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Influence of digital competence on teaching readiness through self-efficacy as moderator variable

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Abstract. In the digital era, mastery of technology is a key factor in improving teaching effectiveness. Therefore, pre-service teachers are expected to have good digital competencies to support an interactive and adaptive learning process. This study aimed to analyse the effect of digital competence on teaching readiness of pre-service teachers at the Faculty of Economics and Business (FEB), Universitas Negeri Surabaya (UNESA), with self-efficacy as a moderator variable. This study used a quantitative approach with an explanatory research design, explaining or knowing the relationship between digital competence and self-efficacy in relation to teaching readiness of pre-service teachers at FEB UNESA. This research data analysis technique used Path Analysis. The questionnaire became the main tool for data collection, which was then analysed using path analysis techniques to examine the relationship between digital competence, self-efficacy, and teaching readiness. Recommendations from the results of this study are to improve the teaching readiness of pre-service teachers at FEB UNESA. It is necessary to develop digital competence and self-efficacy through intensive training, integration of technology in the curriculum, lecturer guidance, and teaching practice activities. Collaboration between lecturers, institutions, and students (pre-service) is important to create a supportive learning. Learning programs need to be adaptive to technological developments with the addition of educational technology modules and digital microteaching activities, accompanied by regular evaluations so that development is sustainable.

Introduction

Full in the digital era, the rapid development of information and communication technology in the world requires pre-service teachers to have adequate digital competencies. Education in the digital era focuses not only on material mastery but also on digital competency capabilities that enable more effective and innovative teaching. In the 21st century, or better known as the digital era, the rapid development of technology has an impact on the development of the world of education (Andi Sadriani et al., 2023). The industrial revolution is experiencing its peak at this time with the birth of digital technology, which has a major impact on human life around the world (Hamidani et al., 2022). Integrating digital technology into the process of planning, implementing, assessing, and evaluating learning in order to run effectively and efficiently (Ardiansyah & Trihantoyo, 2023). This includes technical skills in operating technology, thinking critically about the ethical and social impacts of technology, and building a positive digital culture (Ibda, 2023; Sumandya & Widana, 2022).

Digital competence is one of the main skills that pre-service teachers must have. Digital skills are not only limited to using technological devices, but also include a deep understanding of how to integrate technology in education to improve learning effectiveness (Tomczyk & Fedeli, 2021). The ability to optimally utilise technology not only improves the learning process but also equips learners to be ready to face competition in the increasingly competitive world of work (Gisbert Cervera & Caena, 2022; Widana, 2020). Improving digital skills not only assists students in utilising technology in their daily lives but also creates opportunities for them to develop skills that fit an increasingly digitally connected future (Ruli Haris et al., 2024; Purnadewi et al., 2023). The development of digital competencies for pre-service teachers should be a priority in the higher education curriculum, given the rapid changes in the world of technology that affect the way students learn.

High self-efficacy in pre-service teachers plays an important role in improving their readiness to teach. As pre-service educators, it is very important to understand, master, and utilise technology with a high level of self-efficacy in order to effectively overcome various challenges in learning (Putri & Krismiyati, 2023; Suhardita et al., 2024). Nurmalia & Setiyaningsih (2020) show that pedagogical competence and motivation have a significant effect on teacher self-efficacy, which in turn affects their readiness to teach. The importance of research on digital competence through self-efficacy on teaching readiness is very relevant to the world of education, especially in preparing FEB UNESA Education students as pre-service teachers to face educational challenges in the digital era.

Previous studies have highlighted the importance of digital competence and self-efficacy on teaching readiness. Self-efficacy has a positive and significant influence on career readiness to become a teacher Aprilita & Trisnawati (2022). Self-efficacy and micro-teaching courses affect the teaching readiness of Economics Education students (Salsabila et al., 2022). In addition, another study by Arifah et al. (2021) found that self-efficacy can mediate the effect of perceptions of the teaching profession and family environment on readiness to become a teacher. However, most of these studies still focus on one aspect only or do not examine the interactive relationship between the three in one research model.

