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The Influence of Social-Emotional Learning (SEL) in Understanding the Concept of Digital Citizenship

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Abstract

Digital transformation demands that teachers act as role models and character builders for the digital native generation. However, digital literacy approaches that have focused primarily on technical and instrumental aspects are considered insufficient for fostering responsible digital citizens. This study aims to analyze the influence of Social-Emotional Learning (SEL) on the understanding of Digital Citizenship concepts among students in the Teacher Professional Education Program (PPG) specializing in Primary School Teacher Education (PGSD). The research employed a correlational design with a sample of 200 PPG–PGSD students. Data were collected using a closed-ended questionnaire and analyzed using simple linear regression, following preliminary assumption tests. The results indicate a highly significant influence of SEL on the understanding of Digital Citizenship concepts (β = 0.995, $p < 0.001$), with a coefficient of determination $R^2 = 0.989$. Normality and heteroscedasticity tests showed that the data were normally distributed but exhibited heteroscedasticity. The implication of this study is that developing SEL competencies within the teacher education curriculum represents a crucial strategy for preparing prospective teachers who are not only digitally proficient but also socially and emotionally mature enough to lead digital transformation in educational settings.

INTRODUCTION

Background of the Study

The era of the Industrial Revolution 4.0 and Society 5.0 has brought massive transformative impacts to the global educational ecosystem, including in Indonesia. This digital transformation not only shifts the learning paradigm from conventional to digital through the adoption of various Learning Management Systems (LMS) and educational applications, but has further reconfigured the entire landscape of social interaction and information flow within academic environments (Polizzi, 2020; Quraishi et al., 2024). Teachers and pre-service teachers no longer function merely as disseminators of knowledge; rather, they are required to become competent navigators amid the massive and complex waves of digital information. They must equip students with the ability to filter, analyze, and use information wisely and responsibly.

In this new context, the traditional concept of digital literacy, which focuses on operational technical competencies (the "how to"), is considered inadequate. A new imperative has emerged: comprehensive mastery of the Digital Citizenship concept (Martin et al., 2019). This concept, as defined by Ribble (2015), goes beyond the mere ability to use technological devices; it encompasses norms of appropriate and responsible behavior related to technology use. Digital Citizenship includes a more holistic understanding, covering the dimensions of ethics in interaction (digital etiquette), self-protection (digital security), responsibility for one's actions (digital responsibility), and positive, critical participation in digital society (digital rights and literacy) (Amalia et al., 2025; Hidayat et al., 2024). Thus, Digital Citizenship is not about mastery of tools but rather about the cultivation of individual character within the digital space (Mattson, 2016).

For elementary school teachers, this responsibility becomes particularly crucial because they are the primary figures shaping the mindsets and character of students (who are the digital native generation) at the most fundamental stage (Kim & Choi, 2018; Hidayat, 2025). Elementary school teachers not only serve as instructors of technical skills but, more importantly, act as role models and primary agents of character formation for students in navigating the digital world (Zulmi & Natuna, 2025). Misunderstandings or misapplications of digital citizenship can have serious implications, not only for the teachers themselves but also for the students under their care. Every action and word spoken by teachers in the digital space, both inside and outside the classroom, serves as a tangible example for their students. Therefore, teachers' deep understanding of the Digital Citizenship concept is an absolute prerequisite for creating a safe, ethical, and productive digital ecosystem within the school environment, which will ultimately cultivate good digital citizens for the future (York, 2022).

Problem of the Study

Behind its positive potential, the digital space has become a new arena for the emergence of various forms of ethical and social norm violations that directly contradict educational values (Masur et al., 2021; Tsotniashvili, 2024). Field realities show that primary school teachers and students are not immune to the threats of cyberbullying, hate speech, plagiarism, and the formation of negative digital footprints (Hinduja & Patchin, 2019; Pyżalski et al., 2022; Rumiati et al., 2023). Primary school students, although still young, are already very familiar with gadgets and social media, making them vulnerable to becoming either victims or perpetrators of cyberbullying, the psychological impacts of which can be more severe and permanent than conventional bullying (Monks et al., 2012). On the other hand, teachers themselves often become targets of hate speech from parents or even their own students through anonymous platforms, which can potentially diminish their authority and teaching motivation (Oksanen et al., 2022; Marolla-Gajardo & Riquelme Plaza, 2025). This condition indicates a wide gap between mastery of technical digital skills and the understanding and internalisation of responsible digital citizenship values. However, this practical gap has not been adequately addressed by existing research literature. Most previous studies have still focused on the technical and cognitive aspects of digital literacy, while empirical research explicitly examining the role of affective competencies, such as Social-Emotional Learning (SEL), in bridging this gap remains very limited (Jones & Mitchell, 2016; Schultze-Krumbholz et al., 2020). In other words, there is a research gap between the urgent need to build responsible Digital Citizenship on one hand, and the scarcity of empirical evidence on how social-emotional competencies as the foundation for value internalisation, can systematically influence the understanding and practice of digital citizenship among pre-service teacher populations.

The fundamental problem that can be identified is that Digital Citizenship education approaches have thus far tended to be instrumental and normative in nature. Their focus often lies on memorising rules and prohibitions (for example, 'do not share passwords' and 'do not bully'), rather than on building character and social-emotional competencies that serve as the foundation for such ethical behaviour (Jones & Mitchell, 2016; Ribble, 2015). Knowledge of what is right (knowing what) does not automatically become internalised as a value and then manifest in the action of doing what is right (doing what) without the support of abilities to manage emotions (such as anger and frustration on social media), to empathise with victims (victim empathy), and to make responsible decisions in complex situations (Schultze-Krumbholz et al., 2020). In other words, efforts to build effective Digital Citizenship require more than just instruction; they require an approach that touches the affective domain and builds individuals' social-emotional intelligence.

