



Civic Knowledge and Civic Skills as Enabling Conditions for Digital Citizenship: Examining Their Scope and Limits Among Pre-Service Elementary Teachers

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Abstract

The rapid expansion of digital technologies has increased the urgency of developing responsible digital citizenship, yet existing studies have predominantly explained digital citizenship from the perspectives of digital literacy and technological competence, with limited attention to the contribution of civic competence. Addressing this gap, this study examined the extent to which civic knowledge and civic skills function as enabling conditions for digital citizenship among pre-service elementary school teachers. A quantitative cross-sectional design was employed involving 56 participants, and the data were analysed using multiple linear regression. The findings indicate that both civic knowledge and civic skills are significantly associated with digital citizenship, with civic skills demonstrating a stronger contribution. However, the model explained only 38.7% of the variance in digital citizenship, suggesting that responsible digital citizenship is shaped not only by civic competence but also by broader contextual factors, including digital literacy, digital self-efficacy, institutional support, technology access, and learning environments. Conceptually, this study advances the literature by positioning civic knowledge and civic skills as enabling conditions rather than deterministic predictors of digital citizenship. Practically, the findings highlight the importance of integrating civic competence with authentic digital learning experiences, including project-based learning, ethical decision-making, critical evaluation of online information, and collaborative digital activities within teacher education programmes. These findings provide a conceptual and practical foundation for strengthening civic education in preparing future elementary school teachers for responsible participation in increasingly complex digital societies.

Keywords: Civic Education, Civic Knowledge, Civic Skills, Digital Citizenship, Pre-Service Elementary Teachers

Pengetahuan Kewarganegaraan dan Keterampilan Kewarganegaraan sebagai Kondisi Pendukung Kewarganegaraan Digital: Mengkaji Cakupan dan Keterbatasannya pada Mahasiswa Calon Guru Sekolah Dasar

Abstrak

Pesatnya perkembangan teknologi digital meningkatkan urgensi penguatan kewarganegaraan digital yang bertanggung jawab. Namun, sebagian besar penelitian masih menjelaskan kewarganegaraan digital dari perspektif literasi digital dan kompetensi teknologi, sementara kontribusi kompetensi kewarganegaraan masih relatif kurang mendapat perhatian. Untuk mengisi kesenjangan tersebut, penelitian ini bertujuan menganalisis sejauh mana pengetahuan kewarganegaraan dan keterampilan kewarganegaraan berfungsi sebagai kondisi pendukung bagi kewarganegaraan digital pada mahasiswa calon guru sekolah dasar. Penelitian menggunakan pendekatan kuantitatif dengan desain potong lintang yang melibatkan 56 responden, sedangkan data dianalisis menggunakan regresi linier berganda. Hasil penelitian menunjukkan bahwa pengetahuan kewarganegaraan dan keterampilan kewarganegaraan berhubungan secara signifikan dengan kewarganegaraan digital, dengan keterampilan kewarganegaraan memberikan kontribusi yang lebih kuat. Meskipun demikian, model penelitian hanya

mampu menjelaskan 38,7% variasi kewarganegaraan digital, yang menunjukkan bahwa pembentukannya tidak hanya dipengaruhi oleh kompetensi kewarganegaraan, tetapi juga oleh berbagai faktor kontekstual, seperti literasi digital, kepercayaan diri dalam penggunaan digital, dukungan institusi, akses terhadap teknologi, dan lingkungan pembelajaran. Secara konseptual, penelitian ini memperluas kajian sebelumnya dengan memosisikan kompetensi kewarganegaraan sebagai kondisi pendukung, bukan sebagai prediktor yang bersifat deterministik. Secara praktis, hasil penelitian menegaskan pentingnya mengintegrasikan kompetensi kewarganegaraan dengan pengalaman belajar digital yang autentik melalui pembelajaran berbasis proyek, pengambilan keputusan etis, evaluasi kritis terhadap informasi digital, dan kolaborasi berbasis teknologi dalam pendidikan guru. Temuan ini memberikan landasan konseptual dan praktis bagi penguatan pendidikan kewarganegaraan dalam mempersiapkan calon guru sekolah dasar untuk berpartisipasi secara bertanggung jawab di masyarakat digital.