The urgency of this research is to understand and develop the concept of teaching readiness of pre-service teachers through a more comprehensive approach, namely by examining the effect of digital competence on teaching readiness through self-efficacy as a moderator variable. This research is very relevant in order to solve the problem of teaching readiness in the digital era and provide a basis for educational institutions to develop strategies to improve the quality of pre-service teachers, besides that the purpose of conducting this research is to emphasise a deep understanding of the dynamics of teaching readiness in the digital era and efforts to enrich conceptual models in the field of education. This study aims to analyse the effect of digital competence on teaching readiness of pre-service teachers at the Faculty of Economics and Business (FEB), Universitas Negeri Surabaya (UNESA), with self-efficacy as a moderator variable.

Based on the background description above, the problem formulation obtained is:

1. How does digital competence affect the teaching readiness of pre-service teachers of FEB UNESA?
2. How does digital competence influence the self-efficacy of pre-service teachers of FEB UNESA?
3. How does self-efficacy influence the teaching readiness of pre-service teachers of FEB UNESA?
4. How does digital competence affect teaching readiness through self-efficacy in pre-service teachers of FEB UNESA?

From the description of the background and problem formulation, the hypothesis of this study is as follows:
H1: Digital competence affects teaching readiness
H2: Digital competence affects self-efficacy
H3: Self-efficacy affects teaching readiness
H4: Digital competence affects teaching readiness through self-efficacy.

Method

This study used a quantitative approach with a correlational research design. Quantitative research involved collecting and analysing numerical data with control variables, which allowed researchers to investigate phenomena and relationships between variables in a structured manner (Berlianti et al., 2024). This approach was chosen to analyse the relationship between the independent variable (digital competence) and the intervening variable (self-efficacy) with the dependent variable (teaching readiness). This study used an explanatory research design, which sought to explain or determine the relationship between digital competence and self-efficacy in relation to teaching readiness of pre-service teachers at FEB UNESA. Explanatory research is a type of research that aims to test existing theories or hypotheses, which serve to strengthen or reject theories or hypotheses based on the results of previous research (Pirmanto, 2016).

The population used was UNESA FEB Education Students who were undergoing the PLP MBKM program (introduction to the school field) and who had completed the program. The research was conducted using random sampling techniques, namely randomly from students who were undergoing the PLP MBKM program and who had run the program. The total population of FEB UNESA Education students in Class 2022 is 510 students from the Office Administration Education Study Program, Business Education Study Program, Accounting Education Study Program, and Economics Education Study Program. Determining the sample size is an important element in designing quantitative research to ensure that the results obtained can be validly generalised. The Slovin formula is often applied in research in the social, economic, and educational fields because of its ease of use (Antoro, 2024) . The population size was calculated using the Slovin formula as follows:

$$n = \frac{N}{1 + Ne^2}$$

n = sample size
N = population size (510)
e = margin of error (5% or 0.05)

$$n = \frac{510}{1 + 510(0.05)^2}$$

$$n = \frac{510}{1 + 510 \times 0.0025}$$

$$n = \frac{510}{1 + 1.275}$$

$$n = \frac{510}{2.275} \approx 224$$

With a margin of error of 5%, the number of samples needed is 224 respondents from pre-service teachers at FEB UNESA.

The data collection method involved the use of a questionnaire, which consisted of several question items designed to gather relevant information regarding digital competencies, self-efficacy, and teaching readiness.

Table 1. Research questionnaire table

Variables	Research questionnaire table		
	Indicator	Question Item Number	Source
Digital Competency (X)	• Information and Literacy • Communication and Collaboration • Digital Content Creation • Security • Problem Solving	(1, 2, 3, 4, 5) (6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18) (19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31) (32, 33, 34, 35) (36, 37, 38, 39, 40)	(Rahim & Yustiana, 2023)
Self-efficacy (Z)	• Confidence in one's own abilities • Enthusiastic nature • The ability to persevere in facing obstacles • Tolerant of pain and fatigue	(1, 2, 3) (4, 5, 6) (7, 8, 9) (10, 11, 12)	(A. P. Putra, 2018)
Teaching Readiness (Y)	• Skills • Managing the teaching and learning process • Managing evaluation	(1, 2, 3, 4, 5) (6, 7, 8, 9, 10) (11, 12, 13, 14, 15)	(Ajar et al., 2021) & (Fitriani, 2019)

The questionnaire was prepared using a Likert scale to measure student perceptions of the three variables and was tested for validity and reliability before being distributed. The instrument is said to be valid and reliable if r count > r table at a significance of 0.05. The validity test ensures the questions measure what is desired, while the reliability test assesses the consistency and accuracy of the resulting data (Situmorang & Purba, 2020). Data processing used statistical software to analyze the effect of digital competence and self-efficacy on teaching readiness. This study used data analysis techniques using Path Analysis.

