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Teacher Competencies: How does Implementing Digital Education in Public Elementary Schools?

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ABSTRACT

The development of technology is currently very rapid, this is widely applied in various aspects of life, especially education in Indonesia. Increasingly sophisticated technology can make it easier for teachers to carry out their roles. This is a challenge and a solution in the field of education. On the other hand, currently teachers are expected to have competencies that are appropriate to the times so that students have this knowledge and are equipped to use it. This research aims to analyze the influence of teacher competency on the implementation of digital education at one of the public elementary schools in Bogor City. The object of this research is all teachers at public elementary school in Bogor. This research was conducted using a quantitative approach to analyze the influence of teacher competency on the implementation of digital education public elementary school, Bogor City. The data used in this research is primary data obtained through distributing questionnaires to teachers at the school with a population and sample of 14 people. The tool test was carried out using the SmartPLS version 3 application to analyze the relationship between variables. The results of the analysis show that teacher competency has a significant influence on educational implementation, with the p-value showing a strong and positive relationship between the two variables. It can be concluded that teacher competency has a significant influence on the implementation of digital education at public elementary school in Bogor.

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Introduction

In today's digital era, the development of information and communication technology has changed various aspects of life, including education (Rahmatullah et al., 2022; Limna et al., 2022; Singh, 2016). Digital transformation demands innovation in the learning process,

especially in the elementary school environment. Digital education is one of the solutions to create learning that is more interactive, engaging and relevant to the needs of today's generation (Dineva et al., 2019; Oriji & Torunarigha, 2020; Alruthaya et al., 2021). However, the successful implementation of digital education relies heavily on teachers' competence in adopting and Integrating technology into the learning process.

Teacher competencies in digital education include the ability to use technology devices, understanding basic technology concepts and integrating technology in learning to improve student learning outcomes (Basilotta-Gómez-Pablos et al., 2022; Reisoğlu, 2022). On the other hand, many teachers face challenges in implementing digital education, such as limited technological knowledge, inadequate facilities and lack of relevant training (Knyazeva et al., 2022; Thomas & Palmer, 2014). Therefore, it is important to examine the extent of teachers' competencies in facing these challenges and how opportunities can be utilized to optimize digital education.

Data from the *Survei Nasional Teknologi Pendidikan* (SNTP) in 2021 shows that only around 40% of teachers in Indonesia feel sufficiently skilled and confident in using digital technologies to support classroom learning (Manongga, 2022). This figure indicates a significant gap between the potential use of available technologies and teachers' practical ability to optimize them in an educational context. This gap not only reflects an imbalance in technology mastery among teachers, but also reveals a major challenge in Indonesia's education system that still requires improvement in terms of developing digital competencies for educators. While most schools now have technological devices such as computers, projectors or internet access, the inability of many teachers to use technology effectively suggests that the main problem lies in the practical skills and knowledge factor rather than the availability of tools.

Teacher competencies are a combination of knowledge, skills and attitudes that must be possessed by a teacher to carry out their duties professionally in the context of education and learning. These competencies are essential to ensure that teachers can provide quality learning experiences to students and optimize the learning process in the classroom. Teacher competence is divided into four main aspects, namely pedagogic competence, personality competence, social competence and professional competence (Jentsch & König, 2022). These four aspects are interrelated and function to develop the teacher's overall ability to educate students, both in terms of teaching skills, self-management, ability to interact with students and fellow educators, as well as deep mastery of learning materials. According to Sam & Sulastri (2024), teacher competence involves three main dimensions, namely cognitive, affective, and psychomotor aspects. A competent teacher must not only master the teaching material thoroughly, but must also have the skills to manage the learning process effectively, as well as the ability to build positive relationships with students. These skills include a deep understanding of how to convey information in a way that is easy to understand, as well as managing the classroom well in order to create a conducive learning environment. In addition, teachers are also expected to have good social skills.

