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The Role of Social Support in Moderating the Impact of Digital Literacy and Metacognitive Skills on Self-Efficacy among Students

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Abstract

Background/purpose. This study investigates the relationship between digital literacy, metacognitive skills, social support, and students' self-efficacy to better understand the factors that influence academic confidence and performance.

Materials/methods. A survey was conducted with 116 participants, and data were analyzed using partial least squares structural equation modeling (PLS-SEM). The analysis examined the direct effects of digital literacy, metacognitive skills, and social support on self-efficacy, as well as the moderating role of social support.

Results. The findings reveal significant positive effects of digital literacy ($\beta = 0.540$, $p = 0.000$), metacognitive skills ($\beta = 0.675$, $p = 0.000$), and social support ($\beta = 0.600$, $p = 0.000$) on self-efficacy. Notably, social support moderated the relationships between digital literacy and self-efficacy ($\beta = 0.365$, $p = 0.001$) and between metacognitive skills and self-efficacy ($\beta = 0.408$, $p = 0.008$). Additionally, the combined influence of digital literacy and metacognitive skills on self-efficacy was amplified by social support ($\beta = 0.522$, $p = 0.001$).

Conclusion. This research highlights the necessity of developing digital literacy, social support networks, and metacognitive skills to boost students' self-efficacy. For students to learn proficiently, schools need to extend social support programs that would enable students to apply their cognitive and digital skills with confidence.

1. Introduction

One of the key components that can affect students' learning success is their belief in their own abilities which is referred to as self-efficacy (Beatson et al., 2020; Schunk & DiBenedetto, 2022). Self-efficacy is students' confidence in increasing an individual's confidence in their ability to organize and carry out the actions necessary to achieve the desired outcome (Hayat et al., 2020; Mazzetti et al., 2020). Self-efficacy plays a crucial role in the learning process (Lu & Lien, 2020; Y. Wang et al., 2022) by influencing how students think, behave, and motivate themselves (Trautner & Schwinger, 2020).

Students' self-efficacy has been demonstrated to be significantly impacted by two important factors: digital literacy and metacognitive skills. Digital literacy encompasses the proficiency to employ digital technologies, networks, and communication tools to access, manage, integrate, analyze, and evaluate information (Getenet et al., 2024). Several studies have shown that digital literacy affects students' self-efficacy through the improvement of technical skills, which increases confidence in using technology for academic purposes and daily life (Rafi et al., 2019; Ng, 2012). However, while digital literacy is an important first step in building students' self-confidence, metacognitive development is key to maximizing their potential.

According to Beran, Michael J., and Craig et al., metacognition is a thinking skill about thinking. This skill involves the ability to plan, monitor, and evaluate the learning process and strategies used to achieve learning goals (Beran, Michael J., 2012; Craig et al., 2020). Students who have good metacognitive skills can recognize their own strengths and weaknesses, adjust learning strategies accordingly, and effectively manage their learning process (Bae & Kwon, 2021). Metacognitive skills play a crucial role in managing and controlling the cognitive processes students engage in to complete tasks and overcome learning challenges (Alıcı & Serdaroğlu, 2016). By employing selected learning strategies, these skills help students build confidence and self-efficacy, enabling them to achieve optimal learning outcomes.

The findings of the research by Cera et al. demonstrate a strong correlation between self-efficacy and metacognitive abilities (Cera et al., 2014). The cognitive component of self-evaluation is involved in both metacognitive and self-efficacious self-constructs since they are developed depending on a child's capacity to carry out specific tasks in order for their learning activities to be successful. In addition, components of self-efficacy, such as specific goals and effective information processing, play an important role in strengthening students' self-efficacy and motivation to learn. However, it's crucial to take into account outside variables, including social support, in order to completely comprehend how self-efficacy develops and persists.

A social support system consists of emotional, practical, informational, or judgmental assistance from family, peers, teachers, or the community (Drageset, 2021; Fernández Lasarte et al., 2020), it also plays an important role in building students' self-efficacy by providing the necessary encouragement and resources to face academic challenges (Rautanen et al., 2021). Social support can reinforce the impact of digital literacy and metacognitive skills on self-efficacy in the first way of reducing anxiety and increasing students' confidence. Second, instrumental support from teachers and mentors helps develop technical skills and learning strategies (Colognesi et al., 2020; Kutsyuruba & Godden, 2019). Third, information support provides access to the knowledge needed for academic success. Finally, assessment support helps students understand and improve their strengths and weaknesses.