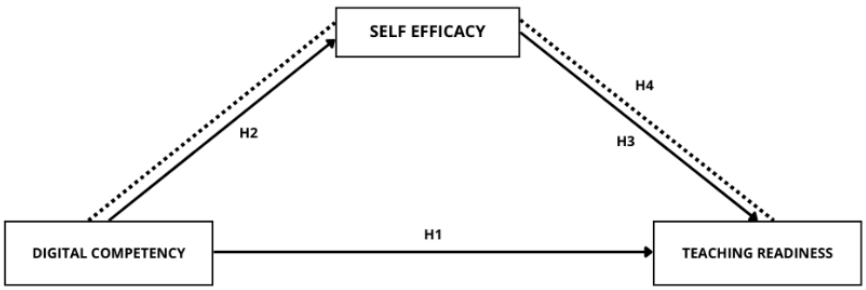

Image 1. Path Analysis Research Model

Path analysis is a statistical technique used to examine the causal relationships among variables in a given model. This approach allows researchers to identify direct and indirect effects between the variables involved. Before conducting the path analysis test, a classic assumption test was carried out first, including: Normality Test, Multicollinearity Test, Heteroskedasticity Test, Autocorrelation

Test, and after the classical assumption test is carried out, hypothesis testing using path analysis. Conclusions were drawn based on the results of data analysis by paying attention to the significance value and interpretation of the results of hypothesis testing and the Sobel test in accordance with the formulation of problems and research hypotheses in accordance with the direction of the arrow of the path analysis research model.

Results and Discussion

Test Validity

The research instrument was tested for validity with a temporary sample of 35 respondents, using R table 0.334 at 0.05 significance. The test results showed that all statement items on variables X (Digital Competence), Z (Self-Efficacy), and Y (Teaching Readiness) were valid.

Test Reliability

This study was assessed for reliability to determine whether the questionnaire was consistent when measurements were repeated using the same questionnaire. The provisional sample size was 35 participants and the decision to use Cronbach's Alpha for the reliability test was based on the perspective that a Cronbach's Alpha number greater than 0.6 indicates that the questionnaire was reliable. The following are the results of the reliability test: The Cronbach Alpha results showed that the questionnaires for the variables Digital Competence (0.991), Self Efficacy (0.955), and Teaching Readiness (0.974) all had values > 0.6, so they were declared reliable.

Classical Assumption Test

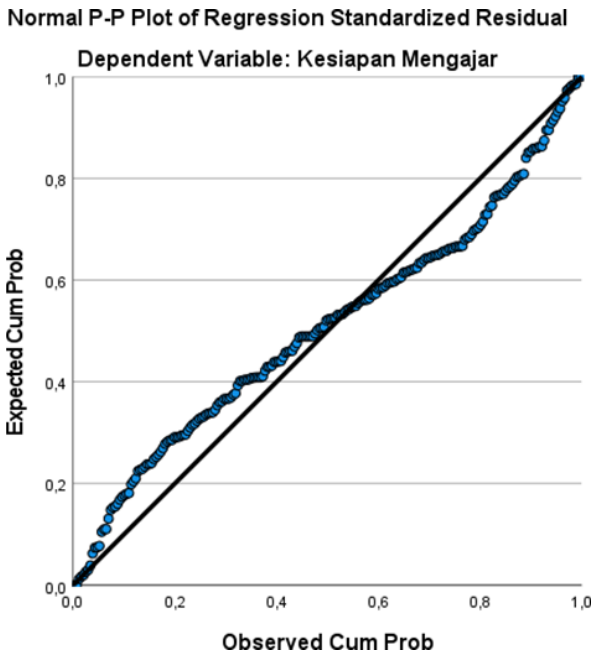

Image 2. Classic Assumption Test Framework

Based on the Normal P-P Plot, the data points followed the diagonal line symmetrically without any significant deviations, indicating that the residuals were normally distributed. Thus, the assumption of normality in regression analysis had been met.