This social-emotional competence functions as a critical bridge connecting cognitive knowledge with responsible, concrete action. Although the theoretical role of SEL as such a bridge has been acknowledged, empirical evidence examining this role in the context of digital citizenship among pre-service teacher populations remains very limited, creating the research gap that motivates this study. A teacher may know that sharing unverified information is wrong, but without self-management skills to control the impulse to share and responsible decision-making skills to fact-check, they may still be swept along and spread hoaxes. Similarly, without social awareness in the form of empathy, knowledge of the dangers of cyberbullying is insufficient to prevent a student from joining in online mockery of a peer. Therefore, explicitly integrating SEL into teacher education curricula is no longer an option but a necessity to ensure that pre-service teachers not only have conceptual understanding but also possess the character and emotional intelligence to practice and model good Digital Citizenship (Villar-Onrubia et al., 2022).

Research's State of the Art

The concept of digital citizenship has developed significantly as digital technology penetrates ever more deeply into all aspects of societal life. Fundamentally, digital citizenship is defined as an individual's ability to use digital technology responsibly, ethically, and participatively in community life, whether at the local, national, or global level (Örtegren 2022; Örtegren 2024). This definition goes beyond mere operational technical skills; it encompasses the knowledge, attitudes, values, and skills necessary for a person to act as a citizen in the digital era (Pucelj & Bohinc, 2025). Through its Digital Citizenship Education (DCE) framework, the European Council formulates four main dimensions of digital citizenship: (1) the ability to use digital technology positively for various activities (creation, work, sharing, social interaction, investigation, play, communication, and learning); (2) active and responsible participation in communities at different levels (local, national, global) while upholding democratic values; (3) engagement in lifelong learning through formal, non-formal, and informal pathways; and (4) a sustained commitment to upholding human dignity (Li, 2024).

In the academic literature, several dominant conceptual models are used to understand digital citizenship. Ribble (2015) proposed a model of nine interrelated elements, including digital access, digital commerce, digital communication, digital literacy, digital etiquette, digital law, digital rights and responsibilities, digital health and wellness, and digital security. Meanwhile, Choi and Choi (2025) colleagues developed a more integrated model with four main categories: digital ethics, digital security, positive participation, and critical literacy. The validity of this model has been empirically tested through the development of a Digital Citizenship scale (Pucelj & Bohinc, 2025). Recent developments in digital citizenship research highlight the importance of a postdigital perspective, which rejects a strict separation between online and offline realms and acknowledges that digital and non-digital life have now become inextricably intertwined (Örtegren 2022; Örtegren 2024). This approach is increasingly relevant given the emergence of new challenges such as algorithm-mediated disinformation, deepfakes, generative artificial intelligence, and the dynamics of political participation in the digital space, all of which are reshaping the very meaning of citizenship (Sahin Bayzan, 2025; Pucelj & Bohinc, 2025).

SEL has emerged as a key paradigm in 21st-century education and has proven effective in mitigating various learning challenges. The extensive meta-analysis conducted by Durlak et al. (2011) and Nadiyah et al. (2025) serves as a primary empirical foundation; it concluded that student participation in structured SEL programs not only produces significant improvements in academic achievement (an average of 11 percentile points) but also substantially reduces behavioural problems and emotional distress while simultaneously enhancing pro-social attitudes. The effectiveness of SEL is rooted in its development of five interrelated core competencies, as formulated by the Collaborative for Academic, Social, and Emotional Learning (Devaney et al., 2006): (1) self-awareness: recognising one's emotions, thoughts, and values; (2) self-management: regulating one's emotions, behaviour, and self-motivation; (3) social awareness: being able to empathise and understand others' perspectives;

(4) relationship skills: building and maintaining healthy relationships; and (5) responsible decision-making: making constructive choices in personal and social interactions.

The positive effects of mastering these competencies extend into the digital domain. Recent research has begun to demonstrate a strong correlation between social-emotional capacity and more ethical and responsible online behaviour. A study by Salem et al. (2023) found that empathy (social awareness) is a significant protective factor against adolescent involvement in cyberbullying. The higher an individual's level of empathy, the less likely they are to become a perpetrator of cyberbullying. Similar findings were reported by Rus et al. (2025), showing that self-management skills and responsible decision-making are strong predictors of individual resilience against misinformation and impulsive behaviour on social media. This indicates that SEL competencies not only apply in the real world but are also transferable and serve as a critical foundation for the development of good Digital Citizenship.

Gap Study and Objective

Although the theoretical foundation concerning the relationship between social-emotional competencies and digital behaviour has begun to be established, two significant research gaps remain. First, empirical studies that explicitly and comprehensively link all five core SEL competencies (self-awareness, self-management, social awareness, relationship skills, and responsible decision-making) to the full dimensions of Digital Citizenship (digital ethics, digital security, positive participation, critical literacy, and social responsibility) remain very limited. Second, no study has specifically examined this relationship among students in the Teacher Professional Education Program, who are pre-service teachers that will become the frontline of digital character education in primary schools. Most previous research, such as that conducted by Güçlü-Aydoğan (2025), has tended to focus on the correlation between one aspect of SEL (e.g., empathy) and one type of digital behaviour (e.g., cyberbullying). Chen's (2024) study examined the relationship between general SEL competencies and problematic internet use and bullying victimisation but did not specifically measure all dimensions of Digital Citizenship. Similarly, research by von Gillern et al. (2024) explored pre-service teachers' perspectives on Digital Citizenship but did not explicitly link these to a structured SEL framework. Studies on digital emotional intelligence Audrin et al., (2025) have indeed touched upon affective aspects of digital interaction but have not yet been integrated into the holistic SEL framework as formulated by CASEL (2020). In other words, a gap exists between the current partial understanding and the need to examine this relationship more holistically and integratively.

