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Digital literacy as a predictor of mathematics self-concept and teacher competence among mathematics teachers

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ABSTRACT

Digital literacy among teachers remains a critical issue in mathematics education, particularly in promoting effective teaching practices in technology-enhanced learning environments. This study aimed to examine the structural relationships among teachers' digital literacy, mathematics self-concept, and teacher competence. A quantitative explanatory survey design was employed, involving 40 high school mathematics teachers from Subang and Ciamis Regencies, West Java, Indonesia. Participants were selected through purposive cluster sampling via local Mathematics Teachers' Working Groups (MGMP). Data were collected using an online questionnaire and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS. The findings indicate that teachers' digital literacy has a positive and statistically significant effect on mathematics self-concept ($\beta = 0.570$, $p < 0.001$) and teacher competence ($\beta = 0.566$, $p < 0.001$). In contrast, mathematics self-concept does not have a statistically significant direct effect on teacher competence ($\beta = 0.130$, $p = 0.411$). The structural model explains 32.4% of the variance in mathematics self-concept and 42.1% of the variance in teacher competence, indicating moderate explanatory power. These findings suggest that digital literacy plays an important role in shaping teachers' confidence in their mathematical abilities and their professional competence. The study highlights the importance of strengthening teachers' digital literacy through continuous professional development and technology-integrated pedagogical training. Future research should involve larger and more diverse samples to improve the generalizability of the findings.

KEYWORDS

Digital literacy; self-concept; teachers; PLS-SEM; teacher competence

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INTRODUCTION

In the digital era, teachers are increasingly expected to possess strong digital literacy skills to design interactive, inclusive, and technology-enhanced learning environments (Herlina & Istikomah, 2023). Despite substantial investments in educational technologies worldwide, the integration of digital tools into classroom practices remains inconsistent across educational systems. Previous studies have shown that many teachers continue to rely on traditional teaching methods and have not yet fully integrated emerging technologies into their instructional practices (Omar et al., 2020). This limitation is often accompanied by a lack of confidence in using technology effectively for instructional purposes (Possaghi & Papavlasopoulou, 2024). Consequently, technology is frequently used as a supplementary tool rather than being meaningfully integrated into pedagogical practices. Several factors have

been identified as barriers to effective technology integration, including limited professional development opportunities, insufficient institutional support, concerns about pedagogical effectiveness, and a lack of confidence in using digital technologies for teaching and learning.

These challenges are not limited to developing countries; they have also been reported in developed contexts. For instance, Possaghi & Papavlasopoulou (2024), in a study involving primary and middle school teachers in northern Italy, found that teachers experienced varying levels of digital competence, low confidence in using technology, difficulties in assessing digitally mediated learning, and tensions between institutional digitalization policies and classroom realities. In Morocco, Oumelaid et al (2025) reported the growing use of digital classrooms in mathematics education and highlighted the continuing importance of equitable access to technology, adequate teacher training, and instructional quality in technology-enhanced learning environments. In Indonesia, although educational digitalization policies have been implemented, they have not yet resulted in substantial improvements in teachers' digital literacy. Previous studies indicate that teachers' digital literacy in Indonesia remains relatively low, particularly among older teachers (Soeparno & Ismaniati, 2022; Utomo et al., 2021). This situation highlights the continuing need to understand the factors associated with teachers' digital literacy and its potential contribution to other professional and psychological dimensions of teaching.