Multicollinearity Test Results

Table 2. Multicollinearity Test Results

Model		Not standardised B	Std. coefficient Error	Beta Standardised Coefficient	t	Sig.	Tolerance	VIF
1	(Constant)	4.581	2.551		1.796	0.074		
	Digital Competency	0.234	0.025	0.556	9.255	<.001	0.348	2.876
	Self-efficacy	0.397	0.071	0.335	5.557	<.001	0.348	2.876

a. Dependent Variable: Teaching Readiness

The multicollinearity test results showed a Tolerance value of 0.348> 0.1 and VIF of 2.876 < 10, so the regression model does not experience multicollinearity problems and was suitable for further research.

Heteroscedasticity Test Results

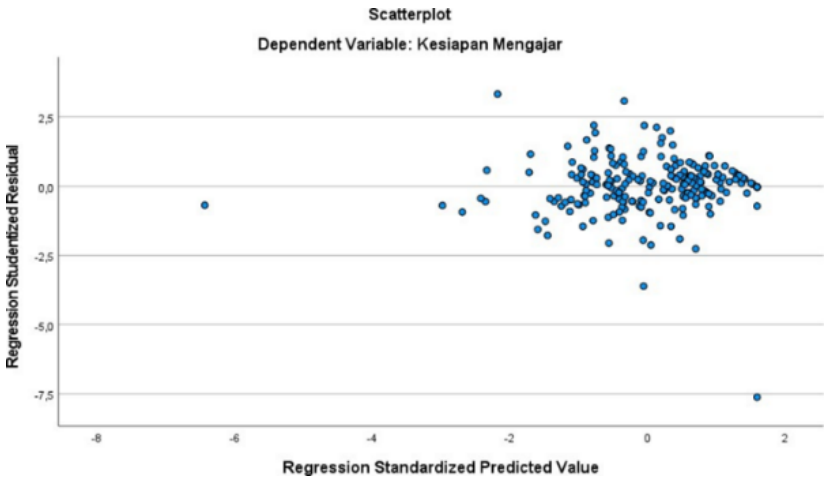

Image 3. Heteroscedasticity Test Results

Based on the results of the scatterplot between Regression Standardised Predicted Value and Regression Studentised Residual, it can be seen that the data points are scattered randomly without forming a certain pattern, either conical or systematically widened. It can be concluded that the test results if there is no clear pattern on the scatterplot, it can be concluded that the regression model does not exhibit heteroscedasticity.

Autocorrelation Test Results

Table 3. Autocorrelation Test Results

Model	R	R_Square	Customised R_Square	Std. Error of the Estimate	Durbin Watson
1	0.850	0.722	0.720	4.37965	2.121

a. Predictors: (Constant), Self-efficacy, Digital Competence
b. Dependent Variable: Teaching Readiness

Based on the Model Summary table, the Durbin-Watson (DW) value = 2.121. The Durbin-Watson test is used to detect the presence of autocorrelation in regression residuals. It is known that the

value of the number of predictors K = 2 and the number of samples = 224. Based on the Durbin Watson table, the value du = 2.121 is obtained. Since the value of 2.121 is in the range (1.799) < Durbin Watson (2.121) < 4 - du (2.201), it can be concluded that there is no autocorrelation in this regression model. Thus, it is concluded that all classical assumption tests are met from the normality test, multicollinearity, heteroscedasticity test, and autocorrelation test.

Research Hypothesis Test

Table 4. Hypothesis Test Results

Model		Not standardised B	Std. coefficient Error	Beta Standardised Coefficient	t	Sig.
1	(Constant)	4.816	2.718		1.772	0.078
	Digital Competency	0.347	0.016	0.827	21.892	<.001

a. Dependent Variable: Teaching Readiness

H1: Digital Competency Affects Teaching Readiness

The significance value for the digital competency variable was found to be 0.001 which was less than 0.05, which indicated that the digital competency variable affected the Teaching Readiness variable (Hypothesis 1 is accepted).