Another critical gap is the scarcity of research targeting students in the Teacher Professional Education Program (PPG), a strategic population that has escaped researchers' attention even though these pre-service teachers will become the frontline of digital character education in primary schools. Consequently, findings from other populations cannot be generalised to the PPG context. Most studies on Digital Citizenship and SEL have focused on secondary school or university students (Choi et al., 2017; Tomar & Garg, 2022). Jarupongputtana et al. (2022) examined how community-based learning enhances digital citizenship competencies among pre-service teachers in Thailand but did not link these competencies to SEL. Penelitian Tus sa'diah et al. (2025) discussed civic education's role in shaping students' moral character in the digital era without specifically targeting pre-service teachers. Similarly, Agus et al. (2025) investigated Digital Citizenship implementation in Indonesian secondary schools, but their subjects were students and in-service civics teachers, not PPG students. Yet, PPG students hold a unique and critical position: they are pre-service teachers being prepared to enter teaching practice directly and will become the frontline for instilling Digital Citizenship values in the younger generation. Their understanding and competencies will directly impact hundreds of future students. Therefore, examining how SEL influences Digital Citizenship understanding within this group is not only relevant but urgently needed to ensure their readiness for digital era classrooms.

To address the two identified gaps (lack of comprehensive studies and scarcity of research on this population), this study aimed to analyse the influence of SEL on Digital Citizenship understanding among students in the Teacher Professional Education Program specialising in Primary School Teacher Education. The findings are expected to provide empirical contributions for developing a more responsive teacher education curriculum that strengthens pre-service teachers' Digital Citizenship competencies.

METHOD

Type and Design

This study employed a quantitative approach with an explanatory research design. We selected this approach to examine relationships between variables through numerical measurement and statistical analysis (Creswell & Creswell, 2017). The study used a correlational survey design to assess the effect of the independent variable (SEL) on the dependent variable, which was participants' understanding of Digital Citizenship concepts.

Data and Data Sources

The study population comprised all students enrolled in the Teacher Professional Education Program (Primary School Teacher Education Study Program) at three Muhammadiyah universities in Indonesia: MS University (180 students), MC University (120 students), and MG University (100 students), resulting in a total population of 400. We employed proportional random sampling using the Slovin formula with a 5% margin of error (Sugiyono, 2016) to obtain a sample of 200 respondents, of whom 156 were female and 44 were male. Table 1 presents the age range of the respondents.

Table 1. Age Range of Respondents

Age Range	Frequency	Percentage
22-24 years	68	34%
25-27 years	92	46%
28-30 years	40	20%
Total	**200**	**100%**

In addition, Table 2 presents the sample allocation details per university.

Table 2. Sample Allocation per University

University	Population	Sample Calculation	Sample	Rounding
MS	180	(180/400) x 200	90	90
MC	120	(120/400) x 200	60	60
MG	100	(100/400) x 200	50	50
Total	**400**		**200**	**200**

Data Collection Technique

Data were collected using a closed ended questionnaire with a 5 point Likert scale. The questionnaire was administered online over a period of one month. Permissions were obtained by sending a letter to the administrators of the Teacher Professional Education Program at the three universities that served as the research locations. The SEL instrument was adapted from the CASEL Framework (2020) and consisted of 25 items. For each statement, respondents could choose from the following options: strongly disagree (score 1), disagree (score 2), neutral (score 3), agree (score 4), and strongly agree (score 5). A description of each indicator is in Table 3 below (CASEL, 2020).

Table 3. Social-Emotional Learning Indicators and Descriptions

Indicator	Description
Self-awareness	An individual's ability to recognise their own emotions, thoughts, and values, and to understand how these factors influence behaviour and performance. This indicator includes sub-indicators such as understanding one's own strengths and weaknesses, as well as self-efficacy.
Self-management	The ability to regulate one's emotions, thoughts, and behaviours effectively in various situations. This indicator includes sub-

Indicator	Description
	indicators such as impulse control, stress management, goal setting and achievement, and intrinsic motivation.
Social awareness	The ability to understand and empathise with others from different cultural and social backgrounds and perspectives. This indicator includes sub-indicators such as empathy, appreciation of diversity, understanding of social norms, and concern for issues of injustice.
Relationship skills	The capacity to establish and sustain healthy, supportive relationships with individuals and groups. Key sub-indicators include effective communication, cooperation, conflict resolution, and the ability to seek or provide assistance.
Responsible decision-making	The ability to make constructive and ethical choices after analysing the consequences of various alternative actions. This indicator includes sub-indicators such as considering the impact on oneself and others, evaluating options objectively, and being accountable for decisions made.

Table 4 shows that the instrument for understanding Digital Citizenship concepts was adapted from the Digital Citizenship Scale (Choi et al., 2018) and consisted of 20 items.

