary School Education study programme at one of the private universities in East Java province, Indonesia. The university was accredited (Good) by the National Accreditation Board of Higher Education. The participants had different teaching experiences. Some of them had teaching experiences or were currently teaching either as teachers in elementary schools or as tutors in other institutions. The response rate to the prospective teacher efficacy survey was 100%.

Research instrument

The instrument used in the study was adapted from the research instrument Technology Integration Self-Efficacy Scale (TISES) developed by Wang et al. (2004) and prospective teachers' efficacy in technology integration instrument by Moore-Hayes (2011). Moore-Hayes (2011) developed the research instrument by adapting the instrument by Tschannen-Moran & Hoy (2001). The instrument was modified according to the present research needs. The instrument consisted of 15 items, and each was measured using a 5-interval Likert scale with options ranging from "strongly disagree" to "strongly agree" to explore students' perceptions of self-efficacy in utilizing computer-based media to support learning. A score of 1 indicates the lowest level of self-efficacy, while a score of 5 indicates the respondent's strong self-efficacy.

Data collection and data analysis

The questionnaire consisted of 15 statements that each had 5 options ranging from "strongly disagree" to "strongly agree". The questionnaires were in Indonesian language, so it obtained valid data to avoid misunderstandings about the instructions and interpretation of the items. The questionnaires were distributed online to 50 prospective elementary school teachers. Because the right instrument is needed to obtain the correct data, testing was done to assess the validity and reliability of the instrument. Therefore, the validity test with

Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) was carried out using JASP. Then, the reliability test was carried out using Cronbach's Alpha formula. Descriptive statistics to find the frequency, mean percentage, and standard deviation were conducted to measure the level of prospective elementary school teachers' self-efficacy in utilizing computer-based media to support learning. Then, inferential statistic independent sample t-tests were conducted to determine significant differences of prospective elementary school teachers' self-efficacy based on female and male students as well as those experienced and inexperienced. To facilitate the interpretation of descriptive statistics results, the interpretation of the mean is based on the formula (1+2+3+4+5=15/5=3). Therefore, if the mean is ≥ 3.00, the level of self-efficacy is considered High. Meanwhile, if the mean is < 3.00, the level of self-efficacy is considered Low.

Results

This section presents the results of the research related to validity and reliability tests, respondents' background information, and the actual results related to the research questions formulated to guide this study.

Validity and realibility tests

The validity tests performed were Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). First, the EFA was conducted to determine whether the 15-item statements (variables) functioned optimally in forming the construct of self-efficacy instruments. The EFA aims to filter out which items are the most superior or most dominant of the selected items in forming a factor (Hair *et al*., 2018). The EFA in this study uses the Varimax rotation method. The Varimax method maximizes the sum of the variances of the factor matrix's required loadings. The Varimax method has proven successful as an analytical approach to obtain orthogonal factor rotations and is the most widely used (Hair *et al*., 2018).

The interpretation of EFA results begins with the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO-MSA) value that measures sampling adequacy. This index compares the observed correlation coefficient with the partial correlation coefficient (Malhotra, 2020). KMO-MSA has a value that varies from 0 to 1. A high KMO-MSA value (between 0.50 and 1.00) indicates that factor analysis is appropriate. A small KMO-MSA value of < 0.50 indicates that the correlation between pairs of variables cannot be explained by other variables, and factor analysis may not be appropriate. The Overall KMO-MSA value generated in the EFA analysis is 0.64, and all items show ≥ 0.50, so the factor analysis process is appropriate and can be continued.

The next step was interpreting Bartlett's test results. Bartlett's test is used to test a hypothesis (null hypothesis) that the variables in the research population are not correlated (Malhotra, 2020). To determine whether the correlation between variables is large or not, the p-value (probability) of Bartlett's test can be compared to the significance level used ($\alpha = 0.05$). If the p-value of Bartlett's test < 0.05, then the correlation between variables is large enough so that factor analysis can be continued. The results of Bartlett's Test obtain

a p-value of 0.001 < 0.05, which means that there is a correlation between the original variables, so the factor analysis process can be continued.

Then, the factor loading value was interpreted based on the result. Factor loading is the correlation of each variable (item) and factor (Hair *et al*., 2018). Loadings indicate the degree of correspondence between a variable and a factor, with higher loadings making the variable representative of the factor. In EFA, each variable has loadings on all factors. According to Malhotra (2020), at least all factor loadings should be statistically significant and greater than 0.50, ideally higher than 0.70. A factor loading of 0.70 or higher indicates that the construct explains 50% or more of the variation in the observed variable. The distribution of item groupings based on the results of factor loading analysis can be seen in Table 1 below.

Table 1- Factor loading result of the EFA

Factor	Items	Factor Loading			Validity
		factor 1	factor 2	factor 3	
implementing computer-based media in classroom learning	item 14	0.79			Valid
	item 12	0.72			Valid
	item 4	0.71			Valid
	item 13	0.67			Valid
	item 11	0.65			Valid
	item 8	0.61			Valid
	item 15	0.61			Valid
	item 5	0.53			Valid
	item 3	0.53			Valid
	item 6	0.41			Invalid
developing computer-based learning media	item 2		0.97		Valid
	item 10		0.72		Valid
evaluating computer-based learning media	item 9			0.89	Valid
	item 1			0.88	Valid
	item 7			0.43	Invalid

Source: Data from this research.