Kata kunci: Keterampilan Kewarganegaraan, Kewarganegaraan Digital, Mahasiswa Calon Guru Sekolah Dasar, Pendidikan Kewarganegaraan, Pengetahuan Kewarganegaraan,

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INTRODUCTION

Digital transformation has fundamentally reshaped how individuals access information, interact with others, participate in public life, and exercise their civic rights and responsibilities. The rapid expansion of the internet, social media, and digital platforms has positioned digital environments as primary spaces for public communication, political participation, civic learning, and identity formation. Consequently, digital citizenship is no longer viewed merely as the ability to use digital technologies; rather, it has become an essential twenty-first-century civic competence encompassing critical thinking, ethical behaviour, responsible participation, and the capacity to maintain personal and collective well-being in digital environments (Agus et al., 2025; Usmi et al., 2024).

In Indonesia, the urgency of strengthening digital citizenship has become increasingly apparent alongside the rapid growth of internet penetration and social media use. As one of the countries with the largest internet user populations globally, Indonesia possesses considerable opportunities to expand civic participation through digital platforms. Nevertheless, increased access to digital technologies has not been accompanied by a corresponding improvement in responsible digital behaviour (Azis et al., 2021; Tadlaoui-brahmi et al., 2022). The widespread dissemination of misinformation, hate speech, cyberbullying, political disinformation, and the declining quality of civic discourse indicate that access to technology alone is insufficient to foster responsible digital citizens (Prasetyo et al., 2021). This situation reveals a critical gap between technological competence and the civic competencies required for meaningful and responsible participation in digital society.

Civic education has long been regarded as a primary means of preparing citizens to exercise their rights and responsibilities responsibly in both physical and digital societies. Within this framework, civic knowledge provides the cognitive foundation through which individuals understand democratic principles, constitutional values, human rights, national identity, and citizens' rights and obligations. Such knowledge enables individuals to interpret civic issues critically and to recognise the ethical implications of their actions in digital environments (Kwiatkowska & Wiśniewska-Nogaj, 2022; Phattanajureephan et al., 2026). Nevertheless, possessing civic knowledge alone does not necessarily translate into responsible digital behaviour, as conceptual understanding must first be transformed into meaningful civic action (Alabdullatif & Gameil, 2020; Kilinc et al., 2023).

For this reason, civic skills are often considered more proximal to digital citizenship because they represent the practical capacities through which civic knowledge is enacted. Civic skills encompass critical thinking, effective communication, collaboration, problem solving, public participation, and responsible decision-making. Within digital environments, these competencies enable individuals to evaluate the credibility of online information, participate constructively in public discussions, respect diverse perspectives, and engage ethically with digital technologies. Accordingly, digital citizenship should not be understood as a direct consequence of civic knowledge alone but rather as the outcome of an interaction between what citizens know and how effectively they apply that knowledge in authentic digital contexts (Örtegren, 2024b; Rakhmawati & Murti, 2024). Although civic knowledge and civic skills are theoretically complementary dimensions of civic competence, the relative contribution of each in shaping digital citizenship remains an unresolved issue in the existing literature.

Previous studies have examined digital citizenship from various perspectives, including digital literacy, media literacy, internet ethics, and technological competence. Most of these studies conclude that digital literacy and responsible technology use contribute positively to the development of digital citizenship (Hamayel & Hawamdeh, 2022; Tinmaz et al., 2022). Other studies further highlight the importance of critical thinking, democratic values, and civic participation in fostering responsible engagement within digital environments (Assante et al., 2022; Karayol et al., 2025). Nevertheless, the existing literature has largely conceptualised digital citizenship as an outcome of digital literacy or technological competence, while the contribution of civic competence as its underlying educational foundation has received comparatively less scholarly attention. Moreover, studies that explicitly investigate the relationship between civic knowledge, civic skills, and digital citizenship have generally examined these dimensions independently or have merely reported statistical associations among the variables. Such approaches provide limited insight into how civic knowledge and civic skills jointly contribute to digital citizenship or the extent to which these civic competencies actually explain responsible digital behaviour (Buasuwan et al., 2022; Hidayat et al., 2024). More importantly, previous research has seldom questioned whether contextual factors including digital literacy, institutional digital culture, social norms, technology access, and learning environments may account for a substantial

proportion of digital citizenship beyond formal civic education itself (Alkhalaf, 2024; Martzoukou et al., 2025). Consequently, the scope and explanatory limits of civic knowledge and civic skills in fostering digital citizenship remain insufficiently understood.