Digital literacy encompasses the knowledge, skills, attitudes, and values that enable individuals to participate effectively, critically, and ethically in the digital world (Nogueira et al., 2022). It involves not only the technical skills required to operate digital media but also the ability to critically understand media content, recognize the social contexts in which digital technologies are used, and participate ethically and effectively in digital environments (Mikkelsen & Chapagain, 2023). In educational contexts, digital literacy comprises three fundamental domains: (1) digital initiative, which includes technological knowledge, skills, and the active use of digital technologies; (2) digital thinking, which involves practical reasoning and attitudes toward using technology for educational and innovative purposes; and (3) digital humanity, which emphasizes values, ethics, and social awareness in digital interactions (Wei, 2023). In mathematics education, digital literacy is essential for helping students engage in complex problem-solving and participate in technology-enhanced learning environments (Yani et al., 2025). The use of digital tools in mathematics requires both practical skills and higher-order thinking skills (HOTS), including analysis, evaluation, and creation. These skills enable learners to interpret data, solve mathematical problems, and

make informed decisions in technology-enhanced learning environments. Examples include analyzing datasets using spreadsheets, exploring mathematical relationships through dynamic software, and evaluating information from digital sources. Accordingly, HOTS are regarded as indicators of digital literacy, with higher-achieving individuals demonstrating more advanced digital skills (Yanuarto et al., 2023).

Furthermore, effective mathematics teaching is influenced not only by cognitive competencies, such as higher-order thinking skills (HOTS), but also by affective factors, particularly mathematics self-concept. Mathematics self-concept refers to an individual's perception of their competence in mathematics and reflects the extent to which they feel confident in understanding mathematical concepts, solving mathematical problems, and performing mathematics-related tasks (Arens et al., 2022; Passiatore et al., 2024). For teachers, mathematics self-concept may influence how they approach mathematical tasks, evaluate their own capabilities, and make instructional decisions in the classroom. Teachers with a stronger mathematics self-concept are generally more confident in explaining mathematical concepts, facilitating student learning, and adopting innovative teaching practices, including the integration of digital technologies into instruction. In addition, mathematics self-concept may shape teachers' professional attitudes, persistence when facing instructional challenges, and willingness to engage in continuous professional development. Previous studies have also shown that self-concept plays an important role in shaping individuals' academic and career-related decisions (Ding et al., 2024; Gaspard et al., 2020). Despite its importance, research on mathematics self-concept has predominantly focused on students (Li et al., 2020; Steinberg et al., 2024; Vasalampi et al., 2020), with relatively limited attention given to mathematics teachers. This research gap is noteworthy because teachers' perceptions of their own mathematical competence may influence not only their professional competence but also their ability to create effective learning environments and meaningfully integrate digital technologies into mathematics instruction.

In the digital era, effective technology integration in mathematics classrooms depends largely on teachers' ability to select, adapt, and implement digital technologies in ways that support pedagogical goals. Consequently, teacher competence plays a vital role in fostering students' digital literacy and higher-order thinking skills. Teacher competence in the digital era requires the ability to integrate digital technologies into classroom practices (Uribe-Banda et al., 2021). Moreover, teacher competence has been shown to have a positive influence on students' mathematical literacy (Franklin & Chang, 2025; Papic & Papic, 2026).

Nevertheless, many teachers continue to encounter obstacles when integrating digital technologies into classroom practices. These challenges include limited digital skills, insufficient professional training, a lack of confidence in using technology for instructional purposes, inadequate technological infrastructure, and restricted access to digital resources (Possaghi & Papavlasopoulou, 2024; Uribe-Banda et al., 2021). In addition, some teachers struggle to align digital tools with pedagogical objectives, resulting in their use primarily for administrative or supplementary purposes rather than as an integral part of the learning process (Biber et al., 2022; Raveh et al., 2025). These barriers may hinder the effective implementation of technology-enhanced instruction and limit the educational benefits that digital technologies can offer.

Despite these challenges, rapid advances in information technology require teachers to take a more proactive role in preparing students with the competencies needed for the future. Teachers with strong digital capabilities are better equipped to design, evaluate, and continuously update digital learning resources, thereby making learning more engaging and relevant (Serezhkina, 2021). In this study, teachers' digital competence is understood as a construct comprising three main components: (1) skills in using digital technologies to solve various learning-related problems; (2) attitudes toward using digital technologies to achieve learning objectives; and (3) knowledge of digital technologies acquired through formal education, work experience, and various professional development activities (Hämäläinen et al., 2021). Thus, teachers' digital literacy can be viewed as a fundamental prerequisite for the effective integration of technology into mathematics classrooms.