The results of the factor loading values analysis with the varimax rotation method are the three factors, namely factor 1, factor 2, and factor 3. The factor loading value accepted to form factors is > 0.50. The analysis results of factor loading value, namely item 14, item 12, item 4, item 13, item 11, item 8, item 15, item 5, and item 3 have variable correlation values with factor 1 > 0.50. Based on the statement items that make up factor 1, it is called self-efficacy in implementing computer-based media in classroom learning. Item 2 and item 10 have variable correlation values with factor 2 > 0.50. Based on the statement items that make up factor 2, it is called self-efficacy in developing computer-based learning media. Item 9 and item 1 have a variable correlation value with factor 3 > 0.50. Based on the statement items that make up factor 3, it is called self-efficacy in evaluating computer-based learning media. Item 6 and item 7 have factor loading values < 0.50, therefore, item

6 and item 7 do not function optimally to explain three factors. Based on the results, there are 3 factors formed, and 13 items have clustered in three existing factors. Meanwhile, there are 2 items that do not function optimally to explain the three factors.

Next is the interpretation of eigenvalues. The eigenvalues of three factors are > 1 indicating a total variance explained of 58%. The items are able to explain the construct of self-efficacy in utilizing computer-based media to support learning by 58%, the rest is explained by other factors. The contribution of factor 1 is 28%, factor 2 is 15%, and factor 3 is 15%. The data can be seen in Table 2.

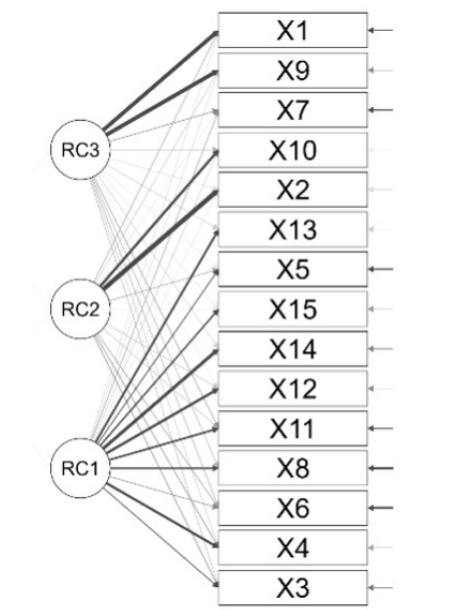
Table 2- Eigenvalues result

Factors			Rotated solution	
	Eigenvalues	SumSq. Loadings	Proportion var.	Cumulative
Factor 1	5.62	4.15	0.28	0.28
Factor 2	2.22	2.23	0.15	0.46
Factor 3	1.91	2.22	0.15	0.58

Source: Data from this research.

The last EFA result is a path diagram. The path diagram visually displays the variables and factors formed. The thicker the line, the higher the factor loading value. The path diagram is presented in Figure 1.

Figure 1- Path diagram of the EFA



Source: Data from this research.

Based on the EFA interpretation, it can be concluded that not all items are valid. There are 13 valid variables that have optimal functions to explain the three factors. There are 3 factors formed, namely factor 1 (self-efficacy in implementing computer-based media in classroom learning), factor 2 (self-efficacy in developing computer-based learning media), and factor 3 (self-efficacy in evaluating computer-based learning media). Variables that can explain factor 1 (self-efficacy in implementing computer-based media in classroom learning) are items 14, 12, 4, 13, 11, 8, 15, 5, and 3. Items 2 and 10 can explain factor 2 (self-efficacy in developing computer-based learning media). Item 9 and item 1 can explain factor 3 (self-efficacy in evaluating computer-based learning media).

The next is CFA which is used to confirm the model formed from the EFA results. CFA verifies the number of variables underlying the factor instrument and the pattern of item factor loading relationships (Malhotra, 2020). CFA aims to identify the right model that explains the relationship between a set of items and the construct. The measurement model has good accuracy when the items involved are able to become indicators of the measured construct, as evidenced by the low measurement error value and high component factor loading. The model is obtained from the EFA results. Therefore, CFA confirms whether the model that has been compiled based on the EFA fulfills the goodness of Fit (GOF) model index or not.

The most commonly used Goodness of Fit (GOF) guides are Comparative Fit Index (CFI), Tucker Lewis Index (TLI), Non-normed Fit Index (NNFI), Normed Fit Index (NFI), Incremental Fit Index (IFI), Goodness of Fit Index (GFI), Root Mean Square Residual (RMSEA), and Standardized root Mean Square Residual (SRMR). Kline (2016) and Kaya & Altınkurt (2018) said to indicate a good fit model, CFI, NNFI, NFI, IFI, and GFI must have values ≥ 0.85. In addition, TLI value ≥ 0.85 indicates a good fit model and TLI > 0.80 indicates a marginal fit (Kline, 2016) (Carlbäck; Wong, 2018). RMSEA and SRMR values ≤ 0.08 indicate a good fit (Kline, 2016) (Carlbäck; Wong, 2018) (Kaya; Altinkurt, 2018).