Building upon the foregoing review, three major research gaps justify the present study. First, previous research has predominantly conceptualised digital citizenship as an outcome of digital literacy or technological competence, leaving the contribution of civic competence particularly civic knowledge and civic skills underexplored as a foundational educational determinant of responsible digital citizenship. Second, most empirical studies have concentrated primarily on establishing statistically significant relationships while paying comparatively little attention to the explanatory scope and limitations of these relationships, especially in the presence of broader contextual factors that may shape digital citizenship. Third, empirical evidence concerning digital citizenship among pre-service elementary teachers remains scarce, despite the pivotal role of this population in fostering future generations of digitally responsible citizens.

Addressing these gaps, the present study extends beyond examining whether civic knowledge and civic skills predict digital citizenship. Instead, it critically evaluates the scope and limits of these civic competencies in explaining digital citizenship among future elementary teachers. Accordingly, this study conceptualises civic knowledge and civic skills not as sufficient causes of digital citizenship but rather as enabling conditions whose influence depends upon broader contextual, institutional, and technological environments. By adopting this perspective, the study seeks to provide a more nuanced understanding of how civic education contributes to digital citizenship while acknowledging the complexity of its development in contemporary digital society.

The present study makes three complementary contributions to the growing body of research on digital citizenship within civic education. First, conceptually, this study advances the argument that civic knowledge and civic skills should not be interpreted as sufficient causes of digital citizenship but rather as enabling conditions whose influence depends upon broader contextual factors, including digital literacy, institutional digital culture, social norms, and learning environments. This perspective extends prevailing conceptualisations that have largely assumed a linear relationship between civic competence and responsible digital behaviour. Second, empirically, the study provides one of the few quantitative examinations of the simultaneous contribution of civic knowledge and civic skills to digital citizenship among pre-service elementary teachers in Indonesia. This population represents a strategically important group because they will become future educators responsible for cultivating digital citizenship among elementary school students. Consequently, the findings contribute not only to the literature on digital citizenship in higher education but also to the development of civic education within teacher preparation programmes. Third, methodologically, this study moves beyond conventional significance testing by interpreting the explanatory power of the regression model through effect size analysis while critically examining the substantive meaning of the unexplained variance. Rather than treating residual variance as a purely statistical limitation, the study considers it as evidence of the multidimensional and context-dependent nature of digital citizenship. This methodological perspective offers a more comprehensive interpretation of the relationship between civic competence and digital citizenship than studies relying solely on statistical significance.

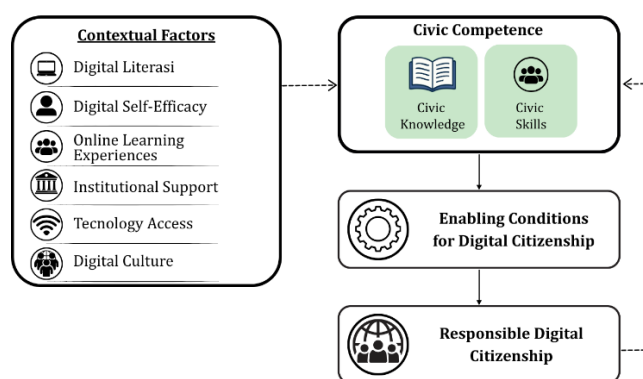


Figure 1. Proposed Conceptual Model of Civic Competence as Enabling Conditions for Digital Citizenship

Figure 1 presents the conceptual model proposed in this study, which positions civic knowledge and civic skills as enabling conditions for the development of digital citizenship among pre-service elementary school teachers. Unlike deterministic perspectives that assume civic competence directly produces responsible digital behaviour, the present model argues that civic competence provides the foundational capacities upon which digital citizenship can be developed. Civic knowledge equips individuals with an understanding of democratic values, constitutional principles, citizens' rights and responsibilities, whereas civic skills enable them to critically evaluate information, communicate responsibly, and participate constructively in civic and digital environments (Branson, 1998; Westheimer & Kahne, 2004).