Effective mathematics teaching in the digital era requires not only strong content knowledge but also the ability to integrate technology and maintain positive beliefs about one's mathematical capabilities. Effective mathematics instruction requires teachers to integrate pedagogical knowledge, mathematical content knowledge, and digital technologies to support students' conceptual understanding and active participation in learning (Priyanda et al., 2025). Moreover, mathematics teachers play an important role in helping students develop a deep understanding of mathematical concepts and explore complex mathematical ideas through meaningful learning experiences (Oumelaid et al., 2025). Among these factors, digital literacy enables teachers to use technological resources to support learning, while mathematics self-concept reflects their confidence in their ability to understand, communicate, and teach mathematical ideas. Previous studies have examined these constructs separately, often focusing on digital literacy, mathematics self-concept, or teacher competence

in isolation. However, limited attention has been given to how these factors interact in relation to teachers' competence. Understanding these relationships is particularly important in contemporary mathematics education, where teachers are expected to combine pedagogical expertise, technological proficiency, and confidence in mathematics to meet the demands of digital-era learning.

Despite growing interest in teachers' digital literacy, mathematics self-concept, and professional competence, limited research has examined how these constructs interact within a single structural model. Previous studies have typically investigated digital literacy, self-concept, and teacher competence independently, resulting in a fragmented understanding of the factors associated with effective mathematics teaching in the digital era. This highlights a gap in the literature concerning the extent to which teachers' digital literacy and mathematics self-concept are associated with their professional competence. To address this gap, this study aims to test a hypothesized structural model examining the relationships among teachers' digital literacy, mathematics self-concept, and teacher competence in technology-enhanced mathematics education. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to examine the relationships among these latent constructs. Unlike previous studies that focus on individual variables in isolation, this study provides a more comprehensive analysis by investigating their simultaneous relationships within a single model. The significance of this study lies in its integration of psychological factors, particularly mathematics self-concept, with professional factors such as digital literacy and teacher competence, thereby contributing to a broader understanding of teacher development in technology-enhanced mathematics education. This study addresses the following research questions:

RQ1: To what extent does digital literacy influence teachers' mathematics self-concept?
RQ2: To what extent does digital literacy influence teacher competence?
RQ3: To what extent does teachers' mathematics self-concept influence teacher competence?

To address these research questions, a hypothesized structural model was developed based on the literature reviewed in the preceding sections. The model specifies three hypothesized relationships among the latent constructs: digital literacy, mathematics self-concept, and teacher competence. Figure 1 presents the proposed research model and the corresponding hypotheses (H1–H3) derived from RQ1–RQ3.

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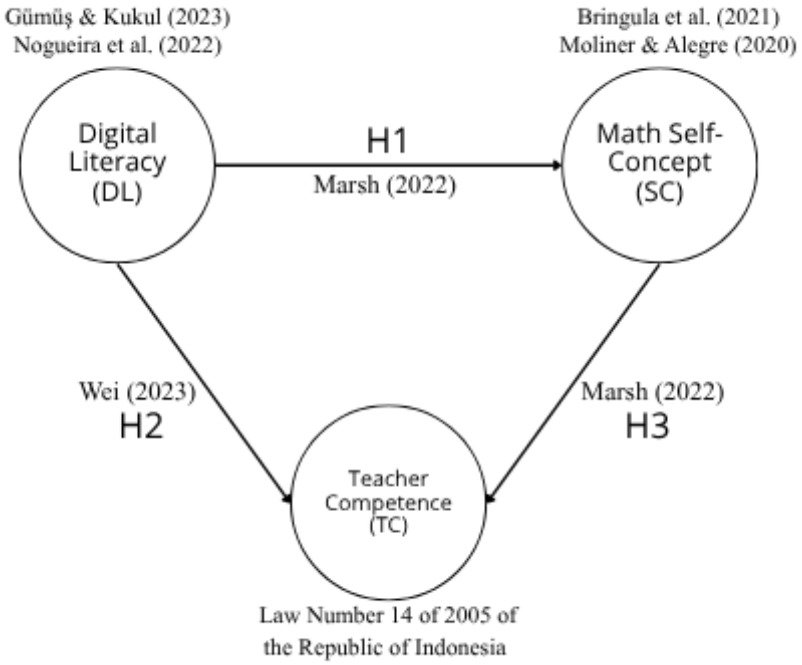


