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Teacher Digital Literacy Based on the Pillars of Skill, Ethics, Safety, and Culture

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Abstract. Digital transformation in education demands that teachers possess adequate digital literacy competencies to enable them to fulfill their roles as facilitators, educators, and agents of change. This activity aims to map the digital literacy levels of teachers within the Surakarta Christian Education Association (PPKS) based on the four pillars of digital literacy established by the Ministry of Communication and Information Technology (Kominfo): Digital Skills, Digital Ethics, Digital Security, and Digital Culture. The method used was a quantitative survey with a Likert-based questionnaire distributed online to 171 teachers from kindergarten to vocational high school levels. The data obtained were analyzed based on age, educational level, and school of origin. The survey results showed that the average digital literacy score for PPKS teachers was 3.467 (on a scale of 5), slightly below the 2022 national average of 3.54. The pillar with the highest score was Digital Culture (3.949), while the lowest score was Digital Ethics (2.72). It was found that teachers under 30 years of age and high school level had the highest digital literacy levels. Based on these findings, recommendations were developed for digital literacy training focused on increasing awareness of digital ethics and security, as well as adapting to artificial intelligence-based technology. This activity is expected to form the basis for developing contextual and sustainable training programs to improve the quality of learning in the digital era.

Keywords: Digital Culture, Digital Ethics, Teachers, Digital Literacy

1. INTRODUCTION

The development of information and communication technology has completely transformed the educational paradigm. In today's digital era, teachers no longer function solely as sources of knowledge, but rather as facilitators, guides, and agents of change in technology-based learning processes. This transformation requires teachers to master and effectively apply digital literacy in teaching and learning activities.

One of the main roles of teachers in the digital era is as a facilitator of technology-based learning [1] . Teachers are required to be able to utilize digital technology to support the learning process, starting from the use of Learning Management Systems (LMS) and the integration of artificial intelligence such as ChatGPT in information searches. This ability is in line with the concept of Technological Pedagogical Content Knowledge (TPACK) proposed by [2], namely the combination of mastery of content, pedagogy, and technology as the basic framework for 21st-century teacher competencies [3].

In addition, teachers also play a role in developing students' digital literacy. Digital literacy includes the ability to think critically about online information, maintain ethical communication in digital spaces, and maintain the security of personal data. UNESCO [4], through the ICT Competency Framework for Teachers (ICT-CFT), emphasizes that teachers must have the ability to use ICT. ICT pedagogical skills are needed to build 21st-century competencies in students, such as communication, collaboration, creativity, and critical thinking [5].

On the other hand, teachers must also be role models in implementing digital ethics and security. Behaviors such as not spreading hoaxes, respecting copyright, and maintaining online privacy must be standardized in digital education activities. Within the DigCompEdu framework, teachers must have competency in digital safety aspects, which include protecting devices, personal data, and students' digital well-being [6].

Furthermore, teachers act as change agents in educational institutions. They are leaders of change who can drive learning innovation and improve the quality of education, especially in facing the challenges of global digitalization [7]. This is crucial considering

that rapid technological change must be responded to with systematic and sustainable teacher capacity building.

Teacher preparedness for the digital era not only impacts learning effectiveness but is also a determining factor in students' success in an increasingly digitalized global ecosystem. Therefore, mapping teachers' digital skills is a strategic step in designing effective training interventions based on real needs.

The Surakarta Christian Education Association (PPKS) is an institution that oversees various levels of education, from kindergarten (TK) to vocational high school (SMK) in the city of Surakarta. As an educational institution with a vision to produce a generation that excels in faith, knowledge, and integrity, PPKS views the readiness of human resources, especially teachers, as crucial for facing the challenges of the digital era.

Teachers in the PPKS environment come from a wide variety of backgrounds, ages, experiences, and teaching levels. A 2023 digital literacy survey involving 171 teacher respondents found that the majority of teachers come from elementary, middle, high, and vocational high schools, with ages ranging from <30 to >50. This variation influences their differing abilities and adaptation to digital technology. This analysis is also crucial for initiating ICT training programs.