However, these competencies alone are unlikely to produce responsible digital citizenship. Their influence is expected to interact with broader contextual factors, including digital literacy, digital self-efficacy, online learning experiences, institutional support, technology access, and digital culture, all of which have been recognised as important determinants of responsible digital participation (Choi, 2016; UNESCO, 2023). Consequently, digital citizenship is conceptualised as a multidimensional outcome emerging from the interaction between civic competence and contextual learning environments rather than as the direct consequence of civic competence alone.

Building upon these theoretical perspectives, the present study proposes civic knowledge and civic skills as enabling conditions rather than sufficient determinants of digital citizenship. This conceptual proposition extends previous regression-based studies by emphasising that civic competence facilitates, but does not independently guarantee, the development of responsible digital citizenship, thereby providing a theoretical explanation for the remaining variance that may be attributable to contextual influences.

Based on this conceptual perspective, the present study is positioned not merely as an attempt to confirm the existence of relationships between civic competence and digital citizenship, but rather as a critical examination of the extent to which civic competence can explain the development of digital citizenship. This position is grounded in the assumption that digital citizenship is a multidimensional construct shaped by the interaction of individual competencies, educational environments, digital culture, and broader social dynamics. Consequently, the relationships among civic knowledge, civic skills, and digital citizenship are interpreted as context-dependent predictive associations rather than deterministic causal relationships. From the perspective of civic education, this position carries important implications for curriculum development and instructional practice. If civic knowledge and civic skills function primarily as enabling conditions, strengthening civic education cannot rely solely on knowledge transmission or isolated skills training. Instead, civic education should be designed as an integrated learning experience that connects civic competence with authentic digital practice, enabling learners to develop responsible, ethical, critical, and participatory forms of digital citizenship.

Drawing upon the foregoing discussion, this study aims to examine the contribution of civic knowledge and civic skills to digital citizenship among pre-service elementary teachers, while critically evaluating the scope and limits of these civic competencies in explaining digital citizenship. Specifically, the study addresses three research questions: (1) Do civic knowledge and civic skills jointly predict digital citizenship? (2) Which civic competency demonstrates the stronger predictive contribution to digital citizenship? (3) What are the theoretical implications of the proportion of digital citizenship that remains unexplained by the proposed model? Guided by the conceptual framework, three hypotheses are proposed: H1: Civic knowledge positively predicts digital citizenship. H2: Civic skills positively predict digital citizenship. H3: Civic knowledge and civic skills jointly and positively predict digital citizenship. By addressing these questions, the present study seeks not only to advance understanding of the relationship between civic competence and digital citizenship but also to provide conceptual and empirical foundations for developing more contextually responsive civic education in the digital era.

METHOD

Research Design

This study employed a quantitative approach using a cross-sectional correlational design to examine the relationships between civic knowledge, civic skills, and digital citizenship among pre-service elementary school teachers. This design was selected to investigate the associations among variables without establishing causal relationships. Data were collected at a single point in time and analysed using descriptive statistics and multiple linear regression.

Participants

The participants consisted of 56 pre-service elementary school teachers enrolled in the Elementary School Teacher Education Program at Universitas Negeri Yogyakarta, Indonesia. Participants were selected using purposive sampling because they had completed civic education courses and had experience using digital technologies in academic learning. These characteristics were considered essential to ensure that respondents possessed sufficient experience to evaluate the constructs investigated in this study.

Although the sample size was relatively modest, it satisfied the minimum requirements for multiple regression analysis involving two independent variables and was considered appropriate for exploratory correlational research. Nevertheless, the findings should be interpreted cautiously and are not intended to represent all pre-service teachers in Indonesia.

Instrument Development

The research instruments were developed through a systematic review of theoretical and curricular references related to civic competence and digital citizenship. The civic knowledge instrument was constructed based on the learning outcomes of the Civic Education course for first-year pre-service elementary school teachers and aligned with the fundamental concepts of Indonesian civic education, including constitutional values, democracy, national identity, citizenship rights and responsibilities, and Pancasila (Winarno, 2019). These dimensions were further aligned with the concept of civic knowledge proposed by the (Branson, 1998), which emphasises citizens' understanding of democratic institutions, constitutional principles, and civic responsibilities.

The civic skills instrument was developed based on the civic competence framework proposed by (Branson, 1998) and further informed by the participatory citizenship perspective of (Westheimer & Kahne, 2004). The instrument measured students' intellectual, participatory, communication, social-emotional, and digital citizenship skills that support responsible civic participation in contemporary society.