First, we grouped the 13 items based on the EFA results according to their respective factors for analysis. The model was formed with GOF values of CFI = 0.57 (poor fit), TLI = 0.46 (poor fit), NNFI = 0.46 (poor fit), NFI = 0.52 (poor fit), IFI = 0.58 (poor fit), GFI = 0.97 (good fit), RMSEA = 0.26 (poor fit), and SRMR = 0.11 (poor fit). Based on the GOF guidelines, the majority of these results indicate that the model does not fit because the CFI, TLI, NNFI, NFI, and IFI values are <0.80. In addition, the RMSEA value and SRMR value > 0.08 indicate that the model does not fit. Although the GFI value is > 0.90.

Therefore, we reduced the 4 items with the lowest factor loading, namely item 3 (0.53), item 5 (0.53), item 15 (0.61), and item 8 (0.61). The final result of reducing 4 items obtained a model with GOF values, namely CFI = 0.89 (good fit), TLI = 0.83 (marginal fit), NNFI = 0.83 (marginal fit), NFI = 0.81 (marginal fit), IFI = 0.89 (good fit), GFI = 0.99 (good fit), RMSEA = 0.15 (poor fit) and SRMR = 0.08 (good fit). Based on the GOF guidelines, the majority of these results indicate that the model fit is acceptable. The model of prospective elementary school teachers' self-efficacy in utilizing computer-based media to support learning consisting of 3 factors and 9 items is acceptable. The results of item selection based on the CFA are presented in Table 3 and the fulfillment of GOF criteria is presented in Table 4.

Table 3- Validity results of the CFA

Items	Statements	CFA
Factor 1. Implementing computer-based media in classroom learning		
item 14	I feel confident that I will be comfortable using computer-based learning media in my teaching	Valid
item 12	I feel confident I can regularly incorporate computer-based learning media into my lessons.	Valid
item 4	I feel confident to determine why, when, and how to use computer-based learning media	Valid
item 13	I feel confident about assigning and grading projects using computer-based learning media to improve instructional practices	Valid
item 11	I feel confident I can provide individual feedback to students during computer-based learning media use	Valid
item 8	I feel confident that I can help students when they have difficulty with computer-based learning media	Invalid
item 15	I feel confident that, as time goes by, my ability to address my students' technology needs will continue to Improve	Invalid
item 5	I feel confident to utilize the computer-based learning media that I have developed.	Invalid
item 3	I can integrate computer-based media into classroom learning well	Invalid
Factor 2. Developing computer-based learning media		
item 2	I feel confident in my ability to develop computer-based media to support learning	Valid
item 10	I feel confident that I can motivate my students to participate in developing computer-based learning media projects	Valid
Factor 3. Evaluating computer-based learning media		
item 9	I feel confident I can effectively monitor student's computer use for project development in my classroom	Valid
item 1	I am competent in selecting and utilize various computer-based media to support learning	Valid

Source: Data from this research.

Table 4- Goodness of fit criteria fulfilment

Criteria	Target GOF	Result	
CFI	≥ 0.85 (good fit), > 0.80 (marginal fit)	0.89	good fit
TLI	≥ 0.85 (good fit), > 0.80 (marginal fit)	0.83	marginal fit
NNFI	≥ 0.85 (good fit), > 0.80 (marginal fit)	0.83	marginal fit
NFI	≥ 0.85 (good fit), > 0.80 (marginal fit)	0.81	marginal fit
IFI	≥ 0.85 (good fit), > 0.80 (marginal fit)	0.89	good fit
GFI	≥ 0.85 (good fit), > 0.80 (marginal fit)	0.99	good fit
RMSEA	≤ 0.08 (good fit)	0.15	poor fit
SRMR	≤ 0.08 (good fit)	0.08	good fit

Source: Data from this research.

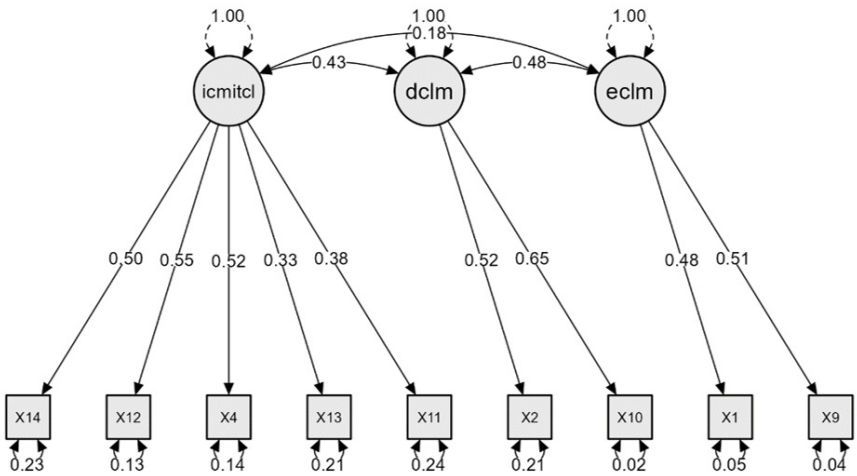
Next is the interpretation of factor loading. The CFA results show that all items already have factor loading > 0.50, so they are declared valid. The items proved to be able to measure the construct in each factor. Each factor is also able to distinguish between one factor and another. The factor loading data from the CFA is presented in Table 5, and the model plot formed is presented in Figure 2.

