Promoting Digital Citizenship among Student-Teachers: The Role of Project-Based Learning in Improving Appropriate Online Behaviors

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Due to the widespread use of the Internet, digital space has now pervaded schools. This study aimed to investigate student-teachers' perspectives and experiences of digital citizenship through project-based learning in a teacher institution in Indonesia. A case study research design was employed using content analysis to analyze the data from semi-structured interviews, observation, and daily journal report. The results showed that technology overuse requires moral guidance in terms of digital citizenship. The student-teachers viewed that digital citizenship provides some principles that encompass knowledge, skills, and appropriate behavior to use technology safely and responsibly. They asserted that digital citizenship is a necessary skill for prospective teachers, particularly considering the growing demand for schools to develop character education programs that address the topic of student technology use. After engaging in digital-issue-driven project-based learning, the student-teachers opined that project-based learning will be beneficial to

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learners' autonomy engagement in constructing an understanding of the digital world. Project-based learning also provides opportunities for learners to advance and grow digital skills that are relevant to the 21st century within a real-world context. This study has implications for educators, school principals, and policymakers in ensuring that youths access curricula at all grade levels for them to be able to show appropriate and responsible behavior in both online and offline environments.

Introduction

The Internet revolutionized the educational system as a whole, particularly in twenty-first-century education. It is widely accepted that the Internet facilitates education across geographic and temporal boundaries (Harsasi, 2015; Kuntoro & Al-Hawamdeh, 2003). As a result, the learning culture has shifted away from face-to-face instruction toward online teaching. Within the digital-mediated world, students can enroll in an online anywhere, everywhere. All academics and administration in school have been transformed by automation, and teachers strive to form partnerships with parents to support student learning (Pannen, 2014; Sekarasih, 2016).

Nevertheless, digital technology is constantly a double-edged sword (Hidayat & Listiawati, 2018). It will provide benefits and risks for the users. Notably, it is critical to recognize that teachers' role in anticipating opportunities and challenges associated with technology use in school. Teachers play a vital role in ensuring students possess the skills and attitudes in using technology responsibly. In order to address social issues associated with technology use, teachers' proficiency with technology must be accompanied by a prompt of digital citizenship. Digital citizenship itself is a useful framework widely accepted as a foundation for acting responsibly when interacting with technology. According to Ribble and Bailey (2006), student-teachers must develop a strong sense of digital citizenship to prepare and educate students to use technology effectively.

Due to widespread Internet and teen-dominated digital citizens, Indonesia has faced a number of challenges associated with the use of technology in educational settings, including cybercrime, widespread pornographic distribution, plagiarism, and cyberbullying (Adiningrum, 2015; Paterson, 2019; Sulistyo & Manap, 2018). Teachers are expected to address appropriate digital media behaviors for students in relation to manage to social media challenges. Nonetheless, most Indonesian teachers are less prepared to promote digital citizenship (Prasetiyo et al. 2021). When students engage in cyberbullying and access pornographic websites, for example, school principals and teachers prefer to restrict Internet access and mobile phone use in order to address digital threats without jeopardizing student rights (Ruiz, 2019).

Currently, there are no significant policies in Indonesia to assist teachers and students in resolving misuse and abuse of technology and preparedness for digital citizenship education. Digital citizenship is a requirement that all teachers must embrace to prepare students to use technology responsibly and safely.

The purpose of this study was to determine the role of Project-Based Learning (PBL) in enhancing digital citizenship among student-teachers, more precisely to accomplish the following goals:
- To analyze student-teachers' comprehension and digital citizenship experience

- To evaluate the use of project-based learning to improve digital citizenship among student-teachers.

Literature Review

Digital citizenship in brief

In general, the development of digital citizenship for teachers is the main concern of scholars, especially in relation to their role in facing the digital generation (Ata & Yildirim, 2019; Karaduman, 2017). As digital citizens, Curran (2012) emphasized, teachers should be committed to resolving issues in the online community, ranging from local to global levels, and providing them with digital competencies will enable them to participate in civil discourses. Teacher education should plan to offer a course that helps students develop their digital citizenship competencies (Choi, Cristol, & Gimbert, 2018).

Digital citizenship is a multifaceted and complicated concept (Choi, 2016). It requires educators to hold initiatives to develop citizenship competencies that include values, attitudes, knowledge, skills, and critical thinking (Richardson & Milovidov, 2019). Ribble's nine elements of digital citizenship have been widely accepted as a well-established framework for articulating the characteristics of citizenship behavior (Alazemi, Sa'di, & Al-Jamal, 2019). According to Xu, Yang, MacLeod, and Zhu (2019), Ribble "has established a widely recognized framework for addressing the global challenges associated with inappropriate digital behavior". Ribble's (2011) study is regarded as the most significant, all-encompassing, and multifaceted concept for promoting appropriate behavior in digital environments (Abulibdeh 2019; Al-Zahrani 2015).