Nurarfiansyah (2018) added that a competent teacher must not only be skilled in aspects of learning, but must also be able to plan, implement, and evaluate the learning process properly. This includes careful planning, which starts from lesson plan that are in accordance with the curriculum and student needs, to the implementation of learning that is able to achieve predetermined educational goals. Evaluation conducted by teachers is also very important to measure the extent to which these goals are achieved, as well as to identify areas that still need improvement. Teacher competence also includes the ability to develop

themselves, namely through continuous training and skills improvement, both in terms of mastery of teaching materials and in other aspects, such as the use of educational technology. In addition, Dita (2022) emphasizes the importance of teachers' ability to plan and evaluate learning to achieve the desired educational goals. Teachers are not only tasked with transferring knowledge, but must also be able to design activities that can increase student understanding to the maximum, as well as ensure that the methods used are effective and efficient in optimizing the achievement of learning objectives. Evaluation conducted by teachers, both formative and summative, is an important tool to evaluate the success of learning and identify weaknesses.

As such, teacher competency not only focuses on the knowledge a teacher possesses, but also includes the ability to apply that knowledge in a broader and more practical context. A competent teacher must be able to design and implement learning effectively, manage the classroom well and develop positive relationships with students and parents. Moreover, teacher competency also includes readiness to face the challenges of digital education. In today's digital era, teachers are required to master technology as a learning tool that can improve teaching quality, provide a more interesting and interactive learning experience, and expand access to education for students. Therefore, teacher competency, which involves various aspects, must be continuously improved, both through training and lifelong learning, so that the education provided can be increasingly relevant to the times and the needs of students in the 21st century.

An educator is required to be able to adapt to the times. Educators should ideally master technology first before the students. The meeting point between teachers and students will be crippled if the two do not meet at the same point. Teachers are talking 3.0 while students are already in 4.0. Teacher's challenge is getting tougher because mastery of technology plays a role in creating the quality of educators, which in turn also affects the quality of student graduates (Sitompul, 2022). Knowledge Deepening (KD) is a key component related to teachers' IS capabilities, referring to teachers' mastery to adjust, understand, handle, and perform ICT activities, such as problem solving, critical thinking, analyzing data, applying policies and skills, and managing (Hizam et al., 2021). According to Demmanggasa et al. (2023) there are five competencies that teachers must master at this time, namely: first, educational competence (internet-based learning as a basic skill); second, the competency of technological commercialization (support for students' innovative work); third, the competency in globalization (able to solve culture-based problems); fourth, the competency in future strategies (predicting future directions); and fifth, counselor competency (the development of the times is one of the problems in students). Digital competencies according to Prayogi & Estetika (2019) include several forms, namely: information (literacy skills); communication (ability to interact through digital technology and media); educational content creation (ability to create digital learning content or media); security (ability to provide protection against the impact of learning content or media); and educational problem solving (ability to solve problems related to technology-based learning).

Digital Education

IT-based learning media is very good to be applied during learning because students will be more interested in technology-based media so that students will be very enthusiastic when learning takes place Susilo & Rohman (2019). Furthermore, digital skills are important for teachers because they play a very important and inseparable role in the learning process. Digital competency for teachers in education in the digital era is the ability to combine physical or non-physical components of technology in the system. Learning to address the

needs of human resources in order to create a learning process by applying digital technology so that it can easily access various online learning resources, the use of interactive learning applications, the use of digital media such as videos, animations, and simulations, as well as collaboration between students and teachers (Silvester et al., 2023).

Digital education refers to the process of integrating information and communication technology (ICT) in learning to improve the quality and effectiveness of education. With the rapid advancement of technology, digital education is now one of the important aspects of global education reform. Wahyudi & Jatun (2024) explain that digital education is a process that utilizes various technological devices, such as computers, the internet, and digital applications, to support and enrich the learning process. This technology provides wider and more flexible access for students to learn, both independently and in interaction with teachers and peers. The utilization of ICT in education allows students and educators to take advantage of various digital resources that can be accessed anytime and anywhere, which in turn improves the quality of learning. Demmanggasa et al. (2023) argue that digital education is not only limited to the use of technological tools, but also includes changes in teaching methods that are more dynamic and interactive. Digital education focuses on utilizing technology to create a learning experience that is more engaging, accessible and suited to students' needs. They also revealed that in digital education, it is important to consider the difference between "digital natives" (the generation that grew up with technology) and "digital immigrants" (the generation that is just adapting to technology). Digital natives are generally more adaptable to technology because they have been used to digital devices since childhood, while digital immigrants need time and training to master technology optimally. Therefore, digital education approaches need to be tailored to the characteristics of students and teachers to achieve maximum learning outcomes.