Table 5- Factor loading results of the CFA

Factor	Items	Factor Loading	Validity
implementing computer-based media in the classrooms	item 12	0.84	Valid
	item 4	0.82	Valid
	item 11	0.61	Valid
	item 14	0.72	Valid
	item 13	0.59	Valid
developing computer-based learning media	item 2	0.75	Valid
	item 10	0.98	Valid
evaluating computer-based learning media	item 9	0.93	Valid
	item 1	0.90	Valid

Source: Data from this research.

Figure 2- Final model plot from the CFA



Source: Data from this research.

The reliability test was then carried out using Cronbach's Alpha formula. The items are reliable if Cronbach's alpha value > 0.60. The results of Cronbach alpha are presented in Table 6. Based on the results of the validity and reliability analysis of EFA and CFA, it can be concluded that the three factors consisting of 9 items of prospective elementary school teachers' self-efficacy in utilizing computer-based media to support learning can be used as a measuring instrument because it is proven to be able to measure constructs, valid, and reliable.

Table 6- Cronbach's alpha result

Factors	Coefficient α	Reliability
implementing computer-based media in classrooms	0.84	Reliable
developing computer-based learning media	0.85	Reliable
evaluating computer-based learning media	0.91	Reliable
Total	0.83	Reliable

Source: Data from this research.

Demographics profile of the participants

Participants of this study were prospective elementary school teachers who were divided into two groups based on their gender and teaching experiences. The data collected are presented in Table 7 below.

Table 7- Demographic profile of the participants (N=50)

	Sub-scale	Frequency	Percentage %
Gender	Male	10	20
	Female	40	80
Teaching experience	Inexperienced	16	32
	Experienced	34	68

Source: Data from this research.

Table 7 shows that there were 10 males (20%) and 40 females (80%) participating in this study. This showed that the majority of participants were female prospective elementary school teachers. Meanwhile, based on teaching experience, 16 people (32%) were inexperienced in teaching, and 34 (68%) people were experienced. The teaching experience refers to the participants' experience in teaching as part-time teachers in elementary schools and tutors in other institutions. This result shows that prospective elementary school teachers already have experience in carrying out the profession as teachers.

The level of prospective elementary school teachers' self-efficacy in utilizing computer-based media to support learning

The first research question is to measure the level of prospective elementary school teachers' self-efficacy in utilizing computer-based media to support learning in which the data were obtained from a self-efficacy questionnaire distributed online. Descriptive statistic was used to determine the mean and standard deviation of each item in the questionnaire. The mean and standard deviation indicate prospective elementary school teachers' level of self-efficacy in utilizing computer-based learning media. The results of the analysis are presented in Table 8.

Table 8- The level of prospective elementary school teachers' self-efficacy in utilizing computer-based media to support learning (N=50)

No.	Item	Mean	SD
1.	Item 4	4.10	0.09
2.	Item 11	4.12	0.09
3.	Item 12	4.18	0.09
4.	Item 13	4.14	0.08
5.	Item 14	3.80	0.10
Total Factor 1. Implementing computer-based media in classrooms		20.34	0.36
1.	Item 2	4.04	0.10
2.	Item 10	4.08	0.09
Total Factor 2. Developing computer-based learning media		8.12	0.18
1.	Item 1	3.96	0.08
2.	Item 9	4.02	0.08
Total Factor 3. Evaluating computer-based learning media		7.98	0.15
	Total	36.44	0.52

Source: Data from this research.

Table 8 shows that prospective elementary school teachers have a high level of self-efficacy (shown by the mean values which are higher than 3.00 on each item). The item with the highest value is item 12 (M = 4.18; SD = 0.09). This item shows the belief of prospective elementary school teachers in regularly incorporate computer-based learning media into lessons. Those who show positive attitudes and perceptions as well as high confidence to use technology are more likely to use technology for teaching. In addition, high technology acceptance can increase teachers' trust in educational technology and willingness to change learning practices by utilizing technology (Holden; Rada, 2011).

The statistical differences between prospective elementary school teachers' self-efficacy in utilizing computer-based learning media and gender

The second research question aims to identify whether there are statistically significant differences in the prospective elementary school teachers' self-efficacy in utilizing computer-based learning media based on gender. In terms of gender and computer self-efficacy, female prospective elementary school teachers are relatively less confident and feel more anxious about using computers than male prospective elementary school teachers (He; Freeman, 2010). Data analysis was conducted using the independent sample t-test. The result of the analysis is presented in Table 9.