Figure 1. The Research Hypothesis

METHODS

This study employed a quantitative explanatory survey design to examine the relationships among teachers' mathematics self-concept, digital literacy, and teacher competence without manipulating participants' conditions. The study was designed as a predictive investigation aimed at explaining the structural relationships among the latent variables. To achieve this objective, Partial Least Squares Structural Equation Modeling (PLS-SEM) was conducted using SmartPLS software.

PLS-SEM was selected over covariance-based structural equation modeling (CB-SEM) for several reasons. First, the primary objective of this study was to predict and explain the relationships among the constructs rather than to confirm an established theory. Second, the sample size was relatively small (n = 40), and PLS-SEM has been reported to provide robust parameter estimates with small samples (Jhantasana, 2023; Kock & Hadaya, 2018). Third, PLS-SEM does not require multivariate normality and can provide reliable estimates even when data distributions deviate from normality assumptions (Cahyawati et al., 2023). The latent variables (constructs) examined in this study were mathematics self-concept (SC), digital literacy (DL), and teacher competence (TC). All three constructs were specified using reflective measurement models (see Figure 2). The complete list of questionnaire items and their corresponding indicators is provided in the Supplementary File.

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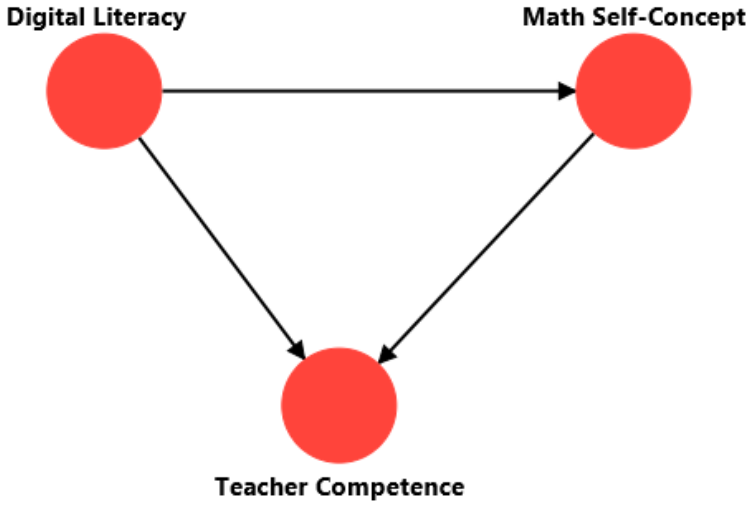


Figure 2. The Initial Measurement Model

The study involved 40 high school mathematics teachers from Subang and Ciamis Regencies, West Java, Indonesia. Participants were selected using purposive cluster sampling. First, the sampling clusters were defined geographically, with Subang and Ciamis serving as the two regional clusters. Subsequently, teachers were purposively recruited through local Mathematics Teachers' Working Groups (MGMP) based on the following inclusion criteria: (1) actively teaching mathematics at the senior high school level; (2) participating in MGMP activities; and (3) being between 25 and 50 years of age. This approach ensured that participants had relevant professional experience and were actively engaged in mathematics teaching communities.