The main goal of digital education is to create inclusive and affordable learning, which can be accessed by anyone, anywhere, and anytime, through various digital platforms and tools (Siddiqi, 2024; Kulal et al., 2024). In this context, digital education is expected to bridge the education gap between urban and rural areas, and between those with greater access to technology and those with limited access. As such, digital education plays an important role in creating equal educational opportunities, regardless of learners' social or geographical backgrounds. Digital education is not only about teaching academic content, but also about teaching essential digital skills for the future, such as media literacy, digital safety and technology-based problem solving. Depita (2024) explains that digital education involves the use of hardware and software in the delivery of learning materials and interactions. This includes the use of computers, laptops, tablets, educational applications, as well as various other digital media to deliver subject matter. Digital learning allows students to learn in a more flexible way and according to their own learning style. It also supports the concept of more personalized and adaptive learning, where technology can customize materials and challenges based on each student's needs. As such, digital education allows for a more individualized approach to delivering subject matter. Overall, digital education is not just about using technology in learning, but also optimizing the potential of technology to create more effective, modern and inclusive learning experiences. Technology provides opportunities for more interactive and collaborative learning, where students can work together with their peers in different parts of the world, access richer information and develop highly relevant skills for the future world of work. With digital education, it can utilize technology to create an education system that is more responsive to the needs of the times, more adaptive to technological developments, and more inclusive for all learners.

Overall, digital education is not just about using technology in learning, but also optimizing the potential of technology to create more effective, modern and inclusive learning experiences. Technology provides opportunities for more interactive and collaborative learning, where students can work together with their peers in different parts of the world, access richer information and develop highly relevant skills for the future world of work. With digital education, it can utilize technology to create an education system that is more responsive to the needs of the times, more adaptive to technological developments, and more inclusive for all learners.

As such, this research is important to contribute to understanding how teachers' competencies can be optimized in facing challenges and taking advantage of opportunities in digital education, especially at Sekolah Dasar Negeri Kedung Badak 2 Kota Bogor. The results of this study are expected to serve as a reference for policy makers, educators and educational institutions in developing more effective strategies to implement digital education in the future.

The Role of Elementary School in Education

Elementary school is the first level of education that plays a very important role in providing the basics of knowledge, skills, and character building for children at an early age, which is around 6 to 12 years old. At this stage, children begin to learn about basic concepts that will be the foundation for their future education. Rohmah et al. (2023) explain that the main purpose of primary school education is to provide a well-rounded education, which includes not only academic knowledge, but also basic skills and moral values that will support children's development. This is very important, given the age of children who are still in the developmental stage, both cognitively and socially. The education provided at this level is expected to shape the child's personality, which in turn will determine the direction of their development at higher levels of education. Muliastrini (2020) adds that elementary schools have a strong focus on basic teaching, which includes learning about science as well as the social skills needed to interact in society. This is where children begin to acquire important skills, such as the ability to communicate, cooperate, and learn about responsibility and discipline. Primary education also aims to prepare students with the knowledge needed to understand the wider world, especially in areas such as mathematics, Indonesian language, science, social studies, and arts and culture. These will form a solid foundation for their further education.

Mubarok et al. (2021) state that elementary schools organize education for children aged 6 to 12 years with the aim of providing the basics of mastery of basic subject matter, which is the foundation for mastering more complex knowledge at the next level. Elementary school focuses not only on academic achievement, but also on the formation of independent and responsible student characters. The learning process in primary school aims to develop children's intellectual and social abilities in a balanced manner, so that they can grow into individuals who can think critically and have the ability to adapt in society. In addition, Armini (2024) revealed that elementary schools also function as a place to instill moral and ethical values to students. At this level, children are not only taught academic skills, but also about the importance of ethics, norms and manners in everyday life. The formation of these moral values is very important because it is at this age that children begin to shape their view of the world and the way they interact with others. The moral education received in primary school will greatly influence their attitudes and behavior in the future, both in social and professional life. Overall, elementary schools play a very strategic role in shaping the foundation of children's education. By providing the basics of academic knowledge, social

skills, and character and moral formation, elementary schools not only prepare students for further education but also prepare them to become independent, responsible and ethical members of society. Therefore, the quality of education in elementary schools greatly affects the quality of future human resources, which will contribute to the nation's development.