Table 5. Hypothesis Test Results

Model		Not standardised B	Std. coefficient Error	Beta Standardised Coefficient	t	Sig.
1	(Constant)	0.590	2.402		0.246	0.806
	Digital Competency	0.286	0.014	0.808	20.407	<.001

a. Dependent Variable: Self-Efficacy

H2: Digital Competence Affects Self-Efficacy

The significance value of the digital competency variable was obtained at 0.001 which was smaller than 0.05, so it was concluded that the digital competency variable affected the Self-Efficacy variable (Hypothesis 2 is accepted).

Table 6. Hypothesis Test Results

Model		Not standardised B	Std. coefficient Error	Beta Standardised Coefficient	t	Sig.
1	(Constant)	4.581	2.551		1.796	0.074
	Digital Competency	0.234	0.025	0.556	9.255	<.001
	Self-efficacy	0.397	0.071	0.335	5.551	<.001

a. Dependent Variable: Teaching Readiness

H3: Self-efficacy affects teaching readiness

The significance value of the Self Efficacy variable was obtained at 0.001 which was smaller than 0.05, so it was concluded that the Self Efficacy variable affected the Teaching Readiness variable (Hypothesis 3 is accepted).

Table 7. Hypothesis Test Results (R Square)

Model	R	R Square	Customised R_Square	Std. Error of the Estimate
1	0.850	0.722	0.720	4.37965

It is known that the R Square value of 0.722 meaning that the contribution of the influence of the digital competency variable on the teaching readiness variable is 72%. While the value of e1 was found by using the formula e1 =√(1-0.722)= 0.527.

H4: Digital Competence affects Teaching Readiness through Self-Efficacy.
It is known that the direct effect given by the Digital Competency variable on Self Efficacy is 0.347 with a standard error of 0.016. Meanwhile, and then on Self Efficacy on Teaching Readiness, getting a coefficient value of 0.397 with a standard error of 0.071.

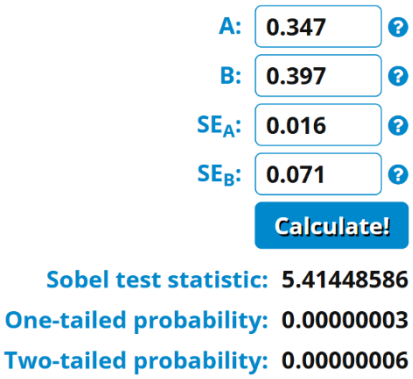

Image 4. Sobel Test Results

Then the data from the regression processing results was processed using the Sobel test to find the Sobel test statistics and P value. The basis for decision making on the Sobel test = If the (Sobel Test Statistic) Z value of 5.414 ≥ 1.96 (for α = 5%), then the mediation effect was significant. If the Two-tailed probability value (two-way p-value) was 0.006 < 0.05 (α = 5%), the intervening variable has a significant role in mediation. Based on the calculation results, it was known that the results of the Sobel test statistic Z value of 5.414 and the P value/Two-tailed Probability test of 0.006 were smaller than 0.05, meaning that the moderating variable had a significant effect. So it was concluded that indirectly, Digital Competence through Self-Efficacy affected Teaching Readiness.

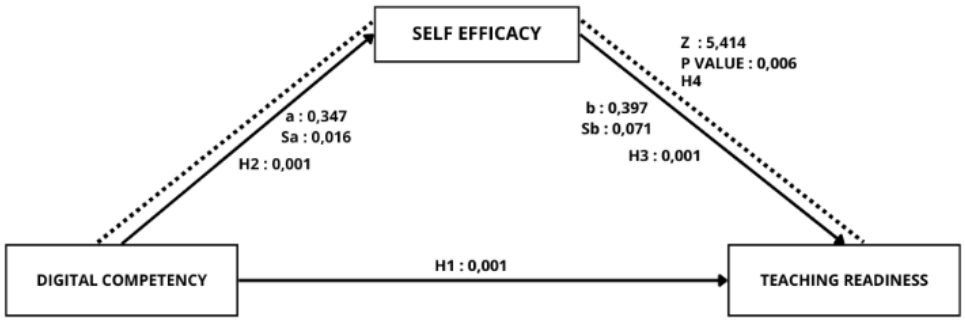

Image 5. Sobel test results of the path analysis model

Digital Competencies Affect Teaching Readiness
Pre-service teachers who have good digital competence will be better prepared to organise, implement, and evaluate technology-based learning. Technology plays an important role in creating more interactive and adaptive learning methods, thus improving students' readiness in dealing with various learning situations. Good digital competence among pre-service teachers is positively related to their readiness to integrate technology in learning. Pre-service teachers who have higher