Data were collected using an online questionnaire administered through Google Forms. Instrument validity and reliability were evaluated as part of the PLS-SEM measurement model assessment using SmartPLS. Convergent validity was examined through outer loadings and Average Variance Extracted (AVE), while internal consistency reliability was assessed using Composite Reliability (CR). Discriminant validity was evaluated using the Heterotrait-Monotrait ratio (HTMT). Indicators with outer loadings above 0.70, AVE values above 0.50, CR values above 0.70, and HTMT values below 0.90 were considered acceptable (Hair et al., 2017).

Mathematics self-concept is defined as an individual's perception of their mathematical competence, including their confidence in understanding mathematical concepts, solving mathematical problems, and successfully performing mathematics-related tasks (Bringula et al., 2021). In this study, the construct was measured using three dimensions: (1) Mathematics Ability (SC1), referring to teachers' confidence in their ability

to understand mathematical concepts and successfully perform and complete mathematical tasks; (2) Perceived Mathematics Performance (SC2), referring to teachers' evaluations of their own mathematical competence and performance in mathematics-related activities; and (3) Mathematics Interest (SC3), referring to their interest in and enjoyment of learning mathematics (Bringula et al., 2021; Moliner & Alegre, 2020). Each dimension was measured using two reflective indicators, resulting in a total of six questionnaire items.

Digital literacy in this study is defined as teachers' ability to master, adapt, and integrate technology into the learning process in accordance with instructional objectives and students' needs (Serezhkina, 2021). Teachers' digital literacy was measured through five dimensions: (1) Data Literacy (DL1), referring to the ability to search for, evaluate, and effectively use digital data and information; (2) Digital Content Creation (DL2), referring to the ability to design, develop, and modify digital content for educational purposes; (3) Problem Solving (DL3), referring to the ability to address problems arising from technology use and adapt to digital innovations; (4) Communication and Collaboration (DL4), referring to the ability to use digital tools to collaborate, participate, and communicate professionally; and (5) Safety and Ethics (DL5), referring to the ability to maintain digital security and privacy, protect personal and student data from online risks, and understand and apply ethical principles when using, sharing, and creating digital content (Gümüş & Kukul, 2023; Nogueira et al., 2022). The digital literacy construct was measured using nine reflective indicators distributed across the five dimensions: three indicators for data literacy (DL1), one for digital content creation (DL2), two for problem solving (DL3), two for communication and collaboration (DL4), and one for safety and ethics (DL5).

Teacher competence in this study refers to the knowledge, skills, and professional behaviors that teachers are expected to possess, internalize, and demonstrate in fulfilling their educational responsibilities, as stipulated in Law Number 14 of 2005 of the Republic of Indonesia concerning Teachers and Lecturers. The construct was operationalized through four dimensions: (1) Professional Competence (TC1), referring to the ability to master subject matter broadly and deeply; (2) Pedagogical Competence (TC2), referring to the ability to manage the learning process; (3) Social Competence (TC3), referring to teachers' ability to communicate and interact effectively and appropriately with students, fellow teachers, parents, and the surrounding community; and (4) Personality Competence (TC4), referring to the possession of a stable personality, noble character, wisdom, and authority, as well as the ability to serve as a role model for students. The teacher competence construct was measured

using 22 reflective indicators distributed across the four dimensions: five indicators for professional competence (TC1), five for pedagogical competence (TC2), eight for social competence (TC3), and four for personality competence (TC4).

RESULT AND DISCUSSION

To assess the extent to which the indicators of a construct are highly correlated and consistently represent the same underlying construct, convergent validity was evaluated using three key measures in SmartPLS: outer loadings, Composite Reliability (CR), and Average Variance Extracted (AVE) (Jhantasana, 2023). The results of the convergent validity assessment are presented in Table 1.