The uniqueness of this study is investigating the elementary school teacher educations' digital learning competencies which affect to learning in the classroom. The implication of this study in practical, if the teacher digital competencies are insufficient, so, there would be workshop for digital learning in primary school to make classroom become fun and foster students' motivation in learning. Thus, the aim of this study is to analyze the influence of teacher competency on the implementation of digital education at one of the public elementary schools in Bogor City.

Method

This study uses a quantitative approach to measure the level of teacher competency, identify challenges and opportunities faced in implementing digital education at Sekolah Dasar Negeri Kedung Badak 2 Kota Bogor. The quantitative approach was chosen because it allows for measurable data collection and statistical analysis to obtain objective results. The study population was all teachers at Sekolah Dasar Negeri Kedung Badak 2 Kota Bogor. The sampling technique used was purposive sampling, with the criteria of teachers who already have a minimum teaching experience of two years.

Data Collection Technique using questionnaire, testing instrument, population and sample, and data analysis. Data collection techniques used include questionnaire and documentation study. A questionnaire will be distributed to teachers to measure their competency in digital education, the challenges they face and the opportunities that exist. The questionnaire is designed using a Likert scale (1-5) to facilitate data analysis. Documentation Study include collecting secondary data such as school policies, training reports, and available technology facilities.

For testing instrument, the instrument that has been designed, before being tested, will first be conducted an instrument test, by taking a sample of several teachers in several public elementary schools in the sub-district of Tanah Sareal, Bogor City (SDN Kedung Badak 1, SDN Kedung Badak 3 and SDN kedung Badak 4 Kota Bogor), which consists of 30 statement items containing statements of teacher competence in the field of implementing digital use in learning, which includes teacher competence in digital education, challenges in digital learning, and opportunities in implementing digital education. This questionnaire consists of positive and negative statements that can be rated by respondents using a Likert scale with a range of values: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree).

The data obtained from the questionnaire will be analyzed using descriptive and inferential statistical methods descriptive statistics this method describes the level of teacher competence, challenges and opportunities faced in the form of percentages, averages and frequency distributions. Validity and reliability tests using Pearson Product Moment correlation, with the help of SPSS. Reliability Test, this test is to measure the consistency and stability of the measurement results of a research instrument. This test is carried out to ensure that the results obtained are reliable and reliable. According to Sugiyono (2020), validity is an index that shows that the measuring instrument really measures what is to be measured. Furthermore Ramadhan et al., (2024), validity shows that the measured variables truly reflect the variables to be studied. Sugiyono (2020) states that validity comes from the

word validity which means validity or truth. Validity means the extent to which the accuracy and accuracy of the measuring instrument is able to perform its measuring function. Item validity can be measured by correlating the score of each item with the total score of the questionnaire. Items that have a significant correlation with the total score are considered valid. If r count ≥ r table at a significance level of 0.05, then the item is valid (Taherdoost, 2016). High validity indicates that the questionnaire can provide accurate and relevant data for research. Invalid questionnaires can produce misleading data, so it is important to identify and remove invalid items. Where the reliability test aims to measure the internal consistency of the measurement instrument. One method commonly used to measure reliability is to calculate the Cronbach's Alpha value. This value ranges from 0 to 1, where higher values indicate a better level of consistency (Tambun et al., 2022).

The variables studied in this research are teacher competency (X) as the independent variable and education implementation (Y) as the dependent variable. Teacher competencies include professional, pedagogic, social and personality skills possessed by teachers, which are expected to influence the quality and effectiveness of education implementation in the classroom. With this methodology, the research is expected to provide a clear picture and quantitative data that can support strategic decision-making related to the implementation of digital education at Sekolah Dasar Negeri Kedung Badak 2 Kota Bogor.