digital understanding and skills tend to be more confident and ready to use technology in their classrooms (Tondeur et al., 2017). (Sokout et al., 2020) The teaching readiness of pre-service teachers is strongly influenced by their level of digital competence, where the ability to use technology effectively can increase their confidence and ability to design and implement learning (Sokout et al., 2020). This statement is also supported by research Sarinten (2023) . This states that the mastery of digital competencies by state vocational teachers in Klaten Regency has a positive and significant impact on their teaching performance. The higher the level of digital competence possessed, the more the effectiveness and quality of teaching provided will increase. Digital competence has a significant effect on the teaching readiness of pre-service teachers of the UNESA Faculty of Education. The higher the mastery of technology, the more their confidence, effectiveness, and quality of teaching will increase, including in designing, implementing, and evaluating digital-based learning.

Digital competence affects self-efficacy

With better mastery of technology, students feel more confident in utilising digital tools to improve the quality of their teaching Rahim & Yustiana, (2023). This finding is in line with previous research showing that good digital skills can increase confidence and effectiveness in teaching (Rahim & Yustiana, 2023). Teachers who are proficient in digital skills tend to be more confident in applying technology in the learning process, which ultimately contributes to improving their professional competence (Prasetyo et al., 2024) . Students with superior digital skills tend to have greater confidence in thinking critically and completing academic tasks (Leuwol et al., 2023). This statement is also supported by research Budiarti et al., (2024) which states that students who feel confident in using technology tend to have better academic achievement. Based on these research findings, it can be concluded that digital competence plays an important role in increasing the self-efficacy of pre-service teachers at FEB UNESA, which in turn has a positive impact on their ability to face learning challenges in the digital era.

Self-efficacy affects teaching readiness

Students with high self-efficacy tend to be more confident in facing teaching challenges and are able to manage the classroom better. This self-confidence helps them deliver material, manage interactions with students, and deal with obstacles in learning more effectively. (Putri & Krismiyati, 2023). Mariyatul Qibthiyah et al., (2024) Self-efficacy also affects student teaching readiness, which means that the higher the confidence of pre-service teachers, the more prepared they are in carrying out their role as educators (Mariyatul Qibthiyah et al, 2024). A. Putra & Ahyanuardi, (2022) Self-efficacy has a significant influence on student teaching readiness, with a high level of self-efficacy tending to be more confident in facing various challenges in the teaching process, being able to manage the class effectively, and delivering material more clearly and structured (A. Putra & Ahyanuardi, 2022).

Self-efficacy has a significant influence on student teaching readiness, with a high level of self-efficacy making them more confident in facing teaching challenges, managing classes, and interacting with students. This confidence also supports them in delivering material more effectively and overcoming obstacles in learning. Thus, the higher the confidence of UNESA Faculty of Education student teachers in the digital era, the more prepared they are in carrying out classroom teaching. This statement is also supported by research Anggraeni et al (2024) , which states that self-efficacy has a positive impact on the readiness of students to become pre-service teachers. The higher the self-confidence that students have, the more prepared students are in carrying out their duties as educators. This belief includes the ability to control oneself, maintain motivation, and face various challenges in the teaching process.

Digital competency influences teaching readiness through self-efficacy

The relationship between teaching readiness and digital competence is significantly moderated by the intervening variable of self-efficacy. The higher the digital competence of pre-service teacher students, the greater their confidence in applying technology in learning, which ultimately increases their teaching readiness. This result is in line with previous research Kurniawan & Devi (2023), which states that students with high and low levels of self-efficacy do not show significant differences in their readiness to teach, indicating that other factors, such as direct teaching experience, have a greater role in improving the readiness of pre-service student teachers. This suggests that self-efficacy plays a role in strengthening the relationship between technology mastery and teaching readiness, so that students who feel more digitally competent are also better prepared to face learning challenges in the digital era. The development of digital technology in education requires pre-service educators to have qualified digital competencies to improve learning effectiveness. Digital competence not only has a direct impact on teaching readiness but also plays a role in shaping educators' self-efficacy in facing the challenges of technology-based learning. Several previous studies have shown that digital competence has a significant influence on teaching readiness, either directly or through moderator variables such as self-efficacy.