Table 1. Convergent Validity of The Latent Variable

Variable	Indicator	Total Item	Outer Loading	CR	AVE
Mathematics self-concept (SC)	SC1	2	0.902	0.924	0.803
	SC2	2	0.849		
	SC3	2	0.935		
Digital Literacy (DL)	DL1	3	0.950	0.958	0.819
	DL2	1	0.891		
	DL3	2	0.892		
	DL4	2	0.938		
	DL5	1	0.849		
Teacher Competence (TC)	TC1	5	0.909	0.972	0.896
	TC2	5	0.966		
	TC3	8	0.956		
	TC4	4	0.954		

As shown in Table 1, all constructs meet the recommended criteria for convergent validity and internal consistency reliability. All outer loading values exceed 0.70, while the Composite Reliability (CR) and Average Variance Extracted (AVE) values are above the recommended thresholds of 0.70 and 0.50, respectively (Hair et al., 2017). These results indicate that the indicators adequately represent their respective latent constructs and demonstrate satisfactory reliability and convergent validity.

Among the three constructs, Teacher Competence exhibits the highest CR and AVE values (CR = 0.972; AVE = 0.896), followed by Digital Literacy (CR = 0.958; AVE = 0.819) and Mathematics Self-Concept (CR = 0.924; AVE = 0.803). Overall, these findings suggest that the measurement model demonstrates satisfactory reliability and convergent validity and is suitable for assessing the structural relationships among the constructs (see Figure 3).

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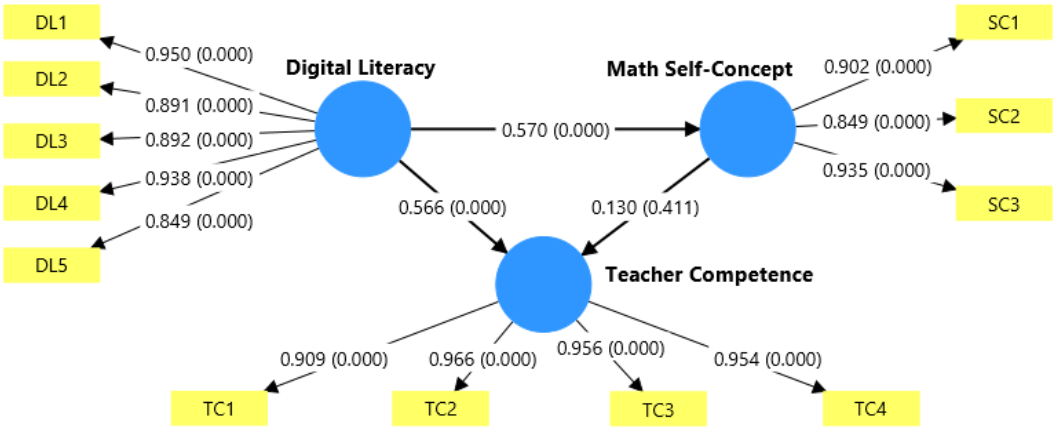


Figure 3. The Measurement Model of 3 Latent Variables

To establish that the three constructs—mathematics self-concept, digital literacy, and teacher competence—are empirically distinct, discriminant validity was assessed using the Heterotrait–Monotrait Ratio (HTMT) in SmartPLS. The results are presented in Table 2. The results are presented in Table 2 As shown in the table, all HTMT values are below the recommended threshold of 0.90, indicating that the constructs are sufficiently distinct from one another and demonstrate acceptable discriminant validity (Hair et al., 2017).

Table 2. Heterotrait-Monotrait Ratio Between Latent Variables

The relation between the latent variable	HTMT Ratio
Math Self-Concept - Digital Literacy	0.628
Teacher Competence - Digital Literacy	0.669
Teacher Competence - Math Self-Concept	0.483

Hypotheses H1, H2, and H3 were tested through structural model evaluation, which involved the following five stages: (1) assessing collinearity using the inner model Variance Inflation Factor (VIF); (2) evaluating the significance of structural relationships using path coefficients; (3) assessing effect sizes (f^2), (4) (4) evaluating the coefficient of determination (R^2), and (5) assessing predictive relevance (Q^2) (Hair et al., 2017).