The digital citizenship instrument was adapted from contemporary digital citizenship frameworks proposed by (Choi, 2016; UNESCO, 2023), encompassing responsible technology use, digital ethics, online participation, critical evaluation of digital information, digital communication, and responsible engagement in digital environments. The operationalisation of all variables was designed to ensure consistency between theoretical constructs and empirical measurement.

Table 1. Definisi Operasional Variabel Penelitian

Variable	Operational Definition	Dimensions	Item	Scale
Civic Knowledge	Students' understanding of fundamental civic concepts, constitutional principles, national identity, democratic values, and citizenship responsibilities in the context of civic education.	Moral values, norms, and ethics; National identity; The Unitary State of the Republic of Indonesia (NKRI); Central and local government; <i>Bhinneka Tunggal Ika</i> ; The 1945 Constitution; Pancasila	1-20	Multiple-choice test (Correct = 1; Incorrect = 0)
Civic Skill	Students' ability to apply civic knowledge through critical thinking, participation, communication, socio-emotional competence, and responsible engagement in digital environments.	Intellectual skills; Participatory skills; Communication skills; Social-emotional skills; Digital citizenship skills	1-25	Five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree)
Digital Citizenship	Students' responsible, ethical, critical, and participatory behaviour when using digital technologies for learning, communication, and civic engagement.	Respect, educate, and protect (covering digital ethics, communication, information literacy, participation, and responsible technology.	1-25	Five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree)

Validity and Reliability

Prior to data collection, the developed instruments underwent a content validity process through expert judgment to ensure their conceptual relevance and suitability for measuring the intended constructs. The validity involved two experts with academic expertise in civic education. The experts evaluated each item based on its relevance to the construct, clarity of wording, representativeness of the indicators, and appropriateness for the characteristics of pre-service elementary school teachers. Based on the experts' recommendations, several items were revised to improve wording clarity, conceptual accuracy, and overall readability before the instruments were administered.

Following the content validation process, the reliability of each instrument was examined using Cronbach's alpha coefficient to evaluate internal consistency. According to the commonly accepted criterion, Cronbach's alpha values greater than 0.70 indicate satisfactory reliability for educational research. The results demonstrated that all research instruments achieved acceptable reliability coefficients, indicating that they were sufficiently consistent for measuring the intended constructs.

Table 2. Content Validation and Reliability of the Research Instruments

Variable	Validity Procedur	Validity Criteria	Reliability Test	Cronbach's Alpha	Interpretation
Civic Knowledge	Expert judgment by two experts in Civic Education	Relevance, clarity, representativeness of indicators, and appropriateness of items	Internal consistency	0.81	Good reliability
Civic Skills	Expert judgment by two experts in Civic Education	Relevance, clarity, representativeness of indicators, and appropriateness of items	Internal consistency	0.84	Good reliability
Digital Citizenship	Expert judgment by two experts in Civic Education	Relevance, clarity, representativeness of indicators, and appropriateness of items	Internal consistency	0.87	Good reliability

Data Collection and Analysis

Data were collected through the administration of research instruments to 56 pre-service elementary school teachers who met the established sampling criteria. Prior to data collection, participants were informed about the objectives of the study, and their participation was voluntary and anonymous. The collected data were analysed using JASP version 0.18.3.0. Descriptive statistics were first employed to summarise the characteristics of each research variable. Subsequently, the assumptions of multiple linear regression, including normality, multicollinearity, heteroscedasticity, and linearity, were examined to ensure the suitability of the regression model. Multiple linear regression analysis was then performed to examine the individual and simultaneous contributions of civic knowledge and civic skills to digital citizenship. Statistical significance was determined at the 0.05 level.

RESULTS

A total of 56 pre-service elementary teachers participated in this study, and all questionnaires were completed without missing responses, allowing all cases to be included in the analysis. Descriptive statistics were calculated to provide an overview of the characteristics of the study variables prior to inferential analysis. As presented in Table 2, participants demonstrated a relatively high level of civic knowledge ($M = 82.15$, $SD = 8.45$). The mean score for civic skills was 3.85 ($SD = 0.56$), while the average score for digital citizenship was 4.02 ($SD = 0.48$) on a five-point scale. Skewness and kurtosis values for all variables fell within the acceptable range of ± 2 , indicating approximately normal distributions and supporting the use of subsequent parametric analyses.