Table 4. Indicators of Digital Citizenship Concept Understanding and Descriptions

Indicator	Description
Digital Ethics	An individual's capacity to apply moral principles and social norms when interacting within the digital environment. This indicator comprises sub-indicators such as respecting privacy rights, maintaining probity in the sharing of information, avoiding the spread of false content (hoaxes), and acknowledging the work of others through accurate citation.
Digital Security	An individual's ability to protect themselves, their data, and their digital devices from potential cyber threats. This indicator includes sub-indicators such as managing strong passwords, identifying digital fraud (phishing, scams), understanding digital footprints, and using security tools such as antivirus and firewall software.
Positive Participation	An individual's ability to contribute constructively to digital communities. This indicator includes sub-indicators such as participating in healthy discussions, sharing educational resources, building collaborative networks, and advocating for beneficial social issues.
Critical Literacy	An individual's ability to analyse, evaluate, and verify digital information critically. This indicator includes sub-indicators such as assessing source credibility, identifying bias or information manipulation, understanding digital regulations , and distinguishing between fact and opinion.
Social Responsibility	An individual's awareness of contributing to creating a safe and ethical digital environment for all users. This indicator includes sub-indicators such as reporting illegal or harmful content, supporting victims of cyberbullying, promoting tolerance and inclusivity, and maintaining a balanced use of technology for mental well-being.

The validity of the two aforementioned instruments was evaluated using Pearson's Product-Moment correlation, and reliability was assessed using Cronbach's Alpha, based on a preliminary study involving 30 respondents. The results are presented in Table 5 below.

Table 5. Results of Instrument Validity and Reliability

Instrument	Number of Items	Range of r-count (Validity)	Cronbach's Alpha (Reliability)	Remarks
Social-Emotional Learning	25	0,374 - 0,745	0,945	Valid and Reliable
Digital Citizenship	20	0,378 - 0,756	0,932	Valid and Reliable

Data Analysis

The data were analyzed using the following procedures: (1) Descriptive statistics to describe the data characteristics for each variable. Specifically, for SEL, a 0–100 converted score was utilized; (2) Prerequisite analysis tests, which included a normality test using the Shapiro-Wilk test to assess residual normality. The selection of the Shapiro-Wilk test was based on the consideration that it possesses higher statistical power compared to other normality tests (such as the Kolmogorov-Smirnov test), particularly for relatively small to medium sample sizes (n ≤ 2000) (Ghaith et al., 2025). Furthermore, a heteroscedasticity test was conducted using the Breusch-Pagan test, which is the most common method employed to detect heteroscedasticity. This test operates by regressing the squared residuals on the independent variable (Akewugberu et al., 2024), and (3) Simple linear regression analysis to examine the effect between the variables (Ghozali, 2013). His study employed a simple linear regression model with the following equation.

$$Y = a + bX + e$$

Where:

Y = Understanding of the Digital Citizenship concept (dependent variable)

a = Constant (intercept), the value of *Y* when *X* = 0

b = Regression coefficient of the SEL variable, indicating the magnitude of change in *Y* for every one-unit change in *X*

X = Social-Emotional Learning (SEL) (independent variable)

e = Error term (residual)

RESULTS

Based on the results of the descriptive analysis of the SEL variable from a sample of 200 students in the Teacher Professional Education Program, Primary School Teacher Education Study Program, the following interpretation is presented.

Table 6. Descriptive Analysis of Social-Emotional Learning

Social-Emotional Learning	
N	200
Missing	0
Mean	82.4
Median	81.6
Standard deviation	11.4
Minimum	64.8
Maximum	100

Table 7. Distribution Shape Statistics of Social-Emotional Learning Data

Statistic	Value	Standard Error	Ratio (Value/SE)	Interpretation
Skewness	0.324	0.172	1.88	Nearly symmetric (approaching 0)
Kurtosis	-0.287	0.342	-0.84	Slightly platykurtic (flatter)

Based on Tables 6 and 7 above, the mean SEL score was 82.4 (SD = 11.4), with a score range of 64.8 to 100. To accurately identify the shape of the data distribution, skewness and kurtosis coefficients were calculated. The analysis results show that the SEL data had a skewness coefficient of 0.324 (SE = 0.172) and a kurtosis coefficient of -0.287 (SE = 0.342). The positive skewness value

approaching zero indicates that the data distribution is nearly symmetric, while the negative kurtosis value indicates a slightly platykurtic distribution (flatter than a normal distribution). The ratio of skewness to its standard error is 1.88 (< |1.96|), meaning that the skewness is not statistically significant at the 95% confidence level. Thus, although there is a small descriptive difference between the mean (82.4) and the median (81.6), the SEL data statistically satisfy the normality assumption for parametric analysis (Figure 1).

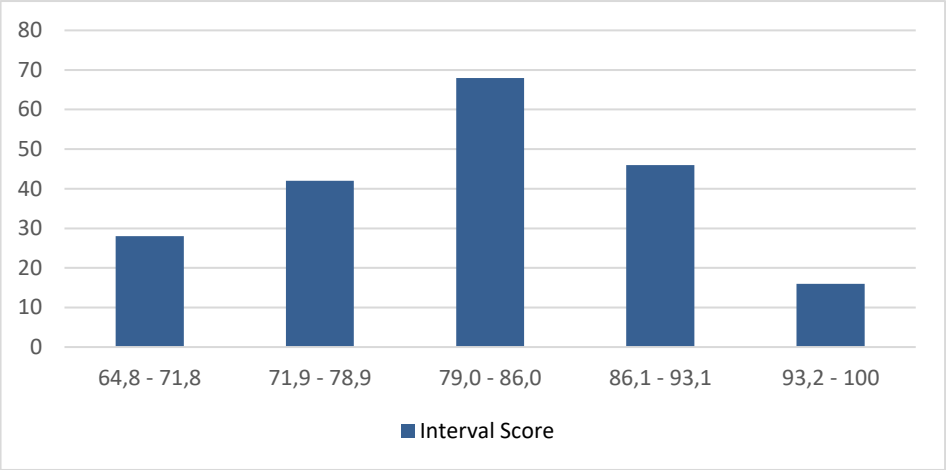

Figure 1. Grouped Frequency Distribution of Social-Emotional Learning

Based on the results of the descriptive analysis of the Digital Citizenship variable from a sample of 200 students, the following interpretation is presented.