Digital citizenship is not just about obeying laws, it also involves developing necessary competencies to demonstrate participation in both online and offline communities. Student-teachers should be able to construct possible solutions based on their knowledge of problem-solving and how to be personally accountable when utilizing technology. It will require involving student-teachers in developing skill-based lessons on digital issues. Thus, teacher institutions are expected to be morally anchored to "lead with empathy and respect, create solutions and solve problems, and value the participatory nature of digital citizenship" (Curran & Ribble, 2017).

Alqahtani (2017) stressed that digital citizenship is inextricably linked to contemporary issues, necessitating the preparation of student-teachers to respond wisely. It is intrinsically tied to the relationship between technological competence and characteristics of citizenship. While digital technology impacts a variety of dispositions, student-teachers should act as role models for citizenship (Kansu and Öksüz 2019). In this context, teacher institutions should offer a citizenship education program to help students develop their digital citizenship skills (Choi, Cristol, & Gimbert, 2018). It has been suggested that to develop digital citizenship, it is essential to provide appropriate instructions on becoming a good digital citizen. Öztürk (2021) conclude that empirical studies and teaching digital citizenship will require attention, related courses and activities should be planned, and this study will also contribute to enriching the discourse of digital citizenship.

Digital citizenship in teacher education: Indonesia and overseas context

Certain countries have begun to recognize the importance of digital citizenship in teacher education curricula. In the U. S., one teacher education faculty used the International Society for Technology in Education (ISTE) standards for student-teachers to promote digital citizenship in future classrooms (Lindsey 2015). However, research conducted in the United States of America and Turkey indicated either non-specific, insufficient, or superficial themes regarding digital citizenship issues for student-teachers (Karaduman 2017). In a Norwegian context, although some problems related to technology are addressed in curriculum documents, the development of teacher competencies related to technology use does not receive sufficient attention (Instefjord and Munthe 2016). In addition, there is no information available in Asia that clearly describes the efforts of teacher education institutions to promote digital citizenship, rather, several studies have discovered that student teachers have a low level of digital citizenship (Choi et al., 2018; Xu et al., 2019a).

There is a dearth of literature describing how policies in teacher education reform in Indonesia respond to the technological era. Prior studies focus on examining pedagogical competence in 21st-century learning, such as prospective teachers' belief, digital media proficiency, and e-learning delivery (Laksani, Fauziati, and Wijayanto 2020; Pramita et al. 2022; Resbiantoro 2017). In the teacher education curriculum, none of the four professional teacher competencies explicitly mentions the development of digital citizenship (Jalal et al. 2009). Teacher institutions emphasize developing technology-based learning that is just offered in later semesters with two credit hours, to be precise through computer and learning media courses (Merdekawati 2018). That obviously is insufficient to develop student-teachers' awareness and comprehension of the digital world. As a result, their ability to operate ICT in the workplace may be limited due to a lack of IT support, limited access, and a lack of training (Mahdum, Hadriana, and Safriyanti 2019). Besides technical skills, teachers must nurture the abilities to use technology to solve issues of inappropriate use of technology, including by instilling digital citizenship in their students. Instructional technology course in the teacher institution can be suggested to incorporate with multimedia and digital citizenship curriculum to enhance student competencies in digital citizenship.

Project-based learning for digital citizenship development

Project-based learning (PBL) is an instructional strategy expected to foster digital citizenship competencies in student-teachers. According to literature, project-based learning has been used to bolster character education in schools (Sulistyarini, Utami, and Hasmika 2019; Trisiana 2015), most notably for student citizenship education teachers (Komalasari 2012; Trisiana 2019). For instance, most educators use the citizen project developed by the Center for Civic Education (CCE) to help students develop their citizenship competence (Bentahar and O'Brien 2019; Center for Civic Education 2012). According to previous research in citizenship education, project-based learning is an effective pedagogical tool for mastery of learning materials, civic participation, self-creation, and critical thinking (Blevins et al. 2016; Mardiati and Leba 2018; Marzuki and Basariah 2017). With the goal of empowering students to construct their own understanding of the digital world, project-based learning enables learners to develop and practice their digital skills through learning activities (Loizzo et al. 2016). Through the creation of products that address real-world issues, project-based learning has enabled the development of 21st-century skills, including the concept of digital citizenship (Pongkitwitoon 2017).

It is believed that PBL promote digital citizenship competencies among teachers and students. Through a project-based approach, student-teachers are motivated to seek out and validate information, thereby developing into informed and active citizens. The development of digital skills occurs due to project-based learning's ability to foster the construction of new knowledge, the development of communication skills through peer interaction, and participation in active learning (Muñoz-Repiso, Gómez-Pablos, and Nieto 2016). According to Frau-Meigs et al., (2017), learning practices have shifted toward incorporating project-based and meaningful learning through digital tools, which has a positive effect on digital citizenship education. As a result, Curran and Ribble (2017) advocated the application of project-based learning to foster digital citizenship as it enables active digital citizens, allowing this strategy to be considered a digital leadership model. Miguel-Revilla et al. (2020) conducted a DigComEdu project for 50 student-teachers in Spanish so that they learn digital citizenship for teaching. Sailin and Mahmor (2018) reached the conclusion that student-teachers increased their digital pedagogy after they were engaged in web 2.0 project-based activities. It was revealed that digital citizenship behaviors in PBL escalated and that their motivation and perception regarding learning increased.