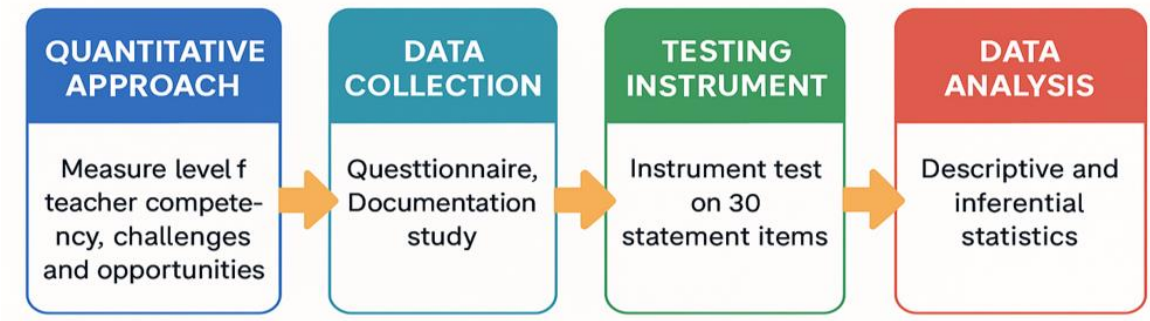

Figure 1. Research Procedure

Results and Discussion

The results of the validity instrument test on 30 statements on the questionnaire obtained 19 valid statements, while 11 statements is invalid (drop) and it could not be used in this study. Validity testing is an important step in research to ensure that the instrument used can measure exactly what is intended. In this case, of the 30 statements tested, 19 statements were declared valid, while 11 statements were invalid and removed from the questionnaire instrument. After obtaining valid items in the validity test, the reliability test is an important step in research to ensure that the instruments used, such as questionnaires, can provide consistent and stable results. After conducting the validity test and getting 19 valid statement items, a reliability test was carried out by calculating the Cronbach's Alpha value. Based on the results of the reliability test on the questionnaire results, the Cronbach's Alpha value is 0.803 for 19 valid statement items. This value indicates that the instrument has good consistency. The Cronbach's Alpha value of 0.803 indicates that the instrument has good internal consistency. Tambun et al. (2022), a Cronbach's Alpha value above 0.8 is considered very good, which means that the items in the questionnaire correlate well with each other and can be relied on to measure the variables under study. With this value, it can be concluded that the questionnaire used can be relied upon to produce consistent data.

An overview of the data is done with descriptive statistical analysis. The results of descriptive statistics can be seen in Table 1.

Table 1. Loading Factor Construct Value Validity Test

Teacher	Teacher's Competency (KC)	Education Implementation (EI)
1	0,001	0,281
2	0,008	0,000
3	0,065	0,001
4	0,153	0,456
5	0,001	0,018
6	0,121	0,104
7	0,001	0,000
8	0,043	0,001
9	0,066	0,122

Table 1 shows the factor loading value of each indicator used in this study. Based on the analysis results, all indicators contained in the table have met the factor loading values suggested by statistical guidelines and are declared valid. This shows that each indicator has a strong and significant relationship with the construct or variable being measured. As such, all indicators in this variable can be stated to have met the expected validity criteria and met the standards set in the measurement model. Therefore, these indicators are declared valid and suitable for use in further analysis. Furthermore, this study can proceed to the next stage of testing, namely structural model analysis, with the confidence that the variable measurements made are reliable and have a high level of accuracy.

Table 2. Average Variance Extracted, R Square, and Path Coefficient Value

	Average Variance Extracted (AVE)	R Square	Path Coefficient
Teacher's Competency (TC)	0.712		0.003
Education Implementation (EI)	0.561	0.615	

Table 2 shows the Average Variance Extracted (AVE) value of each indicator in the research variable, where all AVE values have exceeded the recommended provisions, which are greater than 0.5 in each indicator of the variable under study (Tambun et al., 2022). This achievement shows that the tested construct has good convergent validity, which means that the construct can explain most of the variance in its indicators. In other words, each variable in this study is able to explain a significant relationship with its associated indicators, which indicates a high level of fit between the construct and its measurement indicators. This good convergent validity is evidence that the measurement model used in this study has met the necessary standards, therefore providing a strong basis for continuing further analysis. Overall, this strengthens the reliability of the constructs in the research model, which supports the conclusion that the data obtained from the questionnaire and other measurements can be used to test the hypotheses in the next stage.