In the 2020–2024 Digital Literacy Road Map, digital literacy is defined as "an individual's ability to use digital media wisely, intelligently, and responsibly to obtain information and communicate." Kominfo has established four main pillars of digital literacy, namely: Digital Skills [8],9], Digital Ethics [10], Digital Safety [6] , Digital Culture [11].

These four pillars are designed to build comprehensive digital awareness and skills, from technical mastery, ethical responsibility, personal data protection, to instilling national values in the digital space. In the educational context, teachers are key actors who must master these four pillars, as they not only play a role in transferring knowledge but also serve as digital role models for students amidst the rise of disinformation, cyberbullying, and online ethical violations.

By strengthening digital literacy based on this framework, it is hoped that teachers will develop comprehensive competency in using technology to support relevant, safe, and responsible learning. This roadmap also emphasizes the importance of a mapping-based approach and local needs to ensure the contextual and sustainable implementation of digital literacy programs.

This demonstrates the urgent need to assess educators' digital readiness and identify areas that still require strengthening. Therefore, the research questions for this activity can be outlined as follows: (1) What is the digital capability profile of teachers based on age, educational level, and school of origin?. (2) What are the recommendations for appropriate digital training programs based on the results of teacher capability mapping?. This digital literacy survey was conducted to measure the digital skills of teachers within the Surakarta Christian Education Association (PPKS). The main objective of this survey was to map the level of digital literacy based on the four main pillars established by the Ministry of Communication and Information Technology (Kominfo) in the 2020–2024 Indonesian Digital Literacy Roadmap: Digital Skills, Digital Ethics, Digital Safety, and Digital Culture. These four pillars reflect an individual's ability to use digital technology intelligently, ethically, safely, and based on national values in everyday life.

2. METHODS

The dataset was obtained from a 2023 digital literacy survey conducted by the Surakarta Christian Education Association (PPKS). Data were collected through an online questionnaire designed based on the four pillars of digital literacy as outlined in the 2020–2024 Indonesian Digital Literacy Roadmap by the Ministry of Communication and Information Technology.

The methods used in this activity consist of:

1) Objective Formulation Measuring the digital literacy level of PPKS teachers and identifying aspects that need to be improved.
2) Instrument Development: Developing a questionnaire based on the four pillars of digital literacy from Kominfo (Digital Skill, Ethics, Safety, Culture) using a Likert scale of 1–5.
3) Respondent Determination: The survey involved 171 teachers from kindergarten to vocational school levels under the auspices of PPKS Surakarta.

4) Data Collection: The questionnaire was distributed online, with the completion covering digital habits and time of use of data collection technology through a questionnaire-based survey referring to the National Digital Literacy Framework [12].
5) Processing and Analysis: Data is calculated quantitatively to obtain an index per pillar and displayed based on age, level, and school.
6) Interpretation and Recommendations: The survey results were used to determine training priorities, with a focus on digital ethics and security, which scored low.

3. RESULTS AND DISCUSSION

3.1. Number and Characteristics of Respondents

The survey involved 171 teachers from kindergarten to vocational high school levels under the auspices of the PPKS (Community Service for Teachers). Respondents ranged in age from under 30 to over 50. Data was collected online using a digital form and included additional information such as daily internet usage intensity, types of applications used, and digital habits related to learning. The survey data was then processed quantitatively to calculate an average digital literacy score for each pillar and analyzed based on age, education level, and school of origin.

The survey instrument was developed as a questionnaire based on a 1-5 Likert scale, measuring the frequency and intensity of teachers' use of digital devices, as well as the extent to which they apply ethical principles, security, and cultural values when working in the digital world. Questions were structured based on operational indicators for each pillar. For example, in the Digital Skills aspect, respondents were asked to assess their ability to use software such as Office and other applications like Google Classroom, Canva, or ChatGPT for learning purposes.