Method

Research design

The research was conducted qualitatively to gain multiple realities or interpretations that can be applied to construct "knowledge" (Merriam and Tisdell 2016). A case study research design was employed in this research (Yin 2018). A case study provides an extensive and in-depth explanation of some social issues. Accordingly, this study employed multiple data collection techniques, namely interviews, observation, and documentation, to obtain an in-depth understanding that described insights and feelings as reality was perceived by the participants.

This study focused on the central phenomenon of digital citizenship in student-teachers: the use of PBL to raise their digital citizenship. The issue was widespread and complex, being related to several aspects and contexts in education, and it involved some practical considerations. Following the holistic single-case design by Yin (2018), the case on which this research was focused was investigated as a holistic part of multiple teacher education projects. Data collection was performed by gathering useful and essential information from multi-level sub-sections. According to Grünbaum's (2007) notion, both case and unit of analysis were identical terminology. The level of abstraction was scaled up from the micro level to the macro level to improve the probability of authenticity and transferability of results. It was also essential to gain an understanding of how units of analysis could be understood and how unknown information could be converted into a new insight.

Participants

Twenty student-teachers from the Faculty of Teacher Training and Education of Universitas Muhammadiyah Surakarta were recruited as sample units using a purposive sampling technique. Sampling strategies used in this study is a criterion sampling whereby the selection of cases that meet a predetermined specific criterion that is crucial for the research. Sample selected are who able to provide rich information relevant to the research project. In particular to this study and following the criterion sampling, a whole of 73 potential

participants were involved in online survey and were then selected based on criteria. The criteria for this study are as follows:

Table 1. Participant's selection criteria

Entry eligibility requirements	
i.	Student-teachers Education Institution in Indonesia
ii.	Who enrolled in the Department of citizenship Education at Universitas Muhammadiyah Surakarta (UMS)
iii.	Who learning media course offered by the program that subjected to the four elements of digital citizenship by Ribble (2015)
iv.	Who also enrolled into a computer and internet course with emphasizing on internet skills and pedagogy
v.	Randomly mixed gender
vi.	18-22 years old

This study employed semi-structured interviews, observation, and documentation. As suggested by Patton (2015), the sample size involved in qualitative research is determined by the way in which researchers prioritize what they want to know, what is relevant, credibility, and feasibility, given their time and resources constraints. Scholars point out that data are dense, robust, and deep due to saturation (Lincoln and Guba 1985; McGinn 2010).

Data collection

Creswell (2012) stated that a data collection process is a set of interrelated and sequential stages consisting of sampling, access, permissions, instrumentation, and data collection administration itself. In this study, interviews were the main data collection method, the results of which were critical to answering the research questions. Data collection was carried out during February 2021 to July 2021. I followed best practices for conducting virtual interviews in lieu of face-to-face interviews due to the COVID-19 pandemic, with durations ranging from 60 to 90 minutes.

At first, I developed an instrument based on the nine elements of Digital Citizenship from Ribble (2015). The instrument then gets an assessment from experts. There are five international experts involved. Their notes became the basis for improving the interview and side observation. Items for the interview are grasp from the framework of digital citizenship and the purpose of the interviews was to get the understandings and experience of digital citizenship during the PBL. In details elements of knowledge, values, skills of digital citizenship (DC) were the main focus of the interview questions.

Observation was another important method, while documentation was supplementary to the main method. The observation was made at the physical side or fieldwork side the get the information about the participant, their understandings of the PBL project given and the interaction among the participants. Insight through the observation is important as the PBL project organized by the participant was about the internet and multimedia use and this is where the understandings and skills of DC were also implemented. Then the student-teachers have to make a PBL report stand reflection diary from their project. The document from the PBL report then were analyzed using content analysis from the framework of DC and PBL.

The project-based learning implementation protocol is adapted to ideas from Thomas (2000). Due to the Covid-19 pandemic, there have been adjustments, namely learning changed from offline to online, for example, planning an e-project.

Analysis and interpretation of data

Yin (2018) promoted several approaches to analyzing data in case studies. He distinguished data analysis in case studies based on theoretical prepositions. Evers and Staa (2010) addressed the kinds of data analysis that Yin (2018) has proposed showed a tendency to test hypotheses as in the empirical-analysis tradition. However, there is no single accepted approach for qualitative studies that has been suggested by methodologists (Creswell 2012; Patton 2015).

