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ANALYSIS OF DIGITAL READINESS AND TPACK OF PGSD STUDENTS IN FACING THE DIGITAL TRANSFORMATION OF BASIC EDUCATION

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Abstract

Digital transformation in basic education requires prospective teachers to possess adequate digital readiness and Technological Pedagogical Content Knowledge (TPACK) competence. This study aims to analyze the level of digital readiness and TPACK competence of students in the Primary School Teacher Education (PGSD) Program in facing the digital transformation of basic education. This study employs a descriptive quantitative approach using a survey method. Data were collected from 95 PGSD students through digital readiness and TPACK questionnaires using a five-point Likert scale. Data analysis was conducted descriptively, including mean, median, standard deviation, percentage, and categorization into low, medium, and high levels. The results show that students' digital readiness is in the high category (M = 4.04), while TPACK competence is also in the high category (M = 3.81). Dimensional analysis indicates that students have good mastery of access and basic digital skills, but the pedagogical integration of technology in learning still needs to be strengthened. These findings indicate that PGSD students are generally ready to face digital transformation; however, strengthening integrative TPACK-based learning is still highly necessary in teacher education programs.

Keywords: digital readiness; TPACK; PGSD students; digital transformation; basic education

INTRODUCTION

Research Background

Digital transformation has become one of the strategic agendas in the global education system, including at the level of basic education. The development of digital technology affects the way teachers design, implement, and evaluate learning. Learning is no longer centered on the conventional delivery of content but requires the utilization of technology to create meaningful, interactive, and contextual learning experiences in accordance with the characteristics of 21st-century learners. In the context of basic education, the role of teachers is very crucial because teachers function not only as facilitators of learning but also as guides in the appropriate use of technology according to the cognitive, social, and emotional developmental stages of students. Therefore, prospective elementary school teachers are required to have digital readiness and pedagogical competence integrated with technology. A number of recent studies indicate that the success of digital transformation in education is largely determined by teachers' readiness and competence in integrating technology pedagogically, rather than merely their technical ability to use digital devices (Scherer et al., 2021; Valtonen et al., 2022). In Indonesia, the Merdeka Curriculum policy and the strengthening of the digital education ecosystem emphasize the importance of teachers' digital competence as part of professional professionalism. Students of the Primary School Teacher Education (PGSD) Program, as prospective teachers, need to be prepared from their university years to be able to face the challenges of learning in the digital era. The digital readiness of PGSD students includes access to technology, digital skills, digital literacy, and adaptive attitudes toward technological change. Meanwhile, Technological Pedagogical Content Knowledge (TPACK) competence serves as a conceptual framework that emphasizes the importance of integrating technological, pedagogical, and content knowledge holistically in learning (Koehler et al., 2021).

Research Problems

Although PGSD students generally come from a generation that is close to digital technology, various studies show that familiarity with technology does not always correspond to the ability to integrate it pedagogically in learning. Prospective teachers are often able to use technology technically but experience difficulties in designing learning that combines technology with pedagogical strategies and the characteristics of teaching materials (Koh et al., 2023). This condition has the potential to hinder the implementation of effective digital learning in elementary schools. In addition, institutional and geographical contexts also influence the digital readiness of prospective teachers. PGSD students at Universitas Khairun, which is located in an archipelagic region with diverse characteristics of technological access, face both challenges and opportunities in developing digital competence. Therefore, empirical studies are needed to map the digital readiness and TPACK competence of PGSD students as a basis for strengthening teacher education programs.

State of the Art of the Research

Recent studies (2021–2025) emphasize that digital readiness and TPACK competence are two important and interrelated constructs in the context of teacher education. Scherer et al. (2021) found that the digital readiness of prospective teachers significantly affects their confidence and intention to use technology in learning. Valtonen et al. (2022) emphasized that the development of TPACK does not occur automatically but requires structured, reflective, and practice-based learning experiences. Other studies show that education students tend to have better levels of Technological Knowledge (TK) compared to integrative abilities in Technological Pedagogical Knowledge (TPK) and TPACK (Koh et al., 2023). These findings indicate that the main challenge in teacher education lies not in technological mastery alone, but in the ability to integrate technology with pedagogy and learning content contextually, especially at the level of basic education.

Research Gap and Objectives

Based on the literature review, there are still limited studies that analyze the digital readiness and TPACK competence of PGSD students in an integrated manner and describe them based on achievement categories. In addition, studies that highlight the context of Teacher Education Institutions (LPTK) in archipelagic regions are still relatively scarce. This gap indicates the need for research that provides an empirical picture of the digital readiness and TPACK competence of PGSD students in facing the digital transformation of basic education. Therefore, this study aims to analyze the level of digital readiness and TPACK competence of students of the Primary School Teacher Education (PGSD) Program at Universitas Khairun as prospective elementary school teachers in facing the digital transformation of basic education.