Table 9- Analysis results of prospective elementary school teachers' self-efficacy based on gender (N=50)

No.	Item	Sub-scale	N	Mean	SD	t	df	p-value
Factor 1								
1.	Item 4	Male	10	4.00	0.94	-0.54	48	0.59
		Female	40	4.13	0.56			
2.	Item 11	Male	10	4.30	0.82	1.02	48	0.32
		Female	40	4.08	0.57			
3.	Item 12	Male	10	4.50	0.85	1.75	48	0.09
		Female	40	4.10	0.59			
4.	Item 13	Male	10	4.50	0.71	2.32	48	0.02
		Female	40	4.05	0.50			
5.	Item 14	Male	10	4.10	0.74	1.54	48	0.13
		Female	40	3.73	0.68			
Factor 2								
1.	Item 2	Male	10	3.80	0.63	-1.22	48	0.23
		Female	40	4.10	0.71			
2.	Item 10	Male	10	4.10	0.57	0.11	48	0.92
		Female	40	4.08	0.69			
Factor 3								
1.	Item 1	Male	10	3.80	0.42	-1.06	48	0.29
		Female	40	4.00	0.56			
2.	Item 9	Male	10	4.00	0.67	-0.13	48	0.90
		Female	40	4.03	0.53			

Source: Data from this research.

Table 9 shows that only item 13 (p-value = 0.02) statistically significant difference in the level of self-efficacy based on gender because it has a p-value < 0.05 which is related to confidence about assigning and grading projects using computer-based learning media to improve instructional practices. It shows that male prospective elementary teachers have higher self-efficacy (M=4.50; SD=0.71) than female prospective elementary teachers (M=4.05; SD=0.50). Although only one item has significant difference, both male and female prospective elementary school teachers have a high level of self-efficacy in utilizing computer-based learning media because the mean is ≥ 3.00. Male prospective elementary school teachers show the highest self-efficacy level in item 12 (M=4.50; SD=0.85), which is related to confidence to regularly incorporate computer-based learning media into lessons. Meanwhile, female prospective elementary school teachers show the highest level of self-efficacy in item 4 (M = 4.13; SD = 0.56), which is related to determining why, when, and how to use computer-based learning media. The results show that teachers' familiarity with digital technology is very important. The familiarities are shown by learning intensively, caring about developments, as well as being technologically literate, critical, and creative in using various digital media and learning resources to support learning. Familiarity with

digital technology will provide a comprehensive understanding of determining media and learning resources critically and creatively (Kholifah *et al*., 2023).

The statistical differences between prospective elementary school teachers' self-efficacy in utilizing computer-based learning media and teaching experiences

The second research question aims to identify whether there is a statistically significant difference in the level of self-efficacy between those with experience and those with no experience in teaching. This aspect needs to be investigated because prospective teachers who have teaching experience commonly know how to conduct interesting learning. The collected data were analyzed using an independent sample t-test. The result of the analysis is presented in Table 10.

Table 10- Analysis results of prospective elementary school teachers' self-efficacy based on teaching experiences (N=50)

No.	Item	Sub-scale	N	Mean	SD	t	df	p-value
Factor 1								
1.	Item 4	Inexperienced	16	3.88	0.62	-1.72	48	0.09
		Experienced	34	4.21	0.64			
2.	Item 11	Inexperienced	16	4.00	0.63	-0.93	48	0.36
		Experienced	34	4.18	0.63			
3.	Item 12	Inexperienced	16	3.88	0.62	-2.34	48	0.02
		Experienced	34	4.32	0.64			
4.	Item 13	Inexperienced	16	4.06	0.57	-0.65	48	0.52
		Experienced	34	4.18	0.58			
5.	Item 14	Inexperienced	16	3.56	0.63	-1.68	48	0.10
		Experienced	34	3.91	0.71			
Factor 2								
1.	Item 2	Inexperienced	16	4.00	0.73	-0.28	48	0.78
		Experienced	34	4.06	0.69			
2.	Item 10	Inexperienced	16	4.06	0.68	-0.13	48	0.90
		Experienced	34	4.09	0.67			
Factor 3								
1.	Item 1	Inexperienced	16	4.00	0.52	0.36	48	0.72
		Experienced	34	3.94	0.55			
2.	Item 9	Inexperienced	16	4.00	0.52	-0.17	48	0.86
		Experienced	34	4.03	0.58			

Source: Data collected during this research.

Table 10 shows that only item 12 (p-value = 0.02) has a statistically significant difference between prospective teachers' self-efficacy with teaching experience because it has a p-value < 0.05. This item is related to confidence to regularly incorporate computer-based learning media into lessons. It shows that experienced prospective elementary school teachers (M=4.32; SD=0.64) have higher self-efficacy than the inexperienced (M=3.88; SD=0.62). Although only one item has significant differences, both inexperienced and experienced prospective elementary school teachers have a high level of self-efficacy in utilizing computer-based to support learning because the mean results are ≥ 3.00. Inexperienced prospective elementary school teachers have a high level of self-efficacy in item 13 (M=4.06; SD=0.57). Meanwhile, prospective elementary school teachers who have experience in teaching have a high level of self-efficacy in item 4 (M = 4.21; S = 0.64). These results indicate that prospective elementary school teachers who have experience working as teachers have confidence in selecting and using various kinds of computer technology to support learning and integrating computer-based learning media in classrooms.