Qualitative analysis is based on the interpretation of personal experiences. In the context of this study, the researchers are the main instrument in constructing data by bringing subjectivity and owning interpretation of the phenomenon. Content analysis was employed to determine the acquisition of data and the meaning. The data were refined through content analysis, and underlying patterns and qualitative differences that were likely to exist in the data were revealed (Yıldırım and Şimşek 2011). Due to authenticity and appropriateness, a deductive approach was employed by incorporating transcriptions, coding, categorizing, and building themes.

According to Strauss and Corbin's (1990) guidelines, the raw data were imported to Nvivo 12 Plus and were then analyzed following the key steps in qualitative research: open coding, axial coding, and selective coding. This study employed triangulation and member checking to establish credibility and authenticity of the research findings. Different researchers separately carry out the analysis by cross-checking the data and interpretations, and then discuss their findings to reach consensus. We conducted peer debriefing with expert qualitative researchers to allow for data and research critiques and questions. To ensure the confidentiality of their personal data, all respondents were told about the research and their identities were anonymized (Example: P1FM= [Number of participants][FM = Female, ML = Male]).
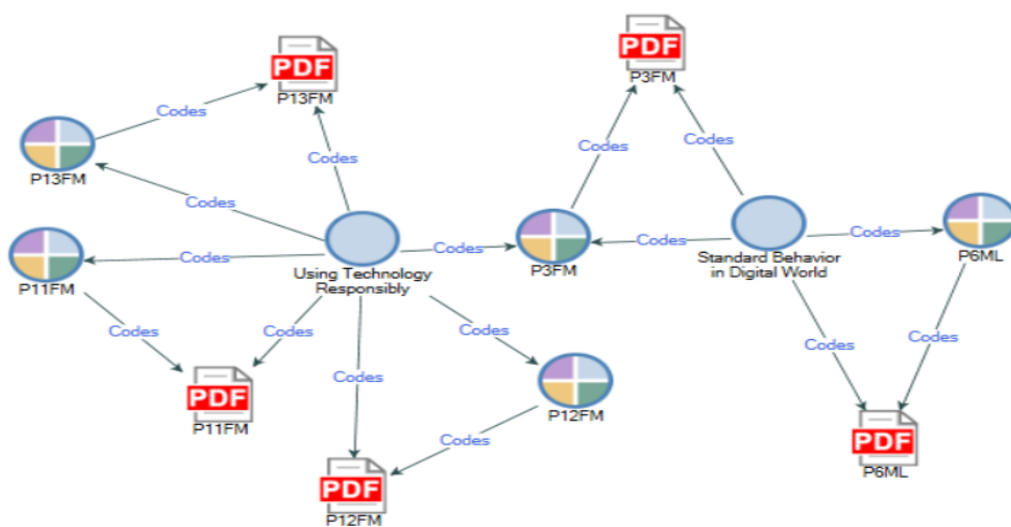

Figure 1. Qualitative data triangulation (Source: Nvivo 12 Plus Output)

Findings

In this study, semi-structured interviews were conducted in relation to the research objectives, particularly regarding the goal and definition of digital citizenship from the perspectives of the student-teachers, as well as to the role of PBL in the citizenship course.

Digital citizenship comprehension within the context of daily routines

The perspectives on digital citizenship perceived by the student-teachers showed details understandings of DC in line with Ribble framework (2015). As illustrated in Figure 2, they understood the definition and goal of digital citizenship in a manner of details and additional understandings of DC. The student-teachers discovered that digital citizenship is primarily associated with "literacy through technology", "standard behavior in the digital world", "good netizenship", "moral guidance in the online environment", and "responsibly using technology". They explained that digital citizenship to be more comprehensive than practical technology use because it encompasses values and morals such as ethics, character, and moral order, which are deemed critical for society. Additionally, they assumed that ethical misconduct leads to social consequences and criminal threats as a result of violations such as cyberbullying and hacking.
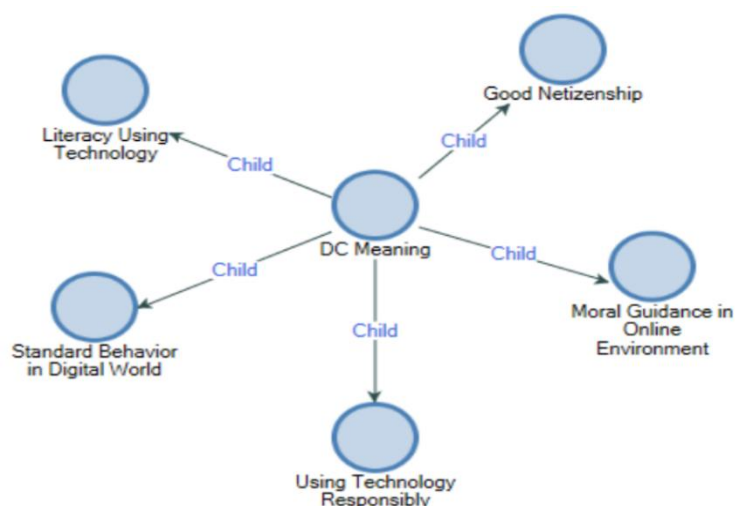
Figure 2. Digital citizenship understanding (Source: Nvivo 12 Plus Output)
Note. DC: Digital Citizenship