METHOD

Type and Research Design

This study employed a quantitative approach with a descriptive design. The quantitative approach was chosen because it allows researchers to obtain an objective picture of students' digital readiness and Technological Pedagogical Content Knowledge (TPACK) competence based on measurable numerical data (Creswell & Creswell, 2018). The descriptive design was used to map the actual condition of the research subjects without any specific treatment, so that the results reflect the real state of prospective elementary school teachers' readiness in facing the digital transformation of education (Sugiyono, 2022).

Research Subjects and Context

The research subjects were 95 students of the Primary School Teacher Education (PGSD) Program at Universitas Khairun. The selection of subjects was based on the consideration that PGSD students are prospective elementary school teachers who are being prepared to implement technology-based learning in schools. Universitas Khairun, as a Teacher Education Institution (LPTK) located in an archipelagic region, has diverse geographical and infrastructural characteristics, making it relevant to examine the digital readiness and TPACK competence of prospective teachers in the context of digital transformation in education.

Research Instruments

The research instruments consisted of a digital readiness questionnaire and a TPACK competence questionnaire, which were developed based on theoretical studies and recent research. The concept of digital readiness refers to an individual's ability to access, use, and have positive attitudes toward digital technology

(Scherer et al., 2021). Meanwhile, the TPACK framework refers to the integration of technological, pedagogical, and content knowledge as proposed by Mishra and Koehler and further developed in recent teacher education studies (Koehler et al., 2021; Valtonen et al., 2022). The digital readiness questionnaire covered aspects of access to technology, basic digital skills, digital literacy, and attitudes toward the use of technology in learning. The TPACK questionnaire included the dimensions of Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK). All items were constructed using a five-point Likert scale, ranging from strongly disagree to strongly agree, which is commonly used in educational research to measure respondents' perceptions and attitudes (Boone & Boone, 2012).

Data Collection Techniques

Data were collected through the distribution of online questionnaires to PGSD students at Universitas Khairun. The online method was chosen to match the characteristics of the research subjects who are accustomed to using digital technology, as well as to increase the efficiency and accuracy of data collection. Prior to filling out the questionnaire, respondents were given an explanation of the research objectives and assurance of data confidentiality.

Data Analysis Techniques

The collected data were analyzed using Microsoft Excel and Python to generate descriptive statistics. Descriptive analysis included the calculation of total scores, mean scores, median, standard deviation, and the percentage of achievement for digital readiness and TPACK competence. The descriptive statistical approach was used to provide a systematic and informative overview of the characteristics of the research data (Fraenkel et al., 2019). Furthermore, the measurement scores were categorized into three levels: low (1.00–2.33), medium (2.34–3.66), and high (3.67–5.00). This categorization was used to facilitate the interpretation of respondents' achievement levels and has been widely applied in educational research using Likert scales (Boone & Boone, 2012; Khairani, 2016). The results of the analysis are presented in the form of tables and descriptive narratives to make them easy for readers to understand and examine.

RESULTS AND DISCUSSION

Descriptive Statistics of Digital Readiness and TPACK Competence

The results of the descriptive analysis of digital readiness and TPACK competence of PGSD students at Universitas Khairun are presented in Table 1.

Table 1. Descriptive Statistics of Digital Readiness and TPACK Competence of PGSD Students

Variable	Mean	Standard Deviation	Median
Digital Readiness	4,04	1,18	4
TPACK Competence	3,81	1,16	4

The data in Table 1 show that the mean scores of students' digital readiness and TPACK competence are in the high category. Nevertheless, the mean score of TPACK competence is lower than that of digital readiness, indicating challenges in the aspect of integrating technology into learning.

Students' Digital Readiness Level

The distribution of digital readiness levels of PGSD students at Universitas Khairun is presented in Table 2.

Table 2. Distribution of Digital Readiness Levels of PGSD Students

Interval	Frequency	Percentage (%)	Qualification
1,00 – 2,33	5	5,3	Low
2,34 – 3,66	22	23,2	Moderate
3,67 – 5,00	68	71,6	High
Total	**95**	**100**	

Based on Table 2, the majority of students are in the high digital readiness category. This indicates that most students already have adequate access, skills, and positive attitudes toward the use of digital technology in learning.

Students' TPACK Competence Level

The distribution of TPACK competence levels of PGSD students at Universitas Khairun is presented in Table 3.

Table 3. Distribution of TPACK Competence Levels of PGSD Students

Interval	Frequency	Percentage (%)	Qualification
1,00 – 2,33	7	7,4	Low
2,34 – 3,66	32	33,7	Moderate
3,67 – 5,00	56	58,9	High
Total	95	100	

The data in Table 3 show that more than half of the students are in the high category of TPACK competence. However, the proportion of students in the moderate and low categories indicates the need to strengthen the ability to integrate technology, pedagogy, and learning content.

Combined Digital Readiness and TPACK Competence

The results of the combined analysis of students' digital readiness and TPACK competence are presented in Figure 1.