Discussion

This study found that prospective elementary school teachers have fairly positive self-efficacy beliefs in utilizing computer-based media to support learning. These beliefs include confidence in implementing computer-based media in the classroom learning, developing computer-based learning media, and evaluating computer-based learning media. It is in line with a study by Keser; Karaoğlan Yilmaz; Yilmaz, (2015), which showed that there was a very positive and significant correlation between prospective teachers' self-efficacy towards technology integration and TPACK competency level. It indicates that an increase in TPACK competency level may increase the perception of self-efficacy towards technology integration. Teacher education institutions should follow up on the high level of prospective elementary school teachers' self-efficacy by providing teaching training that integrates technology in a real way as an example of the practice of developing learning media in which the products are utilised in learning both in and outside the classrooms.

The results of the present study show that there are statistically significant differences of prospective elementary school teachers' self-efficacy in utilizing computer-based learning media based on gender and teaching experiences. First, gender only affects the prospective elementary school teachers' self-efficacy in assigning and grading student project assignments. In this case, male prospective teachers have greater self-efficacy than female prospective teachers. A study by Cassidy; Eachus, (2002) showed that male teachers had significantly higher computer self-efficacy than female. The rest, other items did not show significant differences in the prospective teachers ' teachers'self-efficacy based on gender. The result of this study are directly proportional to the study by Keser; Karaoğlan Yilmaz; Yilmaz (2015). It was found that there was no statistically significant difference between the TPACK competency levels of male and female students. In other words, gender has no impact on the level of TPACK competence. Then, reserach by Kusuma (2023) also showed that there was no difference in the way male and female student

teachers integrated technology into the learning of speaking skills during online learning. Meanwhile, previous research by Almekhlafı; Ismail; Al-Mekhlafy (2016) support the claim that males were more comfortable using technology in teaching, perceived themselves as having more expertise, and integrated technology into learning. On the other hand, the findings also showed that there were many similarities in terms of technology integration between male and female teachers in using technology inside and outside classrooms. Therefore, further research needs to be conducted to find out other factors related to technology integration and gender.

Second, teaching experience only affects the prospective elementary school teachers in regularly incorporating computer-based learning media into lessons because the rest are not affected. In this case, prospective teachers who have teaching experience have greater self-efficacy than prospective teachers who do not have teaching experience. Research conducted by Al-Awidi & Alghazo (2012) examined the effect of pre-service teachers' teaching experience on their self-efficacy in technology integration. The research found that teaching experience significantly affected their self-efficacy in technology integration. Prior teaching experience provided the benefit of preparing pre-service teachers to integrate technology in learning (Sun; Strobel; Newby, 2017). This means that prospective teachers' teaching experiences help foster self-efficacy in technology integration because they can practice what they have learned previously. Meanwhile, research by Saltan; Arslan (2017) showed that considering the impact of experience, it could be expected that pre-service teachers' TPACK scores would be lower than in-service teachers. However, the results did not show a significant difference.

The results of the study illustrate that gender and work experience are not the dominant factors affecting the self-efficacy of prospective student teachers if teacher education institutions provide well-planned classes to prepare them for the teaching profession. Therefore, teacher education institutions should provide opportunities for students to practice using educational technology in real classrooms (Khusniyah *et al*., 2023). They also need to always update the materials so that prospective teachers are able to develop specialised situations and knowledge about using educational technology in classrooms. In this way, teacher education institutions may produce teacher candidates who are able to teach by integrating technology such as implementing computer-based media in classroom learning, developing computer-based learning media, and evaluating computer-based learning media.

Limitation

This study was limited to a small sample. The results would be different if a larger sample was used. However, the use of rigorous statistical methodology and high measurement validity provide confidence in the results obtained. Further research is needed to expand on the impact of gender and teaching experience on self-efficacy in the use of computer-based learning media with a larger sample.

Conclusion

The prospective elementary school teachers have fairly positive self-efficacy beliefs in utilizing computer-based media to support learning. These beliefs include confidence in implementing computer-based media in the classroom learning, developing computer-based learning media, and evaluating computer-based learning media. Therefore, teacher education institutions must facilitate the improvement of self-efficacy by providing opportunities to practice using educational technology in real classrooms. Then, gender only affects self-efficacy in assigning and grading projects using computer-based learning media to improve instructional practices. Meanwhile, teaching experience only affects self-efficacy in regularly incorporating computer-based learning media into lessons. In other word, gender and teaching experience have not prevalently influenced prospective elementary school teachers' self-efficacy in utilizing learning media to support learning.

References

ABBITT, Jasson T. An investigation of the relationship between self-efficacy beliefs about Technology Integration and Technological Pedagogical Content Knowledge (TPACK) among preservice teachers. **Journal of Digital Learning in Teacher Education**, Oxfordshire, v. 27, n. 4, p. 134-143, 2011.

ABBITT, Jasson T.; KLETT, Michell. Identifying influences on attitudes and self-Self confidenty beliefs towards technology integration among pre-service educators. **Electronic Journal for the Integration of Technology in Education**, Idaho, v. 6, n. 1, p. 28-42, 2007.

AL-AWIDI, Hamed Mubarak; ALGHAZO, Iman Mohammad. The effect of student teaching experience on preservice elementary teachers' self-efficacy beliefs for technology integration in the UAE. **Educational Technology Research and Development**, Boston, v. 60, n. 5, p. 923-941, 2012.