Table 8. Descriptive Analysis of Digital Citizenship

	Digital Citizenship
N	200
Missing	0
Mean	82.5
Median	82.0
Standard deviation	10.9
Minimun	66
Maximum	100

Table 9. Distribution Shape Statistics of Digital Citizenship Data

Statistic	**Value**	**Standard Error**	**Ratio (Value/SE)**	**Interpretasi**
Skewness	0.218	0.172	1.27	Nearly symmetric, not significant
Kurtosis	-0.156	0.342	-0.46	Mildly platykurtic, not significant

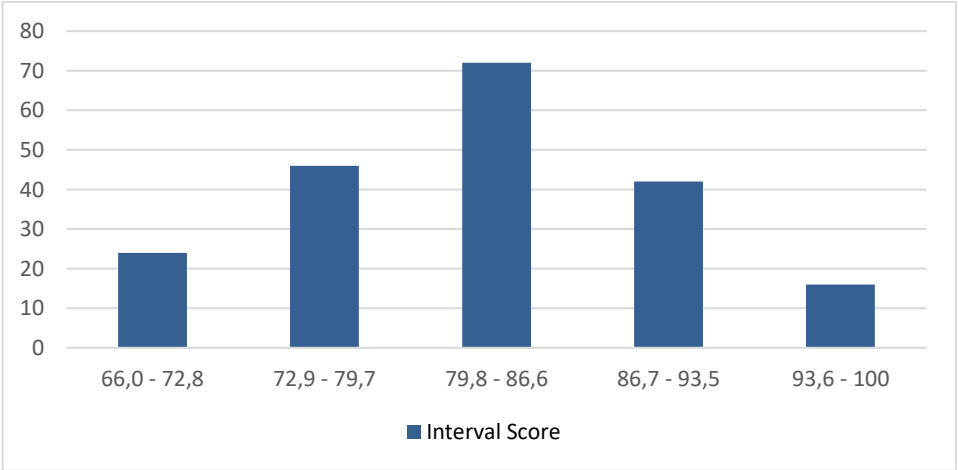

Figure 2. Grouped Frequency Distribution of Digital Citizenship Scores

As shown in Tables 8 and 9, the mean Digital Citizenship score was 82.5 (SD = 10.9), with scores ranging from 66.0 to 100. To accurately assess the shape of the data distribution, skewness and kurtosis coefficients were calculated. The results revealed a skewness coefficient of 0.218 (SE = 0.172) and a kurtosis coefficient of -0.156 (SE = 0.342). The small positive skewness value (0.218) suggests that the distribution is nearly symmetric, whereas the negative kurtosis value (-0.156) indicates a slightly platykurtic distribution, meaning it is flatter than a normal distribution. The ratio of skewness to its standard error is 1.27, which is less than the critical value of |1.96|. This indicates that the skewness is not statistically significant at the 95% confidence level. Consequently, the Digital Citizenship data satisfy the normality assumption required for parametric analysis (see Figure 2).

Subsequently, preliminary assumption tests, including tests for normality and heteroscedasticity, were conducted to ensure the scientific rigour and reliability of the findings. The results are presented below.

Table 10. Normality Test

	Statistic	p
Shapiro-Wilk	0.555	0.875

As shown in Table 10, the Shapiro-Wilk statistic was 0.555 with a p-value of 0.875. Because the p-value (0.875) exceeds the alpha level of 0.05, the null hypothesis (H0) is accepted, indicating that the data are statistically normally distributed. The Shapiro-Wilk value approximates 1.0 (0.555) with a non-significant p-value, confirming that the regression model residuals are normally distributed. Thus, the normality assumption for parametric analysis is met.

Table 11. Heteroscedasticity Test

	Statistic	p
Breusch-Pagan	0.802	0.862

As shown in Table 11, the test statistic was 0.802 with a p-value of 0.862. Because the p-value (0.862) exceeds $\alpha = 0.05$, the null hypothesis is retained, indicating no evidence of heteroscedasticity in the regression model. The residual variance is therefore constant across observations (homoscedasticity), the residuals are randomly distributed without any systematic pattern, and the homoscedasticity assumption for linear regression is satisfied.

A simple linear regression analysis was conducted to examine the effect of SEL on the understanding of Digital Citizenship. The results are presented below.

Table 12. Overall Model Fit

			Overall Model Test			
Model	R	R^2	F	df1	df2	p
1	0.995	0.989	18524	1	198	<.001

As shown in Table 12, the regression model demonstrates a strong capacity to predict Digital Citizenship. Specifically: (a) an R value of 0.995 indicates a near-perfect relationship between SEL and Digital Citizenship; (b) an R^2 value of 0.989 indicates that 98.9% of the variance in Digital Citizenship understanding is explained by SEL; and (c) the F-test yields a highly significant value ($F = 18524$, $p < 0.001$), confirming that the model is statistically significant and suitable for prediction.

Table 13. Regression Coefficients

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept	4.239	0.58049	7.30	<.001	0.995
Social-Emotional Learning	0.949	0.00698	136.10	<.001	

As shown in Table 13, both the intercept (constant) and the SEL coefficient are statistically significant (intercept = 4.239, *p* < .001; SEL coefficient = 0.949, *p* < .001). The interpretation is as follows: a one-unit increase in the SEL score is associated with a 0.949-unit increase in the understanding of Digital Citizenship. The standardized estimate (β = 0.995) indicates a very strong, near-perfect effect of SEL on Digital Citizenship. The t-value for the SEL coefficient is 136.10 (*p* < .001), demonstrating that this effect is statistically highly significant.