Digital citizenship was conceptualized by student-teachers in terms of digital literacy and navigating a digital device. Following Ribble's (2015) nine principles, digital citizenship was defined as the concept of mastering technological literacy, which refers to the proper use of technology. The capability demonstrates an understanding of the digital world and engagement in safe and ethical surfing. Digital citizenship was defined as a collection of behaviors that can serve as a moral standard. Bearing the status and responsibilities of citizenship, digital citizens owe it to the community to use their rights and responsibilities to contribute both online and offline. While digital citizenship is not value-neutral, it lead the student-teachers to believe that being a part of the digital community requires being prepared for the consequences and enforcing rules and policies. They needed to understand and accept that when using technology or interacting with other people in an online environment, they

must adhere to their society's values, norms, and social ethics. Several student-teachers discussed that from their perspectives digital citizenship is:

> *"Literacy with the ability to manage human behavior related to security, ethics, and norms in using technology,"* [P8ML]
> *"Literacy related to cybersecurity and ethics over both cyberspace and the public sphere,"* [P2FM]
> *"A norm or standard of behavior to be responsible for using technology,"* [P6ML]
> *"Norms of appropriate and responsible use of technology; it is the good and right ways to use Internet-based technology,"* [P15FM]
> *"The ability to manage and regulate our behavior in using technology, which includes security, ethics, norms, and culture,"* [P8ML]
> *"Responsible and honest behavior in the use of digital technology so that there is no abuse of technology in the interaction with others in cyberspace,"* [P11FM] and
> *"The quality of behaviors in interacting in cyberspace, especially on social media, by showing responsible behavior according to applicable ethics and norms."* [P10FM]

Other themes emerged of digital citizenship from the perspectives of the student-teachers, which relates to Ribble's (2015) study. Following the nature of digital citizenship as a complex and contentious concept pertaining to appropriate behavior when navigating the digital world, the student-teachers recognized that the concept developed concerns how to live a balanced life both online and offline. In comparison to the concept of operating digital devices such as PCs, laptops, tablets, and smartphones, digital citizenship is more critical about institutionalizing behavioral norms, interacting with others, and contributing to society. The concept emphasizes the competencies necessary to address the global challenges posed by inappropriate digital behavior.

Digital citizenship was conceptualized by the student-teachers as a balanced combination of asserting rights and accepting digital responsibilities. On the one hand, the student-teachers believed that the digital world provides them with the freedom to use digital tools to gain access to a wide variety of resources and create virtual networks. On the other hand, they emphasized the importance of regulating all online and offline activities to maintain a safer society. They prioritized fairness and equal rights for digital citizens to maximize opportunities and uphold ethical principles. Several student-teachers expressed the following viewpoints:

> *"How to be a good digital society? It is by paying attention to the ethical values that exist in the physical space when interacting in cyberspace, as well as with public awareness about cybersecurity and ethics in a digital society"* [P1FM]
> *"Becoming good citizens on the Internet implies limitations. It is not right to be blunt. Yes, you (as an Internet user) have an opinion, but you cannot just write your opinion on the Internet. (Doing so) also has its own rules"* [P2FM]

Student-teachers' views about digital citizenship goal

This study discovered that pre-service teachers held a variety of views on the objectives of digital citizenship. As illustrated in Figure 3, several themes emerged as being comparable to Ribble's (2015) study. In-depth analysis of interview questions about the "goal of digital citizenship" revealed four sub-themes: developing responsible users, becoming wise users, being good teachers, and sharpening ICT skills.
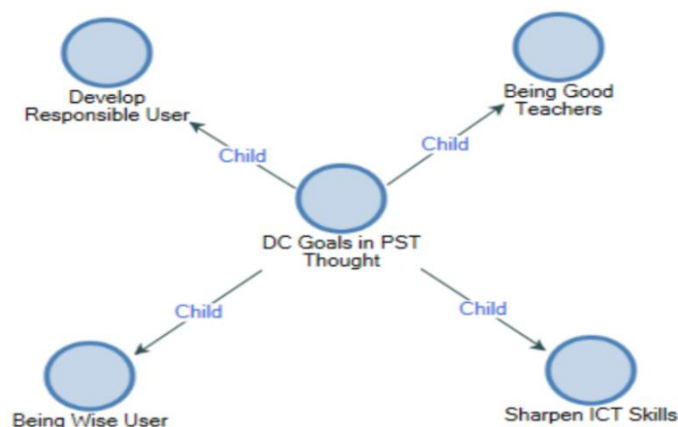
Figure 3. Digital citizenship goal.
Note. PST: Pre-service teacher (Source: Nvivo 12 Plus Output), DC: Digital Citizenship