Table 2. Deskriptive Statistics

Variables	N	Mean	SD	Min	Maks	Skewness	Kurtosis
Civic Knowledge	56	82,15	8,45	65	100	-0,45	0,32
Civic Skills	56	3,85	0,56	2,80	4,80	-0,28	-0,15
Digital Citizenship	56	4,02	0,48	3,20	4,75	-0,22	-0,22

Prior to conducting the multiple linear regression analysis, regression assumptions were evaluated to determine the appropriateness of the model. As summarised in Table 3, all assumptions were satisfactorily met. The Shapiro–Wilk test indicated that the residuals were normally distributed ($W = 0.982$, $p = .354$). Multicollinearity was not evident, as reflected by a Variance Inflation Factor (VIF) of 1.178. The Breusch–Pagan test showed no evidence of heteroscedasticity ($p = .247$), while the Durbin–Watson statistic (2.054) suggested the absence of residual autocorrelation. These results confirm that the data satisfied the assumptions required for multiple linear regression analysis.

Table 3. Regression Assumption Tests

Test Type	Method	Statistics	Value	Criteria	Conclusion
Normality	Shapiro-Wilk	W	0,982	$p > 0,05$	Met
Multicollinearity	VIF	VIF value	1,178	< 10	Satisfied
Heteroscedasticity	Breusch-Pagan	p-value	0,247	$> 0,05$	Met
Autocorelation	Durbin-Watson	DW	2,054	$= 2$	Satisfied

The results of the multiple linear regression analysis are presented in Table 4. The regression model was statistically significant ($F = 16.754$, $p < .001$) and explained 38.7% of the variance in digital citizenship ($R^2 = .387$). The adjusted coefficient of determination (Adjusted $R^2 = .364$) indicates that the model retained adequate explanatory power after accounting for the number of predictors. Furthermore, the calculated Cohen's f^2 of 0.632 indicates a large practical effect.

At the individual predictor level, both civic knowledge and civic skills were found to contribute significantly to digital citizenship. Civic knowledge demonstrated a significant positive association with digital citizenship ($B = 0.230$, $\beta = 0.400$, $t = 3.428$, $p = 0.001$), while civic skills also showed a significant positive contribution ($B = 0.320$, $\beta = 0.346$, $t = 2.965$, $p = 0.005$).

Table 4. Multiple Regression Analysis

Variable	B	SE	β	t	p
Constant	43.028	8.555	-	5.029	0.000**
Civic Knowledge	0.230	0.067	0.400	3.428	0.001**
Civic Skill	0.320	0.108	0.346	2.965	0.005**

Based on the regression results, all proposed hypotheses were supported. Civic knowledge was positively and significantly associated with digital citizenship, and civic skills likewise demonstrated a significant positive relationship with digital citizenship. Collectively, both predictors significantly explained variations in digital citizenship among pre-service elementary teachers.

DISCUSSION

Civic Competence as Enabling Conditions

The findings of this study demonstrate that both civic knowledge and civic skills significantly contribute to digital citizenship among pre-service elementary school teachers. These results indicate that civic competence constitutes an important enabling condition for the development of responsible digital citizenship, although its influence is not deterministic. From the perspective of the Civic Competence Framework, civic knowledge provides the conceptual foundation for understanding democratic principles, citizens' rights and responsibilities, and constitutional values, whereas civic skills enable individuals to apply these understandings through responsible participation and decision-making in both civic and digital contexts (Branson, 1998; Riyanto et al., 2025). Consequently, digital citizenship should be

understood not merely as technological competence but as the manifestation of civic competence within increasingly complex digital environments. These findings are consistent with recent studies reporting that civic competence represents one of the essential foundations for responsible digital participation among university students and pre-service teachers, particularly when civic understanding is translated into authentic digital practices ([Gutiérrez-Aguilar et al., 2024](#); [Martzoukou et al., 2025](#); [Zahrah & Dwiputra, 2023](#)). Therefore, the present study extends previous empirical evidence by conceptualising civic knowledge and civic skills as enabling conditions that facilitate, rather than independently determine, the development of digital citizenship.