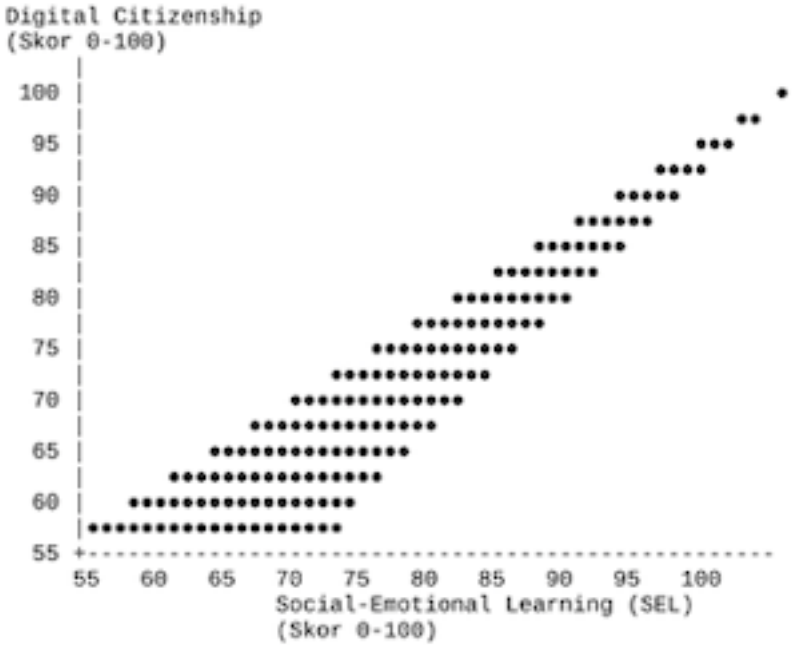

Figure 3. Scatter plot of the relationship between Social-Emotional Learning (SEL) and Digital Citizenship

Based on the Table 13 simple linear regression analysis, the following conclusions can be drawn: (1) SEL has a very strong effect on the understanding of Digital Citizenship among pre-service teachers in the Teacher Professional Education program specialising in Primary School Teacher Education; (2) the regression model is robust, explaining 98.9% of the variance in Digital Citizenship; (3) improvements in SEL competence are associated with nearly equivalent improvements in Digital Citizenship understanding; and (4) the research hypothesis is accepted: SEL exerts a positive and significant effect on the understanding of Digital Citizenship.

DISCUSSIONS

This study was designed to address the primary research question: Does Social-Emotional Learning influence the understanding of Digital Citizenship among students enrolled in the Teacher Professional Education programme specialising in Primary School Teacher Education?. The simple linear regression results provide an affirmative answer. SEL exerts a highly significant positive effect on Digital Citizenship understanding (β = 0.995, *p* < .001, R^2 = 0.989). Higher SEL competence is associated with a more profound grasp of Digital Citizenship. Two critical aspects emerge. First, the contribution of SEL to Digital Citizenship is substantial, with a coefficient of determination of 98.9%, indicating that nearly all variance in Digital Citizenship understanding is accounted for by SEL competence. Second, the five core SEL competencies (self-awareness, self-management, social awareness, relationship skills, and responsible decision-making) collectively serve as a foundational framework for ethical and responsible digital behaviour.

These findings corroborate relevant previous research at both international and national levels. First, they align with the work of Schultze-Krumbholz et al. (2020) who found that core SEL competencies, particularly social awareness and responsible decision-making, are strong predictors of ethical online behaviour. Their research demonstrates that empathy prevents involvement in cyberbullying, whilst responsible decision-making enhances resilience against digital misinformation (Ananto & Ningsih, 2023; Prasetiyo, 2023; Yosep et al., 2023). Second, the results reinforce the

argument advanced by Jones and Mitchell (2016) that responsible digital behaviour cannot be cultivated solely through technical-instrumental learning but instead requires a mature foundation of SEL competencies. The present study's finding that SEL explains 98.9% of the variance in Digital Citizenship provides robust empirical support for this position. Third, this study confirms Prasetiyo (2023) findings regarding the importance of developing Digital Citizenship competencies among Indonesian pre-service teachers through project-based learning. However, the current study extends those findings by demonstrating that the effectiveness of such pedagogical approaches is heavily contingent upon pre-service teachers' existing level of SEL competence. Fourth, these results corroborate Ananto & Ningsih (2023) who emphasise that civic education in the digital era must integrate socio-emotional character development as an integral component rather than a mere supplement. Their study highlights that moral awareness in the digital era is a multidimensional construct encompassing empathy, digital responsibility, and ethical reflection (Pandikar et al., 2025). Fifth, the findings are consistent with Perla et al. (2022), who stress that teachers require specialised training to integrate the digital dimension into civic education. The present study suggests that such training would be markedly more effective if preceded or accompanied by the reinforcement of pre-service teachers' SEL competencies.

To clarify the position of the present study within the extant body of literature, a comparative analysis with several pertinent antecedent investigations is presented below. A study conducted by Prasetiyo (2023) concerning Digital Citizenship Competency cultivated through Project-based Learning amongst pre-service teachers in Indonesia evinces a distinct focus relative to the current enquiry. Whereas Prasetiyo primarily emphasised the efficacy of project-based learning methodologies in augmenting comprehension of Digital Citizenship, the present study specifically examines the influence exerted by Social-Emotional Learning (SEL) competencies upon this understanding. A further fundamental distinction resides in the research methodology employed. Prasetiyo adopted a qualitative approach utilising a case study design, whereas the present study deploys a quantitative methodology predicated upon simple linear regression analysis.