Findings showed that the purpose of digital citizenship is to develop an ethical digital citizen in the manner of an Eastern society with a spoken language and social norms. When interacting face to face, the values and norms shaped by one's attitude must be applied. The student-teachers perceived that digital citizenship promotes appropriate everyday use of technology. In their words, 'wisdom' was defined as the capacity to apply a critical analytical mindset to ensure the reliability of the information obtained. In their opinion, the concept of digital citizenship is a necessary component of educational discourse. They asserted that digital citizenship is a necessary skill for prospective teachers, particularly considering the growing demand for schools to develop character education programs that address the topic of student technology use. A teacher assumes the role of a 'front liner' who is responsible for implementing and evaluating technology appropriately. As a result, they should foster a shared understanding of the benefits and drawbacks of technology as their future students may benefit from the abundance of information sources over the Internet. Some sample views of the student-teachers are as follows:

> *"I personally want people to know and be wise in applying and using social media."* [P11FM]
> *"For student-teachers, DC can improve the quality of learning for students, while we as prospective teachers must especially be able to master and equip students with skills."* [P9ML]
> *"Teachers as role models for their students are expected to be able to set good behaviors for their students. So, their students believe that their teachers give a positive vibe about DC."* [P2FM]

Student teachers' perceptions about PBL's role in the citizenship course

Figure 4 shows the role of PBL in improving digital citizenship awareness among student-teachers in terms of their perceived benefits and expectations for their future classroom.

As illustrated in Figure 4, the student-teachers viewed PBL in two distinct ways: it is either complicated or interesting. The majority of student-teachers argued that the embedded PBL digital citizenship project presented a series of challenges that were less adaptable to their initial abilities. They previously raised doubts about their ability to complete multiple

activities that became increasingly complex on a weekly basis. Throughout both urban and rural areas, the Covid-19 pandemic and digital inequalities had posed enormous obstacles. They perceived stress and shock from the pressure associated with PBL implementation. On the other hand, some student-teachers believed that PBL is far more fascinating than previous strategies. It is widely accepted that PBL engages students in real-world problems while also fostering a variety of critical digital citizenship skills through an inquiry process. The following are some student teachers' perspectives:

> *"PBL is complicated, innovative, and maybe difficult. They are complicated because the tasks are also different, and everyone has their own responsibilities to ensure that everything goes well." [P12FM]*
> *"I would consider it as challenging. In addition, this (DC project) is important for the future for teacher candidates and for prospective students." [P20FM]*
> *"Project-based learning creates a new, interesting atmosphere and also motivates students to be active and enthusiastic in carrying out learning activities."[P13FM]*

Additionally, the student-teachers agreed that PBL aided the development of their digital literacy and promoted educators' 21st-century skills. Although the demands for PBL were perceived to be high, they recognized the importance of digital skills and literacy for operating in a digital environment. These abilities foster an in-depth and student-driven inquiry. They gained knowledge and insight as future teachers that digital pedagogy alone is insufficient. For example, collaboration is a necessary capability for success in networked societies. In PBL, the student-teachers received a rigorous instruction on effective communication, listening to others, respecting diversity, and accepting responsibility for their errors. They recognized that these abilities enabled them to engage in and contribute to the expansion of the scope of digital citizenship. Below are some sample views of the student-teachers:

> *"It (PBL) provides many valuable benefits. I can practice creativity, communication skills, problem-solving skills, and training at once." [P20FM]*
> *"With PBL, I expand my networking with other people or experts to contribute webinar (e-seminar) implementations." [P10FM]*
> *"I feel that my leadership has increased. I can think critically. We have our own responsibilities in the group. All projects are a shared responsibility." [P14FM]*