ALMEKHLAFI, Abdurrahman Ghaleb; ISMAIL, Sadiq Abdulwahed; AL-MEKHLAFY, Mohamed Hatem. Male and female language teachers' technology integration differences in elementary schools in the United Arab Emirates. **International Journal of Research Studies in Educational Technology**, Waynesville, v. 6, n. 1, p. 1-14, 2016.

BANDURA, Albert. Self-efficacy: Toward a unifying theory of behavioral change. **Psychological Review**, Washington, DC, v. 84, n. 2, p. 191-215, 1977.

BANDURA, Albert. **Social foundations of thought and action**: A social cognitive theory. New Jersey: Prentice-Hall, 1986. (Prentice-Hall series in social learning theory).

BANDURA, Albert. **Self-efficacy**: the exercise of control. New York: W.H. Freeman, 1997.

BARMORE, Peggy. **Teachers colleges struggle to blend technology into teacher training**. The Hechinger Report, New York, 2015. Disponível em: https://hechingerreport.org/teachers-colleges-struggle-to-blend-technology-into-teacher-training/. Acesso em: 17 May 2023.

BERTRAM, Victoria. *et al*. Promoting pre- and in-service teachers' digital competence by using reverse mentoring. **Unterrichtswissenschaft**, Weinheim, v. 51, n. 4, p. 559-577, 2023.

BROWN, Dina; WARSCHAUER, Mark. From the university to the elementary classroom: students' experiences in learning to integrate technology in instruction. **Journal of Technology and Teacher Education**, Waynesville, v. 14, n. 3, p. 599-622, 2006.

CANER, Mustafa; AYDIN, Sinan. Self efficacy beliefs of pre-service teachers on technology integration. **Turkish Online Journal of Distance Education**, Eskişehir, v. 22, n. 3, p. 76-96, 2021.

CARLBÄCK, John; WONG, Alex. **A study on factors influencing acceptance of using mobile electronic identification applications in Sweden**. 2018. Thesis (Undergraduate Thesis) – Jönköping International Business School, Jönköping, 2018.

CASSIDY, Simon; EACHUS, Peter. Developing the computer user self-efficacy (CUSE) scale: investigating the relationship between computer self-efficacy, gender and experience with computers. **Journal of Educational Computing Research**, Washington, DC, v. 26, n. 2, p. 133-153, 2002.

DURAK, Hatice Yildiz. Modeling of relations between K-12 teachers' TPACK levels and their technology integration self-efficacy, technology literacy levels, attitudes toward technology and usage objectives of social networks. **Interactive Learning Environments**, Oxfordshire, v. 29, n. 7, p. 1136-1162, 2021.

FENG, Le; HE, Lie; DING, Jie. The association between perceived teacher support, students' ICT Self-efficacy, and online english academic engagement in the blended learning context. **Sustainability**, Basel, v. 15, n. 8, 2023.

GILES, Rebecca Mahon; KENT, Andrea M. An investigation of preservice teachers' self-efficacy for teaching with technology. **Asian Education Studies**, Singapore, v. 1, n. 1, p. 32, 2016.

GRAHAM, Charles R.; BORUP, Jered; SMITH, N. B. Using TPACK as a framework to understand teacher candidates' technology integration decisions. **Journal of Computer Assisted Learning**, Hoboken, v. 28, n. 6, p. 530-546, 2012.

HAIR, F. Joseph *et al*. **Multivariate data Analysis.** New Jersey: Pearson Prentice Hall, 2018.

HAŞLAMAN, Tülin; ATMAN USLU, Nilüfer; MUMCU, Filiz. Development and in-depth investigation of pre-service teachers' digital competencies based on DigCompEdu: a case study. **Quality and Quantity**, Heidelberg, v. 58, n. 1, p. 961-986, 2024.

HATLEVIK, Ove E.; BJARNØ, Vibeke. Examining the relationship between resilience to digital distractions, ICT self-efficacy, motivation, approaches to studying, and time spent on individual studies. **Teaching and Teacher Education**, Amsterdam, v. 102, p. 103326, 2021.

HE, Jun; FREEMAN, Lee A. Understanding the formation of general computer self-efficacy. **Communications of the Association for Information Systems**, Atlanta, v. 26, n. 1, p. 225-244, 2010.

HOLDEN, Heather; RADA, Roy. Understanding the influence of perceived usability and technology self-efficacy on teachers' technology acceptance. **Journal of Research on Technology in Education**, Oxfordshire, v. 43, n. 4, p. 343-367, 2011.

KALYAR, Masood Nawaz; AHMAD, Bashir; KALYAR, Hadiqa. Does teacher motivation lead to student motivation? The mediating role of teaching behavior. **Voprosy Obrazovaniya / Educational Studies Moscow**, Moscow, n. 3, p. 91-119, 2018.

KAYA, Çağlar; ALTINKURT, Yahya. Role of psychological and structural empowerment in the relationship between teachers' psychological capital and their levels of burnout. **Egitim ve Bilim**, Istanbul, v. 43, n. 193, p. 63-78, 2018.

KESER, Hafize; KARAOĞLAN YILMAZ, Fatma Gizem; YILMAZ, Ramazan. TPACK Competencies and technology integration self-efficacy perceptions of pre-service teachers. **İlköğretim Online**, Ankara, v. 14, n. 2, p. 1193-1207, 2015.