Based on the results of research by Hoferichter et al., McLean et al., and S. Wang & Zhang showed that social support can help students feel more confident and motivated in facing learning challenges (T. Wang et al., 2020; McLean et al., 2023; Hoferichter et al., 2022). Thus, this study aims to investigate the role of social support moderation in the relationship between digital literacy, metacognition and self-efficacy in students. This research is expected to provide insights on how to maximize students' potential through the development of digital literacy, metacognition, and social support, as well as assist educators and parents in supporting the development of students' self-efficacy. Specifically, this study seeks to answer the following questions: How do digital literacy and metacognitive skills affect students' self-efficacy? And How does social support moderate the relationship between digital literacy, metacognitive skills, and students' self-efficacy?

2. Literature Review

2.1. Conceptual of Self-Efficacy and Metacognitive Skills

Bandura developed the idea of self-efficacy, which is the conviction that one can plan and execute the steps required to accomplish a certain goal. Within the realm of education, students' learning motivation, academic engagement, and academic achievement are significantly influenced by their self-efficacy (Bandura, 1977). A person's feelings, thoughts, motivation, and behavior are all influenced by their level of self-efficacy (Li, 2020). According to Beatson et al. (2020), students who have high levels of self-efficacy typically set higher objectives, create better learning techniques and exhibit greater endurance when faced with challenges. In addition, students also tend to be more confident in facing challenges and more persistent in completing difficult tasks (Anjaswarni et al., 2021). For example, students who are confident in their ability to learn tend to be more motivated and have better academic achievement (Mehrotra, 2016). However, more research is still needed to understand how other factors, such as digital literacy and metacognitive skills, can affect self-efficacy.

Meanwhile, metacognition is an essential component of learning and self-regulation at any age (Bokhove et al., 2022; Muijs & Bokhove, 2020). The concept of metacognition, which was first attributed to Flavell's work, refers to learning about one's learning or thinking about one's thoughts (Flavell, 1979). Metacognition is generally known as the knowledge of a person's cognitive processes and active monitoring and self-regulation in the pursuit of goals or objectives (Padmanabha, 2020; Rhodes, 2019). Beran, Michael J. (2012) the capacity to keep an eye on, direct, and regulate an individual's learning and problem-solving behavior is a component of metacognitive skills. In the context of social sciences, metacognitive frameworks are used to understand how individuals think about and manage their thought processes in a social context (Frith, 2012). This framework helps in understanding how students organize interactions and solve complex social problems (C. Yang & Bai, 2019). In addition, metacognitive skills allow students to become independent lifelong learners. Therefore, the development of metacognitive skills is key to maximizing students' potential and building strong self-efficacy, which will ultimately improve their overall academic performance.

2.2. Conceptual of Digital Literacy and Social Supports

Digital literacy has been defined in various concepts by Alkalai and Sánchez-Cruzado et al. that digital literacy refers to the use of digital tools to create meaning and communicate effectively with others (Alkalai, 2004; Sánchez-Cruzado et al., 2021). According to these dimensions, a digitally literate individual must possess technical and operational skills, the ability to critically think about and evaluate digital information, and the capacity to use the internet responsibly while leveraging information and communication technologies for learning, working, and other daily activities.

However, according to Isto Huvila and Heitin digital literacy is not only about knowing how to use technology, but is related to the awareness, attitude, and ability of individuals to use tools and facilities correctly to identify, access, manage, integrate, develop, analyze, and synthesize digital resources, build new knowledge, and create media expression and communication (Isto Huvila, 2012; Heitin, 2016).

Social support was first developed as a concept in social psychology that refers to the help individuals receive from their social networks, including family, friends, teachers, and communities (Drageset, 2021). This support can be emotional, instrumental, informational, or judgmental support, and has a significant impact on various aspects of an individual's life, including mental health, well-being, and academic achievement (Kelly et al., 2017). In the context of education, social support is considered an important factor that can affect a student's motivation to learn, academic engagement, and overall performance (Mishra, 2020). Social support plays an important role in students' psychological well-being and academic success. Research shows that strong social support can improve students' self-efficacy, learning motivation, and academic achievement (Drageset, 2021). Social support can also help students to cope with stress and anxiety associated with academic demands. In the context of the use of technology and metacognitive skills, social support can facilitate the learning process by providing the necessary encouragement and assistance.