3.2. Survey Respondent Demographics

A digital literacy survey conducted within the Surakarta Christian Education Association (PPKS) involved a total of 171 teachers from various educational levels. Based on teaching level data, the majority of respondents came from elementary schools (59), followed by junior high schools (26), senior high schools (24), and kindergartens (3). This composition

indicates that the level of participation of elementary school teachers is quite dominant in the survey activities, which provides a strong picture of digital literacy at the elementary school level.

In terms of age, respondents were fairly evenly distributed, but showed a tendency toward seniority. A total of 42 teachers were recorded as under 30, 26 between the ages of 30 and 40, 42 between the ages of 40 and 50, and 61 over 50. This data indicates that the over-50 age group constituted the largest population in this survey. This age diversity is an important factor in the analysis, as the survey results found that age significantly influences digital literacy levels, with younger teachers tending to have higher digital literacy scores than more senior teachers.

3.3. Survey Results

1) Digital Skill

This pillar had the highest score at SMA Kristen 1, followed by SD Kristen Banjarsari and SMP Kristen 1. All schools showed scores above 3.8, indicating that teachers are quite proficient in using digital devices and applications for learning.

2) Digital Ethics

The lowest scores were generally seen in this pillar, particularly at SMP Kristen 1 and SMK Kristen 1, which scored below 2.5. Only SD Kristen Banjarsari scored above 3.0, indicating that digital ethics, such as social media etiquette and maintaining privacy, remain significant challenges.

3) Digital Safety

All schools scored between 3.2 and 3.4, with SMK Kristen 1 and SMA Kristen 1 achieving the highest scores. This indicates that students' understanding of account security, privacy management, and digital threats is relatively good but still has room for improvement.

4) Digital Culture

This pillar consistently achieved the highest scores across all schools, particularly Christian High School 1, which scored nearly 4.2. This reflects the understanding of

national values, cultural diversity, and social awareness in the digital space that has become part of digital learning within the PPKS environment.