KHOLIFAH, Nur. *et al.* The role of teacher self-efficacy on the instructional quality in 21st century: A study on vocational teachers, Indonesia. **International Journal of Evaluation and Research in Education**, Bantul, v. 12, n. 2, p. 998-1006, 2023.

KHUSNIYAH, Tri Wardati *et al.* Pre-service primary school teachers' self-efficacy for teaching social studies: An Indonesian perspective. **Issues in Educational Research**, New South Wales, v. 33, n. 4, p. 1403-1420, 2023.

KIRSCHNER, Paul A.; DE BRUYCKERE, Pediro. The myths of the digital native and the multitasker. **Teaching and Teacher Education**, Amsterdam, v. 67, p. 135-142, 2017.

KLINE, Rex B. **Principles and Practice of Structural Equation Modeling**. 4. ed. New York: The Guilford Press, 2016.

KOEHLER, Matthew J.; MISHRA, Punya; CAIN, William. What is Technological Pedagogical Content Knowledge (TPACK)? **Journal of Education**, London, v. 193, n. 3, p. 13-19, 2013.

KUSUMA, I Putu Indra. The role of gender in student teachers' technology integration in teaching English speaking skills during the Covid-19 pandemic. **Knowledge Management and E-Learning**, Hong Kong, v. 15, n. 3, p. 487-505, 2023.

LEE, Doo Young; RYU, Hokyoung. Learner acceptance of a multimedia-based learning system. International **Journal of Human-Computer Interactio**n, Philadelphia, v. 29, n. 6, p. 419-437, 2013.

MALHOTRA, Naresh K. **Marketing research**: an applied orientation. Delhi: Pearson Education, 2020.

MALOSHONOK, Natalia. How the use of internet and multimedia technology in education correlates with student engagement. **Voprosy Obrazovaniya: Educational Studies Moscow**, Moscow, v. 2016, n. 4, p. 59-83, 2016.

MARNER, Anders. Digital media embedded in Swedish art education–A case study. **Education Inquiry**, Umeå, v. 4, n. 2, p. 355-373, 2013.

MOORE-HAYES, Coleen. Fall / automne 2011 technology integration preparedness and its influence on teacher. **Canadian Journal of Learning and Technology**, Alberta, v. 37, n. 3, p. 1-15, 2011.

ÖRTEGREN, Hans. Digital media added on to the subject of Art in secondary schools. **Education Inquiry**, Umeå, v. 5, n. 2, 2014.

REDECKER, Christine. **European framework for the digital competence of educators**: DigCompEdu. Luxembourg, 2017.

SALTAN, Fatih; ARSLAN, Kürşat. A comparison of in-service and pre-service teachers' technological pedagogical content knowledge self-confidence. **Cogent Education**, Oxfordshire, v. 4, n. 1, 2017.

ŞEN, Şenol. Modelling the relations between Turkish chemistry teachers' sense of efficacy and technological pedagogical content knowledge in context. **Interactive Learning Environments**, Oxfordshire, v. 30, n. 7, p. 1215-1228, 2022.

SETYAWAN, Theresia Yunia. Primary school pre-service teachers' technology self-efficacy in creating e-learning content using courselab 2.4. **Jurnal Inovasi Teknologi Pendidikan**, Sleman, v. 6, n. 2, p. 159-170, 2019.http://journal.uny.ac.id/index.php/jitp

SUN, Yan; STROBEL, Johannes; NEWBY, Timothy J. The impact of student teaching experience on pre-service teachers' readiness for technology integration: A mixed methods study with growth curve modeling. **Educational Technology Research and Development**, New York, v. 65, n. 3, p. 597-629, 2017.

SYUHADA, Siti et al. Predicting teachers' use of digital technology. **International Journal of Evaluation and Research in Education (IJERE)**, Bantul, v. 12, n. 2, p. 555-562, 2023.

THOHIR, M. Anas; JUMADI, Jumadi; WARSONO, Warsono. Technological Pedagogical Content Knowledge (TPACK) of pre-service science teachers: A Delphi study. **Journal of Research on Technology in Education**, Oxfordshire, v. 54, n. 1, p. 127-142, 2022.

TSCHANNEN-MORAN, Megan; HOY, Anita Woolfolk. Teacher efficacy: capturing an elusive construct **Teaching and Teacher Education,** Washington, DC, v. 17, n. 7, p. 783-805, 2001.

WANG, Ling; ERTMER, Peggy A.; NEWBY, Timothy J. Increasing preservice teachers' self-efficacy beliefs for technology integration. **Journal of Research on Technology in Education**, Oxfordshire, v. 36, n. 3, p. 231-250, 2004.

WU, Leon Yufeng; YAMANAKA, Akio. Exploring the effects of multimedia learning on pre-service teachers' perceived and actual learning performance: the use of embedded summarized texts in educational media. **Educational Media International**, Oxfordshire, v. 50, n. 4, p. 291-305, 2013.

ZIPKE, Marcy; INGLE, Jeanne Carey; MOOREHEAD, Tanya. The effects of modeling the use of technology with pre-service teachers. **Computers in the Schools**, New York, v. 36, n. 3, p. 205-221, 2019.

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