Table 3. Evaluation of the structural model

The latent variable	VIF	Model path coefficient		f^2	R^2	Q^2
		Path coefficient (β)	p-value			
Digital Literacy → Math Self-Concept	1.000	0.570	0.000	0.480		
Digital Literacy → Teacher Competence	1.480	0.566	0.000	0.374		
Math Self-Concept → Teacher Competence	1.480	0.130	0.468	0.020		
Math Self-Concept					0.324	0.287
Teacher Competence					0.421	0.370

Table 3 shows that all VIF values are below 5, indicating that there are no critical collinearity issues among the predictor constructs in the structural model. Therefore, the model is suitable for further analysis (Hair et al., 2017). The results also reveal that digital literacy has a positive and statistically significant relationship with both mathematics self-

concept ($\beta = 0.570$, $p < 0.001$) and teacher competence ($\beta = 0.566$, $p < 0.001$). These findings support H1 and H2, suggesting that teachers with higher levels of digital literacy tend to report greater confidence in their mathematical abilities and higher levels of professional competence.

In contemporary education, digital literacy extends beyond technical proficiency and serves as an essential resource for designing, implementing, and evaluating technology-enhanced learning environments. Teachers' digital literacy is particularly important when preparing lesson plans, selecting instructional strategies, and using technology to enhance student engagement (Priyanda et al., 2025).

These findings suggest that strengthening teachers' digital literacy may contribute to improvements in both their mathematics self-concept and professional competence. Theoretically, the results support the view that the digital era necessitates the integration of information and communication technology (ICT) into education to make mathematics learning more effective and relevant (Novitasari et al., 2020). Teachers with high levels of digital literacy may be better equipped to use technology to explore, teach, and reflect on mathematical concepts (Basilotta-Gómez-Pablos et al., 2022), potentially strengthening their confidence in their mathematical abilities. Furthermore, digital literacy may support teacher competence by enhancing teachers' pedagogical and professional capacities to design innovative, interactive, and technology-integrated learning experiences.

In contrast, mathematics self-concept does not have a statistically significant direct relationship with teacher competence ($\beta = 0.130$, $p = 0.411$). This finding suggests that teachers' confidence in their mathematical abilities alone may not be sufficient to predict their overall professional competence. The multidimensional nature of teacher competence may help explain this result. Although internal beliefs may contribute to professional competence, teachers' competence is also shaped by external and contextual factors, including professional training, teaching experience, institutional support, and access to educational resources. Therefore, even when teachers have a positive mathematics self-concept, these external factors may play an important role in shaping their overall professional competence.

This finding is consistent with previous studies by Marsh et al. (2022) and Sorjonen et al. (2024), which suggest that self-concept is more closely associated with motivational constructs, such as effort, persistence, and engagement. These motivational factors may function as mechanisms through which self-beliefs are translated into professional behaviors and performance. Mathematics self-concept belongs to the affective domain, reflecting

individuals' perceptions and beliefs about their mathematical abilities. In contrast, teacher competence encompasses cognitive and behavioral dimensions, including pedagogical knowledge, instructional skills, and professional practices. The distinction between these domains may help explain the absence of a statistically significant direct relationship between the two constructs in the present structural model.

This result highlights that improving teacher competence may require more than strengthening psychological factors such as self-concept. Rather, it may require integrated efforts that combine internal factors, such as beliefs and motivation, with external support, including professional development programs, institutional policies, and collaborative learning environments.

The coefficient of determination (R^2) indicates that digital literacy explains 32.4% of the variance in teachers' mathematics self-concept ($R^2 = 0.324$). According to Hair et al., (2017). this value falls within the moderate range of explanatory power. This finding suggests that teachers' digital literacy is an important predictor of their mathematics self-concept. Teachers with higher levels of digital literacy may feel more confident in exploring mathematical materials and accessing a wider range of digital resources, which may strengthen their perceptions of their mathematical abilities. Nevertheless, the moderate explanatory power indicates that mathematics self-concept is a multidimensional construct that may also be shaped by factors beyond digital literacy. Teachers' prior mathematical knowledge, teaching experience, and institutional support, for example, may also contribute to the development of their mathematics self-concept.