Notwithstanding these divergences, both studies underscore the imperative of fostering Digital Citizenship competencies amongst Indonesian pre-service teachers. The present research, however, advances this premise by demonstrating that the efficacy of Digital Citizenship education is appreciably contingent upon the pre-service teachers' antecedent levels of SEL competency. When interpreted in conjunction with the findings of the present study, Prasetiyo concludes that project-based learning effectively enhances digital citizenship comprehension. This finding suggests that learners' SEL competencies likely mediate the success of these pedagogical interventions. The investigation by Ananto & Ningsih (2023) evinces convergences with the present study with respect to its accentuation of the critical function of socio-emotional dimensions within digital-era pedagogy. Their research highlights that moral consciousness in the digital epoch does not constitute solely a cognitive competency; rather, it embodies a multidimensional construct encompassing empathy, digital responsibility, and ethical reflexivity. Ananto and Ningsih posit that digital citizenship education must integrate socio-emotional character development as an integral constituent, rather than a merely supplementary adjunct.

The primary point of departure, however, concerns the research population. Whereas Ananto and Ningsih centred their analysis upon students and in-service educators, the current study specifically targets students enrolled in Teacher Professional Education that is, pre-service teachers undergoing a transitional phase of professional formation. Moreover, Ananto and Ningsih employed a descriptive qualitative approach, whereas the present study adopts a quantitative framework, thereby facilitating the empirical mensuration of the magnitude of SEL's influence upon Digital Citizenship. Consequently, this research supplements the findings of Ananto and Ningsih by furnishing quantitative substantiation regarding the extent to which SEL competencies contribute to an enhanced understanding of Digital Citizenship.

Haga's (2022) study concerning the "Professional Development Programme for Teachers of Digital Citizenship Education" in Japan maintains a focus distinct from that of the present research.

Whereas Haga emphasises the development of training programmes tailored for in-service educators, this investigation concentrates upon pre-service teachers currently enrolled in the Teacher Professional Education programme. Haga identified that educators require specialised training in order to integrate digital dimensions into citizenship education, a process which simultaneously encompasses pedagogical, technical, and socio-emotional facets. The findings of the present study corroborate Haga's contention by demonstrating that socio-emotional competence functions as a critical foundation for Digital Citizenship comprehension. Nonetheless, this research augments Haga's study by furnishing empirical evidence derived from the Indonesian context, which possesses socio-cultural characteristics appreciably different from those of Japan. Moreover, this investigation quantitatively measures the magnitude of SEL's influence upon Digital Citizenship, an analytical dimension not undertaken within Haga's research.

The DiCE.Lang project, developed by Simões et al. (2024), centres upon the creation of training packages for Digital Citizenship Education within the domain of foreign language instruction. Their research underscores the imperative of cultivating teacher awareness of Digital Citizenship Education through structured and sustained professional development. The divergence from the current study resides in its scope and contextual framing; the research conducted by Simões et al. (2024) constitutes development research and is confined to the subject area of foreign languages, whereas the present enquiry is explanatory in nature and addresses students more broadly. Nevertheless, both studies converge upon the significance of holistic teacher preparation. The outcomes of the present investigation reinforce the recommendations advanced by the DiCE.Lang project, indicating that Digital Citizenship training for educators proves more efficacious when it is either preceded by or accompanied by the fortification of pre-service teachers' SEL competencies.

Recent research undertaken by Ongoren & Burgueño-Lopez (2025) explores the perceptions of social studies pre-service teachers concerning distance learning and digital citizenship skills. This study ascertained that distance learning experiences occasioned by the COVID-19 pandemic heightened pre-service teachers' awareness of the salience of digital citizenship capabilities. The point of departure from the current study resides in the primary emphasis: Ongoren and Burgueño-Lopez concentrate upon perceptions and experiential learning, whereas this enquiry investigates the causal relationship between SEL competencies and Digital Citizenship comprehension. Both studies, however, affirm that pre-service teachers necessitate comprehensive preparation in order to confront digital challenges within the educational milieu. This investigation supplements the findings of Ongoren and Burgueño-Lopez by demonstrating that SEL competence constitutes a pivotal factor in determining the degree to which pre-service teachers may effectively harness their digital experiences to cultivate an understanding of digital citizenship.

In summation, the comparative analysis with antecedent scholarship indicates that the novelty of the present study inheres in three principal dimensions. Firstly, this study specifically scrutinises the impact of SEL upon Digital Citizenship through the deployment of a quantitative methodology incorporating regression analysis, whereas the preponderance of prior investigations adopted qualitative approaches or centred upon programme development. Secondly, this enquiry targets the PPG student cohort, a population that remains comparatively under-researched within the corpus of digital citizenship studies in Indonesia, notwithstanding their role as the vanguard of digital character education within primary schooling. Thirdly, this research furnishes empirical substantiation regarding the substantial contribution of SEL ($R^2 = 0.989$; $\beta = 0.995$) to the comprehension of Digital Citizenship—a relationship that has seldom been subjected to to the comprehension of Digital Citizenship, a relationship that has seldom been subjected to quantitative measurement within the extant literature. Accordingly, this study not only corroborates antecedent findings but also extends both the scope and the depth of understanding concerning the nexus between SEL competencies and Digital Citizenship within the specific context of teacher education in Indonesia.