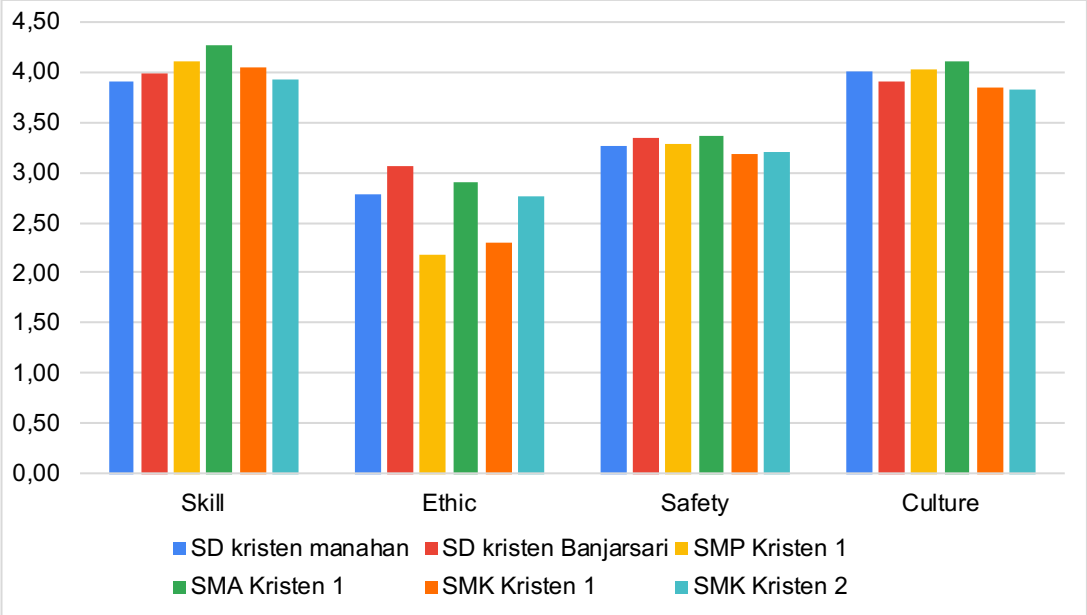

Figure 1. Digital Literacy Pillars per School

The analysis results presented in Figure 1. show that the overall digital literacy score was 3.467 on a scale of 5, slightly lower than the 2022 national average of 3.54. The pillar with the highest score was Digital Culture (3.949), while the lowest score was Digital Ethics (2.72). Furthermore, it was found that teachers over 50 years of age had the lowest digital literacy scores, while teachers under 30 years of age demonstrated the highest levels. These findings provide an important basis for developing training strategies tailored to the needs of each group of teachers, based on their level, age, and school conditions. Based on the results of the survey and analysis of the level of digital literacy skills of PPKS Surakarta teachers based on the four pillars of digital literacy, the following results were obtained:

a) Digital Skills

This pillar reflects teachers' ability to use hardware, software, learning applications, and the internet to support teaching and learning activities. Most teachers demonstrated strong competency in using Microsoft Office and other applications such as Canva, Google Forms, and YouTube. They also accessed and evaluated online information. They also used digital communication platforms such as Zoom and WhatsApp for learning. However, the use of new technologies

such as AI (ChatGPT) remains limited among younger teachers. This means that while basic technical competency is well established, there is a need to encourage the use of more advanced technologies based on artificial intelligence.

b) Digital Ethics

This pillar received the lowest score in the survey. Teachers still face challenges in maintaining digital media ethics, including awareness of others' digital privacy (e.g., not uploading photos of children without permission), practicing good social media netiquette, and avoiding the dissemination of sensitive information or negative comments in online public spaces. This highlights the need for specific training interventions to build awareness and ethical responsibility in educators' use of digital technology.

c) Digital Safety

In terms of digital security, teachers demonstrated a fairly good level of awareness regarding antivirus use and device protection, secure password management, social media privacy settings, and the ability to distinguish malicious emails. However, personal data protection practices and the safe use of technology are still not consistently implemented by all respondents, especially those aged over 50. This suggests that basic technical training on digital security remains highly relevant.

d) Digital Culture

This pillar reflects how teachers apply the values of nationalism, tolerance, and diversity in the digital environment. The highest average score in this pillar indicates that the majority of teachers demonstrate an awareness of communicating while considering the religious backgrounds, ethnicities, and political views of others. Teachers actively share and appreciate local cultural content digitally. This demonstrates that the values of Pancasila and Bhinneka Tunggal Ika (Unity in Diversity) have been sufficiently ingrained in teachers' digital attitudes and have become a driving force in digital literacy within the PPKS environment.

4. CONCLUSION

Based on the results of the digital literacy survey, it can be concluded that teachers' digital skill profiles show significant variations based on age, educational level, and school

of origin. Teachers under 30 years of age demonstrated the highest level of digital literacy, with an average score of 3.75, while teachers over 50 years of age demonstrated the lowest score, at 2.91. In terms of educational level, high school teachers had the highest digital literacy score (3.66), followed by elementary school teachers (3.57), while junior high and vocational high school teachers had lower scores (3.39). Based on school of origin, SMA Kristen 1 demonstrated the highest achievement in almost all pillars, especially digital skills and digital culture, while other schools showed varying strengths and weaknesses.

The results of mapping teachers' digital capabilities using a digital literacy pillar analysis approach indicate that digital ethics and digital security are the areas most in need of improvement. Therefore, the recommended training program focuses on strengthening digital ethics, personal data protection, and cybersecurity practices in learning. Furthermore, training should include developing skills in using AI-based technologies such as ChatGPT, especially for more senior teachers. The training approach should be tailored to the profile of each teacher cluster to be more contextual and have optimal impact.

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