The predictive relevance results further indicate that the model has for mathematics self-concept ($Q^2 = 0.287$). The model also demonstrates for teacher competence ($Q^2 = 0.370$), suggesting that the model has predictive relevance for both endogenous constructs. The role of digital literacy in the structural model underscores its importance in supporting teachers' professional capacities, particularly in technology-enhanced learning environments. Teachers with strong digital literacy may be better equipped to design interactive learning experiences, use digital learning resources effectively, and adapt to the evolving demands of education.

However, teacher competence is influenced not only by individual capabilities but also by professional learning experiences and contextual conditions within schools and educational systems (OECD, 2017). Teacher competence is a multidimensional construct shaped by teachers' knowledge, beliefs, motivation, and the contextual factors that influence their

professional performance (Blömeke et al., 2015). Teaching experience, pedagogical knowledge, institutional support, and other variables not included in the present model may also make important contributions. Thus, although digital literacy plays a significant role, it should not be regarded as the sole determinant of teacher competence. Rather, it operates alongside other individual and contextual factors. Teachers' ability to use technology may strengthen their confidence and increase their readiness to adopt innovative classroom practices. These findings also have practical implications, highlighting the importance of improving teachers' digital literacy through professional development initiatives to support the quality of classroom teaching and learning.

Several limitations should be acknowledged. First, the study involved a relatively small sample of only 40 mathematics teachers, which may limit the statistical generalizability of the findings. Second, all participants were drawn exclusively from Subang and Ciamis Regencies in West Java, Indonesia. Consequently, the findings may reflect the characteristics of these local educational contexts and may not be fully representative of mathematics teachers in other regions or countries.

Third, participants were limited to teachers aged 25–50 who were actively involved in Mathematics Teachers' Working Groups (MGMP). As a result, the sample may represent teachers who are relatively engaged in professional development activities and potentially more familiar with digital technologies than the broader teacher population. Therefore, caution should be exercised when generalizing the findings to teachers with different demographic and professional characteristics, particularly older teachers and those with limited participation in professional learning communities.

Future studies should employ larger and more diverse samples to improve the generalizability of the findings and provide a more comprehensive understanding of the relationships among digital literacy, mathematics self-concept, and teacher competence. Further research could also incorporate additional individual and contextual variables to examine other factors that may contribute to teachers' professional competence.

CONCLUSION

This study examined the relationships among teachers' digital literacy, mathematics self-concept, and teacher competence using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings indicate that digital literacy is a positive and statistically significant predictor of both mathematics self-concept and teacher competence. Teachers with higher levels of digital literacy tend to report greater confidence in their mathematical abilities

and higher levels of professional competence. These results highlight the importance of digital literacy not only as a technical skill but also as a factor associated with teachers' psychological and professional development in technology-enhanced mathematics education.

In contrast, mathematics self-concept does not have a statistically significant direct relationship with teacher competence. This finding suggests that confidence in one's mathematical abilities alone may not be sufficient to predict overall professional competence, which encompasses a broader combination of pedagogical, professional, social, and personal dimensions. Consequently, efforts to improve teacher competence should not focus solely on strengthening teachers' self-perceptions but should also address digital literacy and other professional capacities. Professional development programs should therefore prioritize strengthening teachers' digital literacy through continuous training, technology-integrated pedagogical practices, and active participation in professional learning communities.

Overall, the structural model demonstrates moderate explanatory power, indicating that digital literacy is an important predictor of both teachers' mathematics self-concept and teacher competence. These findings contribute to the growing body of literature on teacher development in the digital era by highlighting the importance of considering both psychological and technological dimensions in supporting effective mathematics teaching. Future research should involve larger and more diverse samples across different educational contexts to further examine and validate the proposed structural model.

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