According to researchers Maghfiroh et al. (2023), most participants had a medium level of digital competence, while only a few felt able to integrate various digital technologies in learning. This situation shows the importance of improving digital competence to strengthen teaching readiness in the digital era. This is in line with the findings in the study (Dinda Rahmawati (2025). The importance of continuous professional development for teachers to improve their digital capabilities in order to improve the effectiveness of the learning process is emphasized on teacher digital competence and student learning motivation. During the COVID-19 epidemic, ECD teachers' self-efficacy and digital literacy were significantly correlated, which in turn affected their readiness to teach using digital technologies (Sya'dullah et al., 2024). Educators who have high levels of self-efficacy are more likely to be confident in integrating technology into the learning process, thus improving their teaching readiness. In this context, digital competence is a key factor in improving self-efficacy, which in turn contributes to better teaching readiness.

Understanding the teaching and learning process in the classroom and in the larger socio-technical ecosystem, where digital technologies are crucial, should be part of social science education. Adequate digital competence in schools depends on good technological infrastructure, teachers skilled in pedagogical technologies, continuous professional development, and effective technology-based communication and administration (Olofsson et al., 2020). In addition to being a personal task, teacher digital competence is a component of the school digitization process (Fransson et al., 2019). Teaching readiness is strongly influenced by the extent to which pre-service teachers feel capable of using technology to support learning. Therefore, improving digital competencies is not only important in facing the era of technology-based education, but also in building the confidence of educators to be better prepared to carry out their teaching duties. Thus, research on digital competence and self-efficacy on teaching readiness is very relevant in the current educational context, especially in preparing pre-service teachers of FEB UNESA Education Students in facing learning challenges in the digital era

The novelty of this research is that it focuses on analyzing the relationship or influence between digital competence and self-efficacy on the teaching readiness of pre-service teacher students at the UNESA Faculty of Economics and Business, which specifically examines the relationship between these three variables in the context of students of economics education, business education, office administration education, and accounting education study programs in the digital era. This study also adds a new dimension by highlighting the role of self-efficacy as a moderator variable between

digital competence and teaching readiness, which has not been thoroughly studied in the scope of economic vocational education in Indonesia.

Conclusion

he results of this study indicate that digital competence and self-efficacy have a significant influence on the teaching readiness of pre-service teachers at FEB UNESA. High digital competence allows pre-service teachers to be more adaptive in using technology in learning, creating innovative teaching methods, and increasing teaching effectiveness and efficiency. In addition, high self-efficacy plays a role in increasing students' confidence in facing teaching challenges, managing classes, and delivering material more effectively. Furthermore, digital competence not only directly affects teaching readiness but also indirectly through self-efficacy as a moderator. Students who have strong digital competence usually feel more comfortable in utilising technology to enhance the learning process, which in turn makes them more prepared to teach. In the digital era, mastery of technology is an important aspect in shaping the readiness of pre-service teachers. Therefore, improving digital competence and strengthening self-efficacy need to be a concern in the education system to prepare pre-service teachers, especially UNESA Faculty of Education students, who are ready to face the challenges of technology-based learning

From the results of the discussion, the author provides recommendations to improve the teaching readiness of pre-service teachers at FEB UNESA, focused efforts are needed in developing digital competence and student self-efficacy. Digital competence can be improved through intensive training, integration of technology in the curriculum, and provision of digital-based learning facilities. Meanwhile, self-efficacy needs to be strengthened continuously through practical teaching experiences, lecturer guidance, and self-development activities that build confidence in using technology and managing the classroom. In addition, it is important to encourage collaboration between lecturers, institutions, and students to create a learning ecosystem that supports the integration of technology and the professionalism of pre-service teachers. Learning programs should also be designed to be more adaptive to the development of educational technology, for example, by adding special courses or modules related to the implementation of technology in learning. Project-based learning activities or digital microteaching also need to be expanded to train students' practical skills. For this reason, the faculty and study program are advised to routinely evaluate and monitor students' digital competence and self-efficacy so that the development of teaching readiness can take place in a sustainable and directed manner.

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