The findings of this investigation serve to clarify the transformative mechanisms by which Social-Emotional Learning (SEL) exerts influence upon the comprehension of Digital Citizenship concepts. Grounded in both theoretical and empirical analysis, these mechanisms may be explicated through three principal pathways. First Pathway: Emotion Regulation and Impulse Control. Students who possess elevated self-management competencies demonstrate a greater capacity to restrain the impulse to disseminate information without prior verification. As advanced by Hinduja & Patchin

(2018), the ability to regulate negative affective states such as anger and frustration within social media environments constitutes a salient protective factor against cyberbullying behaviours (Prasetiyo, 2023; Ananto & Ningsih, 2023). The outcomes of the present enquiry confirm that such competencies contribute directly and substantively to an enhanced understanding of both digital ethics and digital safety (Kaitatzi-Whitlock, 2021). Second Pathway: Empathy and Social Awareness**.** The capacity for empathy, situated within the broader dimension of social awareness, has proven foundational to constructive participation within the digital sphere. Students who exhibit elevated levels of social awareness display a more pronounced propensity to value the perspectives of others, to extend tolerance towards divergent viewpoints, and to engage more actively in supporting victims of cyberbullying. This finding accords closely with the research outcomes reported by Schultze-Krumbholz et al. (2020) which indicate that empathy constitutes the most robust predictor of prosocial behaviour within digital environments (Prasetiyo, 2023). Third Pathway: Self-Reflection and Awareness of Consequences. Students endowed with well-developed self-awareness competencies are capable of thoughtful reflection upon the ramifications of their digital footprint for long-term reputational standing. The competency of responsible decision-making, moreover, enables them to subject the potential consequences of each prospective digital action to careful analysis prior to its execution.

Within the specific context of teacher education in Indonesia, the findings of this study carry several significant implications. First, the explicit integration of SEL components into the curriculum of Teacher Professional Education ought no longer to be regarded as a merely supplementary adjunct, but rather as a strategic imperative. As has been underscored within the literature addressing Teacher Professional Development for Digital Citizenship Education, the cultivation of teachers' digital competencies demands a holistic approach that simultaneously encompasses technical, pedagogical, and socio-emotional dimensions (Haga, 2022). Second, the Teacher Professional Education programmes are impelled to devise embedded assessment instruments capable of measuring not solely cognitive knowledge pertaining to digital ethics, but also affective competencies such as digital empathy, the regulation of emotion within online interactions, and the exercise of ethical judgement in dilemmatic circumstances. Such an approach aligns with the recommendations advanced by the DiCE.Lang project, which accentuates the importance of fostering teacher awareness of Digital Citizenship Education through structured and sustained professional development (Simões et al., 2024). Third, these findings reinforce the dual role of the teacher as both educator and digital role model. A high level of SEL competency equips teachers to model positive digital behaviours, including respect for privacy, courteous modes of communication, and constructive participation within digital communities, behaviours that will ultimately be emulated by their students (Ananto & Ningsih, 2023). Within the Indonesian milieu, where social media penetration amongst school-age populations is exceptionally elevated, this modelling function assumes an ever-increasing degree of critical importance. Fourth, this research furnishes empirical evidence of direct relevance to the formulation of teacher education policy at the national level. As has been identified in studies examining Digital Citizenship within Indonesia, a discernible gap continues to obtain between policy articulation and practical implementation in the field (Agus et al., 2025; Ananto & Ningsih, 2023). The findings concerning the salience of SEL may therefore serve as a foundation upon which to construct more comprehensive standards of digital competency for teachers.

CONCLUSION

Based on the results of the analysis and subsequent discussion, this study concludes that Social-Emotional Learning has a highly significant positive impact on the conceptual understanding of Digital Citizenship among pre-service teachers in the Elementary School Teacher Education study program within the Teacher Professional Education framework. This finding is demonstrated by a coefficient of determination (R^2) of 0.989, indicating that 98.9% of the variation in Digital Citizenship conceptual understanding can be explained by SEL competencies. Furthermore, a standardized regression coefficient (β) of 0.995 reinforces the nearly perfect contribution between these two variables. The novelty and contributions of this research can be summarized in three main points. First, in terms of

theoretical novelty, this is one of the pioneer studies to empirically test the causal relationship between the five core SEL competencies (self-awareness, self-management, social awareness, relationship skills, and responsible decision-making) and all dimensions of Digital Citizenship simultaneously using a quantitative approach. As most prior research has been partial or qualitative, this study fills that gap with robust empirical evidence. Second, regarding population novelty, this study is a pioneering effort targeting Teacher Professional Education students. This population has largely been overlooked in research concerning the link between SEL and Digital Citizenship, despite their unique and strategic position as prospective teachers about to enter professional practice. Third, this study developed and validated a Digital Citizenship measurement instrument integrated with the SEL framework in the Indonesian teacher education context. This study has several limitations, including the limited sample of PPG students from three Muhammadiyah universities, the use of a cross-sectional design, potential social desirability bias from self-report questionnaires, and the focus solely on the direct influence of Social Emotional Learning (SEL) on Digital Citizenship without considering other mediating or moderating factors. Therefore, future research is recommended to involve broader populations, apply longitudinal and mixed-methods approaches, and test SEL intervention programs experimentally. Despite these limitations, the findings provide important implications for stakeholders by emphasizing the need to integrate SEL competencies into PPG curricula, strengthen the role of lecturers and mentor teachers as positive digital role models, include SEL in teacher competency standards and educational policies, and implement Digital Mentorship programs in elementary schools. Overall, strengthening SEL is considered a strategic effort to enhance Digital Citizenship and support a more ethical, safe, and responsible digital education ecosystem.

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