Why Civic Skills Matter More

The most notable finding of this study is that civic skills demonstrated a stronger predictive contribution to digital citizenship than civic knowledge, although both variables were statistically significant predictors. This finding can be interpreted through the perspective of competence theory, which posits that knowledge constitutes a foundational cognitive resource, whereas skills represent the capacity to mobilise and apply that knowledge effectively in authentic situations ([Mulder, 2014](#); [Rychen & Salganik, 20023](#)). From this perspective, civic knowledge enables individuals to understand democratic values, constitutional principles, and citizens' rights and responsibilities, but these understandings alone are insufficient to produce responsible digital behaviour unless they are translated into observable actions through civic skills. Consequently, digital citizenship is more closely associated with the practical enactment of civic competence ([Dolezal et al., 2025](#)) than with conceptual understanding alone, particularly in teacher education contexts where professional digital competence is developed through authentic pedagogical practice ([Japar et al., 2021](#); [Syahrizal & Firdaus, 2026](#)). This interpretation is further supported by Experiential Learning Theory ([Kolb, 1984](#)), which argues that meaningful learning occurs through the continuous transformation of knowledge into concrete experience, reflective observation, abstract conceptualisation, and active experimentation. Within digital environments, responsible citizenship is developed not merely by acquiring civic concepts but by repeatedly engaging in authentic activities such as evaluating online information, participating in public discussions, solving digital problems, communicating ethically, and making responsible decisions ([Trixa & Kaspar, 2024](#)). These learning experiences strengthen civic skills because they require learners to actively apply civic knowledge in real-world situations ([Merjovaara et al., 2024](#)). Consequently, civic skills become more directly associated with responsible digital citizenship than civic knowledge, as behavioural competence emerges through experience rather than through cognitive understanding alone.

The present findings are also consistent with ([Choi, 2016](#)) Digital Citizenship Framework, which conceptualises digital citizenship as a multidimensional construct integrating cognitive, ethical, and participatory competencies rather than technological proficiency alone. Recent studies in teacher education have likewise emphasised that digital citizenship extends beyond technological proficiency and requires the integration of civic, ethical, and participatory competences within authentic educational contexts ([Örtegren & Olofsson, 2024](#)). In this framework, responsible digital citizenship is demonstrated through critical participation, ethical communication, and informed civic engagement, all of which rely heavily on applied competencies ([Örtegren, 2024](#)). Therefore, the stronger predictive contribution of civic skills observed in this study is theoretically plausible because digital citizenship is ultimately manifested through behaviour rather than through declarative knowledge. This interpretation extends previous empirical studies that primarily reported statistical associations by providing a theoretical explanation of why civic skills represent a more proximal predictor of digital citizenship among pre-service elementary school teachers, thereby reinforcing recent evidence that teacher education should prioritise the development of digital and socio-civic competences alongside conceptual civic knowledge ([Guerrero Elecalde et al., 2024](#)).

Beyond Civic Competence

Although the regression model explained 38.7% of the variance in digital citizenship, a substantial proportion of the variance (61.3%) remained unexplained, indicating that digital citizenship is influenced by a broader set of contextual and individual factors beyond civic competence alone. This finding supports the conceptual perspective proposed in Figure 1, which positions civic knowledge and civic skills as enabling conditions rather than sufficient determinants of digital citizenship. From an ecological perspective, responsible digital citizenship develops through the interaction between individual

competencies and the surrounding educational, technological, and social environments rather than through personal competencies in isolation. Several contextual factors may account for the remaining unexplained variance. First, digital literacy equips individuals with the ability to access, evaluate, and utilise digital information critically (Tnibar-Harrus & Latorre-Medina, 2025), thereby strengthening responsible participation in digital environments (Ng, 2012; Siddiq et al., 2016; UNESCO, 2023). Second, digital self-efficacy influences learners' confidence in applying digital technologies ethically and effectively, which in turn affects their willingness to engage in responsible online behaviour (Inamorato dos Santos et al., 2023; Jones et al., 2024). Third, online learning experiences and institutional support create authentic opportunities for students to develop civic participation (Momdjian et al., 2025), digital collaboration, and ethical decision-making through meaningful educational practices (Zhang et al., 2026). These contextual variables were intentionally not included in the present study because the primary objective was to examine the foundational contribution of civic knowledge and civic skills as enabling conditions for digital citizenship. Nevertheless, the unexplained variance observed in the regression model suggests that future studies should develop more comprehensive models by integrating civic competence with digital literacy, digital self-efficacy, technology access, institutional support, and digital culture (Çemcem et al., 2023). Such an approach may provide a more holistic explanation of digital citizenship development among pre-service elementary school teachers.