The student-teachers' enthusiasm about learning practices was triggered by their orientation toward prioritizing the internalization of knowledge, skills, and good deeds in their professional careers. They believed that critical issues surrounding irresponsible technology use need to be addressed. They believed that inequality in technology has affected every citizen's ability to participate in digital communities. Additionally, they urged policymakers to ensure that sufficient infrastructure is provided for all schools, particularly those that require technical assistance in forms like gadgets, software, and Wi-Fi.
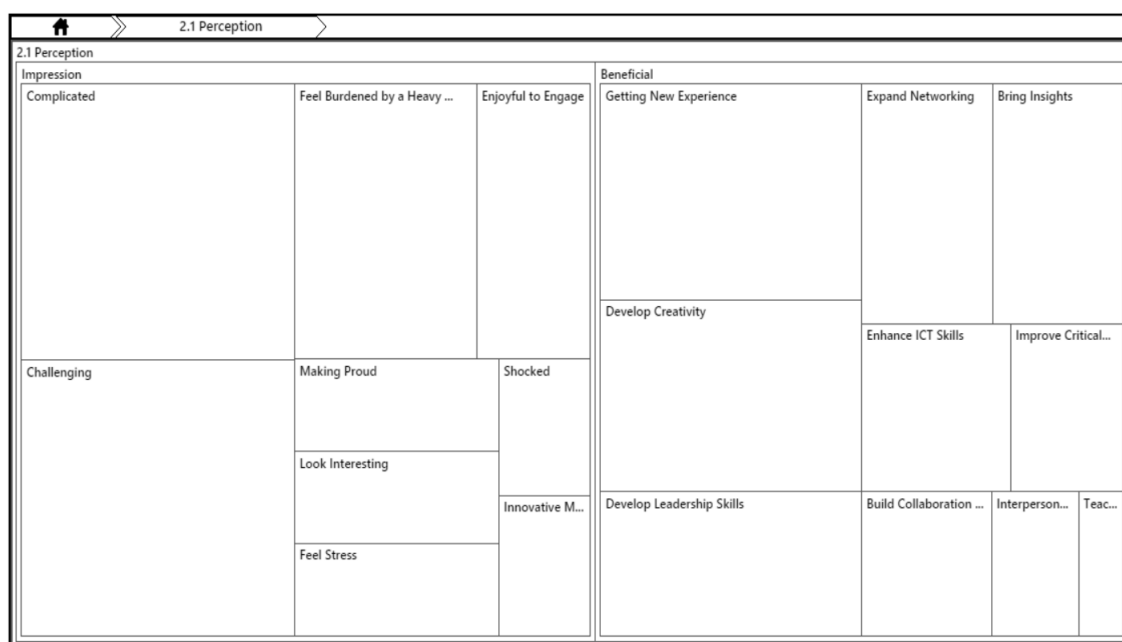
Figure 4. Student-teachers' perspectives on PBL' role (Source: Nvivo 12 Plus Output)

The student-teachers emphasized the importance of teacher institutions in addressing the numerous ethical issues surrounding digital citizenship. Education is critical in educating and training technology users about the digital citizenship framework, both in schools and universities. The student-teachers were passionate about promoting safe, ethical, and responsible technology use rules, particularly considering the expectation to integrate digital citizenship into schools. They agreed that it is critical to reform school curricula and teacher education. Additionally, schools are required to implement guidelines that establish standards for technology use and involve parents in the process of developing digital citizenship. They anticipated additional courses that would incorporate materials that would enable novice teachers to acquire practical knowledge and stimulate their minds, desires, and knowledge to deal with ethical problems in the digital landscape. Some of the student-teachers' views are as follows:

> *"We need to propose DC guidelines in schools. We need a guidance to how to act appropriately and wisely on the Internet." [P15FM]*
> *"Teacher institutions ought to teach DC competencies to prospective teachers. So far, the campus has not provided knowledge related to DC." [P9ML]*
> *"In schools, we should propose DC guidelines, integrate them into learning activities, optimize collaborations between schools, parents, and the community, and especially supervise Internet use." [P3FM]*

Discussion

This study aimed to investigate student-teachers' perspectives and experiences of digital citizenship through project-based learning at teacher institution in Indonesia. Curran and Ribble (2017) stated that digital citizenship cannot be taught exclusively through lectures. Digital citizenship must also be taught through life experiences that require student-teachers to address a real-world issue, preferably one involving technology use. Letting them to self-evaluate aids them in dealing with some technology abuses independently. The reflective process may aid them in acquiring new knowledge and comprehension regarding digital

citizenship. Additional values to previous studies that presented digital citizenship in multi-layered and transdisciplinary manners (Choi, 2016; Oyedemi, 2020), this study contributes to the literature for further identifying student-teachers' understanding and willingness to integrate digital citizenship education for future classrooms after their participation in project-based learning.

In addition to student-teachers' comprehension, Ribble's study (2015) depicted student-teachers' initial understanding of digital citizenship by mapping their familiarity with technology, particularly digital tools. The student-teachers emphasized that all digital citizens are fully responsible for being aware and acknowledging that navigating the digital world requires adhering to certain standards of behavior or ethical guidelines regarding data protection and respect for others. They claimed that digital citizenship assists users in balancing their online and offline lives (Fingal, 2019). When they stated, 'online environment is not a value-free zone,' they meant that the virtual world, like social life, is constrained by values, both in terms of what we can do and what we cannot do. Based on Collier (2009), we have control over what we see, choose, say, and share in cyberspace. These choices included ethical values and the digital perspectives, attitudes, and behaviors of technology users.

Meanwhile, the student-teachers used the term 'responsible' to describe a responsible digital citizen. They perceived that being a technology user implies an awareness of individual's rights and an acceptance of associated risks and consequences. This was evident when the student-teachers used technology to complete assignments, communicate with lecturers, and participate in e-learning via online meetings. They navigated social media in a way that required them to develop the knowledge and skills necessary to access reliable and trustworthy information, establish their identities and digital footprints, and adhere to district policies regarding responsible technology use. Literature shows that Indonesia's networked environment has been contaminated by political hate speech. Social media platforms, particularly those that are politically motivated, have evolved into a channel for disseminating fake news, slander, and provocation (Lailiyah, Yuliyanto, and Pradhana, 2018; Yuliarti, 2018). In addition, social media did not provide a sound communication pattern, so it is challenging to filter the information gained relative to conventional mass media (Santoso et al. 2017). Given the evident, an initiative program is needed to instill digital citizenship to address issues, for example, in evaluating online resources and cyber-attacks through shared site links. As noted by Armfield and Blocher (2019), the proliferation of technological threats necessitates the development of teacher education programs to address these complexities. This call for action encourages preparation programs to incorporate digital citizenship into their curricula in order to address certain unethical and illegal behaviors associated with technology use.