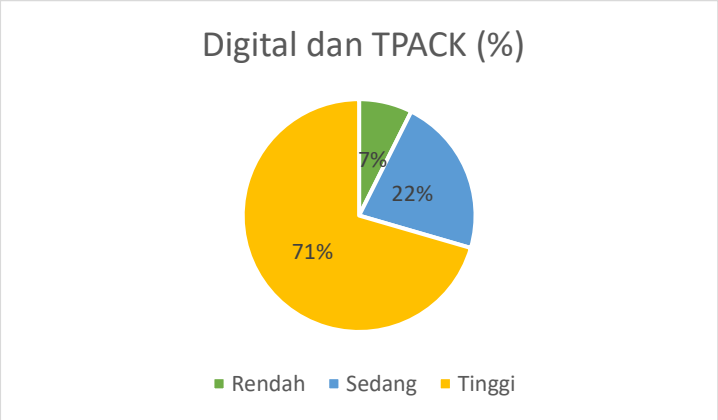

Figure 1. Combined Distribution of Digital Readiness and TPACK Competence of PGSD Students

Overall, the data in Figure 1 show that the majority of PGSD students at Universitas Khairun are in the high category for both digital readiness and TPACK competence, indicating that they have strong initial capital to face the digital transformation of basic education.

Discussion

The results of this study show that the digital readiness of PGSD students at Universitas Khairun is in the high category. This finding indicates that students already have adequate access to digital technology as well as basic skills in operating learning devices and applications. This condition is in line with the characteristics of prospective teachers from the digital generation who are relatively adaptive to technological developments (Scherer et al., 2021). However, high digital readiness does not automatically guarantee the ability to integrate technology effectively in learning. In terms of TPACK competence, PGSD students are also in the high category, although the mean score of TPACK is lower than that of digital readiness. This finding reinforces previous studies stating that technical mastery of technology (Technological Knowledge) tends to be more developed than integrative abilities in Technological Pedagogical Knowledge (TPK) and TPACK (Valtonen et al., 2022; Koh et al., 2023). This means that students are relatively capable of using technology, but still face challenges in linking technology with pedagogical strategies and the characteristics of elementary school learning content. The proportion of students who are in the moderate and low categories, both in digital readiness and TPACK competence, indicates the existence of competency gaps among students. In the context of an archipelagic teacher education institution such as Universitas Khairun, this condition may be influenced by variations in technology-based learning experiences, differences in access to infrastructure, and the intensity of technology use in lectures. This finding strengthens the view that the development of TPACK competence requires systematically and continuously designed learning experiences, rather than merely general exposure to technology (Koehler et al., 2021).

The implications of these findings indicate that teacher education programs, particularly PGSD, need to strengthen learning that is oriented toward TPACK integration. Strategies that can be applied include the development of digital-based project-based learning, technology-assisted microteaching, and reflection on technology-supported teaching practices. This approach is in line with recommendations from recent studies that emphasize the importance of contextual and reflective learning in developing prospective teachers' TPACK competence (Valtonen et al., 2022; Scherer et al., 2021). Overall, the digital readiness and TPACK competence of PGSD students at Universitas Khairun are important assets in supporting the digital transformation of basic education. However, without strengthening the pedagogical integration of technology, such readiness may not be optimally realized in elementary school teaching practices. Therefore, the results of this study provide an empirical basis for the development of policies and curriculum designs in teacher education that are more responsive to the demands of digital transformation.

CONCLUSION

This study aims to analyze the digital readiness and Technological Pedagogical Content Knowledge (TPACK) competence of students in the Primary School Teacher Education (PGSD) Program at Universitas Khairun in facing the digital transformation of basic education. The results show that, in general, PGSD students are in the high category for both digital readiness and TPACK competence. These findings indicate that students already possess adequate initial capital to adapt to the demands of technology-based learning in elementary schools. Nevertheless, the analysis also reveals a gap between digital readiness and TPACK competence. Students' digital readiness tends to be higher than their integrative TPACK ability. This suggests that technical mastery of technology has not been fully accompanied by the ability to integrate technology with pedagogical strategies and the characteristics of elementary school learning content. Thus, high digital readiness does not automatically guarantee technology-based pedagogical readiness.

Policy and Practice Implications for PGSD Education

Based on the research findings, there are several important implications for the development of policies and educational practices in the PGSD program. First, the teacher education curriculum needs to be directed more explicitly toward strengthening TPACK integration, not merely focusing on instrumental mastery of technology. Technology integration should be consistently embedded in educational courses, subject-matter courses, and practicum courses. Second, the PGSD program needs to expand students' learning experiences through project-based learning, technology-assisted microteaching, and reflective assignments that emphasize the integration of technology, pedagogy, and content. This approach is believed to encourage students not only to use technology but also to understand the pedagogical rationale and contextual considerations for its use in elementary school learning. Third, at the institutional level, the results of this study can serve as a basis for faculty and program leaders in formulating policies to strengthen lecturers' capacity, particularly in relation to TPACK-based learning design. Continuous professional development for lecturers is essential so that digital transformation does not stop at the level of infrastructure but continues into meaningful teaching and learning practices. Overall, this study provides an empirical contribution to the development of elementary teacher education in the era of digital transformation. The findings are expected to serve as a reference for policy formulation and learning innovation in teacher education institutions (LPTK), especially in PGSD programs, to produce prospective teachers who are adaptive, reflective, and competent in utilizing technology for high-quality learning.

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