Implications for Teacher Education

The present findings have important implications for teacher education, particularly for the design of civic education curricula in elementary teacher preparation programmes. Since civic skills demonstrated a stronger association with digital citizenship than civic knowledge, learning experiences should extend beyond the transmission of civic concepts and place greater emphasis on the active application of civic competence in authentic digital contexts. This pedagogical orientation is consistent with authentic learning and experiential learning approaches (Moynihan et al., 2026), which emphasise that meaningful competencies are developed through participation in real-world tasks, collaborative problem-solving, critical reflection, and socially situated learning (Oliver et al., 2007). Accordingly, civic education courses should provide structured opportunities for pre-service teachers to engage in project-based learning, digital collaboration, critical evaluation of online information, ethical decision-making, and reflective participation in digital communities (Ohle-peters et al., 2024). These experiences are expected to strengthen not only civic knowledge but also the practical competencies required for responsible digital citizenship (Falloon, 2020; Redecker, 2017; Tondeur et al., 2016). Consequently, the integration of civic competence and digital citizenship should become an essential component of teacher education curricula to prepare future elementary school teachers who are capable of fostering democratic, ethical, and responsible digital participation among their students.

Contribution to the Literature

Beyond demonstrating statistically significant relationships, this study offers a conceptual contribution by positioning civic knowledge and civic skills as enabling conditions rather than deterministic predictors of digital citizenship. Unlike many previous regression-based studies that primarily focused on identifying significant predictors, the present study argues that civic competence provides the foundational capacities that facilitate the development of responsible digital citizenship but does not independently determine it. This perspective acknowledges that digital citizenship emerges through the interaction between civic competence and broader contextual influences, including digital literacy, digital self-efficacy, institutional support, technology access, and digital culture. Accordingly, the findings encourage future research to develop more comprehensive explanatory models that integrate both individual competencies and contextual factors (Zeng et al., 2025). Such models may provide a deeper understanding of how responsible digital citizenship is developed among pre-service teachers and contribute to the advancement of civic education research in the digital era. From a practical perspective, this conceptualisation also offers a foundation for designing teacher education curricula that integrate civic competence with authentic digital learning experiences to prepare future elementary school teachers for responsible participation in increasingly complex digital societies.

CONCLUSION

This study demonstrates that civic knowledge and civic skills are significantly associated with digital citizenship among pre-service elementary school teachers. Rather than functioning as deterministic

predictors, both dimensions of civic competence should be understood as enabling conditions that support the development of responsible digital citizenship. The findings further indicate that civic skills have a more proximal association with digital citizenship than civic knowledge, highlighting the importance of translating civic understanding into authentic civic participation, ethical decision-making, and responsible engagement in digital environments.

Conceptually, this study extends previous regression-based research by proposing an enabling conditions perspective, which emphasises that digital citizenship develops through the interaction between civic competence and broader contextual factors rather than through civic competence alone. Practically, the findings suggest that teacher education programmes should integrate civic competence with authentic digital learning experiences, including project-based learning, digital collaboration, critical information evaluation, and ethical participation in online communities. Future research is encouraged to develop more comprehensive explanatory models by incorporating contextual variables such as digital literacy, digital self-efficacy, institutional support, technology access, and digital culture to obtain a more holistic understanding of digital citizenship development among future teachers.

LIMITATIONS AND FUTURE RESEARCH

This study has several limitations that should be considered when interpreting the findings. The relatively small sample size, purposive sampling technique, cross-sectional correlational design, and reliance on self-report measures limit the generalisability of the findings and preclude causal inferences regarding the relationships among civic knowledge, civic skills, and digital citizenship. In addition, although the proposed model explained a meaningful proportion of digital citizenship, a substantial amount of variance remained unexplained, suggesting that other contextual factors, such as digital literacy, digital self-efficacy, institutional support, technology access, digital culture, and online learning experiences, may also play important roles. Therefore, future research is encouraged to employ larger and more diverse samples, probability sampling techniques, longitudinal or experimental designs, and more comprehensive explanatory models integrating both individual competencies and contextual factors to provide a deeper understanding of digital citizenship development among pre-service teachers.

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