In terms of PBL' effectiveness, the most valuable findings revealed student-teachers' perspectives in relation to digital skills proficiency and 21st-century skills enhancement. While some students may have felt frustrated during a time-consuming project, PBL encourages them to generate ideas, negotiate, discuss, and make decisions based on their own experiences. PBL advocates for an examination of digital abuse. PBL's autonomy enables student-teachers to develop their capacity to be self-directed learners. This means that they can develop their understanding independently with numerous responses. Tangül and Soykan (2021) stated that PBL helps students to develop a breadth of understanding through complicated learning experiences and anxiety associated with digital exposures, particularly to propose ideas and solutions to real-world situations. It is possible that the student-teachers believed that project-based activities increased their motivation to demonstrate proficiency in

addressing technology issues. In other words, they gained increased control over student-led projects to maintain their own educational output. As pointed out by Gomez-Pablos et al., (2017) and Tantrarungroj and Suwannatthachote (2012), PBL benefits learners by boosting their self-efficacy for integrating self-regulated learning and autonomy.

It is important to remember that technology advances at a fast pace necessitate users' acceptance and adaptation. In other words, technology users constantly require new abilities, including new knowledge and comprehension of the human consequences of technology use (Milenkova and Lendzhova 2021). PBL is considered beneficial in this context because it provides student-teachers with an initial understanding of how the digital world is changing, enabling them to create solutions and forecast demand for adoption into learning. The student-teachers engaged in a sustained inquiry while developing a product addressing digital issues. After completing the project proposal, they engaged in collaborative activities within the group. Everyone contributed ideas and participated in discussions at various levels of PBL, most notably in e-forums, to reconcile divergent viewpoints. They collected data in order to develop products, conduct in-person interviews, and consult with experts in the field on digital challenges. They had been taught to communicate effectively, to negotiate effectively, to formulate and promote ideas, and to collaborate with others. In terms of 21st-century teaching and learning abilities, the student-teachers discussed the benefits of PBL, including how it had helped them develop as future teachers, digital citizens, and life-long learners (Loizzo et al. 2016; Shun Xu et al. 2019).

Finally, the student-teachers expressed their strong support to use technology responsibly in the classroom, particularly in terms of digital citizenship. They proposed that all teachers be able to identify themselves and their role in inspiring students to contribute positively and responsibly to the digital environment and in assisting students in envisioning themselves as responsible global and digital citizens (Hollandsworth, Dowdy, and Donovan 2009). In Ribble's words, teachers guide students in implementing responsible digital behaviours (Ribble, 2015). They noted the concept of incorporating elements of digital citizenship into teacher education programs. Additionally, digital inequality between urban and preurban areas restricts teachers' and students' development of digital skills. Similarly, Walters (2018) and Mahdum et al. (2019) suggested that the financial support of the government as a policymaker is crucial for providing ICT tools in schools adequately. Within the context of their professional careers, the student-teachers expressed concerns and criticism regarding the promotion of digital citizenship.

Conclusion

Prospective teachers' role in the future is crucial in expanding digital citizenship awareness to prepare students for a greater degree of preparedness to deal with misuse and abuse of technology. This study noted that digital citizenship is not just related to digital problems; it also concerns social and ethical issues. Student teachers' views on their rights and responsibilities in networked environments were examined. They were observed to obey the law, both online and offline, have conscience when posting something on social media, protect their personal data from phishing, and ensure online transactions safely. They fully agreed that digital citizenship encompasses online interactions beyond ICT proficiency to expand in blurred boundaries in- and out-of-school environments. Considering the numerous risks that children may face while navigating the digital world, it is critical to foster a positive culture that will help prevent or mitigate negative outcomes in cyberspace (Brandau et al. 2021). This study also found that exposed student-teachers' views and comprehension about

digital issues in project-based learning would improve their readiness regarding appropriate behaviors in technology use. Given the lack of Internet access and heavy workload, student-teachers perceived PBL as beneficial for engaging learners' autonomy in constructing an understanding of the digital world. They also regarded PBL as providing opportunities for students to advance and grow digital skills relevant to the 21st century within a real-world context.

Future research may replicate this study with quantitative methods and educational settings. Researchers may focus on examining demographic backgrounds, perceptions, and digital skills to present the relationships between those variables and digital citizenship performance. In conclusion, we are convinced in our belief that educators, school principals, and policymakers have the responsibility to provide digital citizenship education and thereby ensure that youths access curricula at all grade levels for them to be able to show appropriate and responsible behavior in both online and offline environments.

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