Table 2 shows the R^2 value for one variable, namely Education Implementation, with a value of 0.615. This figure indicates that Teacher Competency has a significant contribution to the Education Implementation variable, with a contribution percentage of 61.5%. That is, about 61.5% of the variability or change in Education Implementation can be explained or influenced by Teacher Competence. This shows that Teacher Competency plays an important role in improving or influencing the implementation of education policies implemented in schools. Meanwhile, the remaining 38.5% of the variability in Education Implementation is explained by other factors not included in this research model. Such factors may include external variables not examined, such as broader education policies,

infrastructure conditions or support from other parties such as parents and communities. Therefore, these results provide a clear picture of how much influence Teacher Competence has on Education Implementation and show that there are other factors that also play a role in determining the success of existing education implementation.

Table 2 shows the results of testing the direct contribution of each hypothesis in this research model. In the hypothesis testing the relationship between Teacher Competency and Education Implementation, a p-value of 0.003 was found. This p-value, which is smaller than the 0.05 threshold, indicates that the relationship between the two variables is statistically significant (Rustamana et al., 2024). Thus, the hypothesis stating that Teacher Competence contributes to Education Implementation can be accepted. This indicates that the competencies possessed by teachers positively influence how education implementation is carried out in the classroom.

These results prove that teacher competency is a very important factor in determining the quality of education implementation. Improvements in teachers' competencies, whether in pedagogical, professional or social aspects, are proven to have a significant impact on the way teachers implement teaching methods and educational policies. Therefore, efforts to improve teachers' competencies through training or professional development can be a strategic step to improve the effectiveness of education implementation in schools. In other words, the results of this study confirm that teacher competency development is one of the key elements in improving the overall quality of education. The teachers proficiency, especially in digital competencies, profoundly impacts the quality of learning in primary school classrooms by improving teaching efficacy and student involvement. Digital competences empower educators to incorporate technology into their instructional methods, cultivating an atmosphere that promotes active and innovative learning. This is especially significant about Generation Z and alpha pupils, who are intrinsically more involved with digital tools (Susilawati et al., 2024). Nonetheless, obstacles such as infrastructural constraints and disparate degrees of digital literacy among educators might influence the efficacy of digital integration in education. Educators possessing advanced digital proficiency can adeptly oversee learning processes, fostering a cohesive and stimulating classroom atmosphere. This is especially advantageous in disciplines such as science, which students frequently perceive as difficult (Marnita et al., 2023). Digital capabilities enhance the acquisition of other vital skills, including communication and content creation, which are crucial for contemporary education (Trninić, 2024).

Conclusion

Based on the results of the analysis, it can be concluded that teacher competency has a significant influence on the implementation of digital education at public elementary school in Bogor. The test results show that high competency in teachers, both in pedagogical, professional, social and personality aspects, strongly supports the successful implementation of technology-based education in the school. This indicates that teachers' ability to understand and utilize technology in the learning process plays an important role in the successful adoption of digital education. Digital education, which is becoming increasingly important in facing the challenges of the times, requires teachers who are skilled and knowledgeable in the use of technology. Competent teachers can optimize the use of digital tools to support the teaching-learning process, thus creating a more interactive and effective learning experience. Therefore, improving teachers' competencies, especially in educational technology, is a crucial step to improve the quality of education in primary schools.

However, although the effect of teacher competency on the implementation of digital education was found to be significant. This research also identified a number of challenges faced by teachers in implementing technology-based education. Limited access to adequate technological devices and lack of structured training are the main obstacles in implementing effective digital education. In addition, changes in learning patterns involving technology also require adaptation time, which is not easy for most teachers. Therefore, to ensure successful implementation of digital education, policies that support the continuous development of teacher competencies are needed. Intensive training in the use of educational technology and the provision of adequate facilities and infrastructure are needed to overcome these obstacles. Collaboration between the government, schools and training institutions is needed to ensure that every teacher has the opportunity to improve their digital skills. Overall, this study confirms that teacher competency is a key factor in the successful implementation of digital education in primary schools. To achieve better education goals in the digital era, efforts to develop teachers' competencies should be a top priority. This will not only improve the quality of learning but also provide opportunities for students to make optimal use of technology in the education process so that they can compete in a world increasingly dominated by technological advances.

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