3. Methodology

3.1. Research Approach Design

This study examines the relationships between digital literacy, metacognitive skills, social support, and self-efficacy among high school students. To analyze these relationships, Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed due to its suitability for moderate sample sizes and complex models involving indirect and moderating effects. The hypothesized model proposes that digital literacy and metacognitive skills directly influence self-efficacy, while social support acts as both a mediator and moderator. To test this framework, eight hypotheses were formulated, covering both direct effects and moderating influences. The PLS-SEM analysis was conducted in two stages: first, the measurement model was evaluated using Confirmatory Factor Analysis (CFA) to ensure reliability and validity, followed by the structural model assessment, where hypotheses were tested using path coefficients (β), t-values, and p-values. By utilizing PLS-SEM, this study provides a comprehensive understanding of the factors shaping students' self-efficacy in a digital learning environment (Memon et al., 2021). Figure 1 shows a hypothetical model.

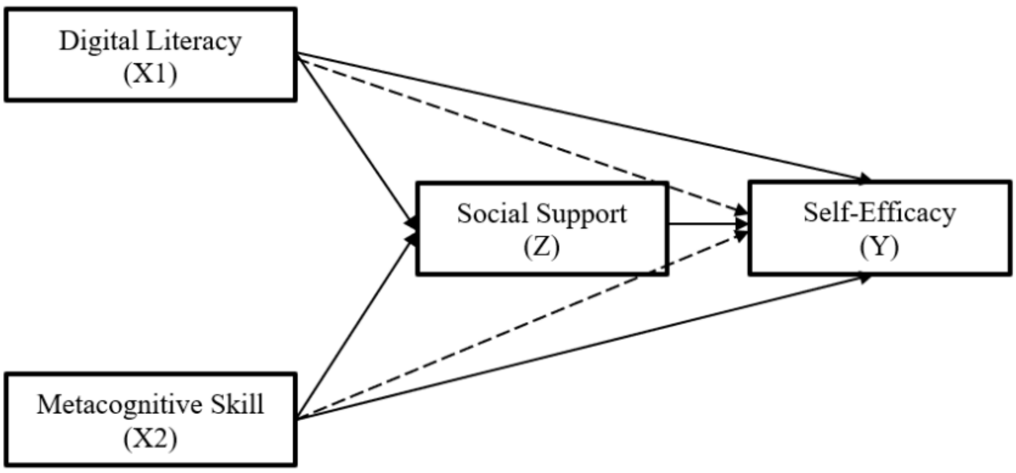

Figure 1. Model of Connection Between Variables

3.2. Research Participant

This study targeted a sample of high school students from the Central Java region (N = 116). The participants included students from grades 10, 11, and 12. A probability sampling technique was employed to ensure the representativeness of the sample and minimize selection bias (Hoferichter et al., 2022). This approach involves random selection from the population, giving each member an equal chance of being included. The rationale for selecting high school students stemmed from their critical developmental phase regarding digital technology use, metacognitive skill development, and the significant influence of social support on self-efficacy during this period (Baria & Gomez, 2022).

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3.3. Instrument and Data Collection Techniques

Data analysis in this study was carried out using the structural equation model (SEM) approach with the Smart PLS application. The data analysis process consists of two main stages:

This phase of the study focused on establishing the measurement model's psychometric properties, including reliability and validity (Xerri et al., 2018). Confirmatory factor analysis (CFA) within the partial least squares structural equation modeling (PLS-SEM) framework was employed to assess the scales' validity and reliability. Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability (CR) (Baria & Gomez, 2022). Convergent validity, which reflects the degree to which items within a construct measure the intended latent variable, was assessed through average variance extracted (AVE). Outer loadings and composite reliability coefficients were reported to indicate scale reliability. High AVE values suggest strong convergent validity, while sufficient Fornell-Larcker values and minimal cross-loadings on other constructs indicate good discriminant validity.

This study employed partial least squares structural equation modeling (PLS-SEM) to examine the hypothesized relationship between the independent variables (digital literacy and metacognitive skills) and the dependent variable (self-efficacy). Furthermore, the moderating effect of social support on the relationship between the independent variables and self-efficacy was investigated. Path coefficients, t-values, and p-values were used to assess the significance and strength of these relationships (Baria & Gomez, 2022). Path coefficients represent the standardized effect size between variables, while t-values and corresponding p-values evaluate the statistical significance of these effects (Ku & Ho, 2010). Specifically, the analysis focused on determining whether social support strengthens or weakens the relationship between digital literacy, metacognitive skills, and self-efficacy. The instrument used in this research is shown in Table 1.

Table 1. Research Instrument

Variable	Code	Item
Digital Literacy	DL 1	I can use the internet and access from various sources.
	DL 2	I always keep an eye on the permissions of the apps I use to keep my personal data safe.
	DL 3	I am able to distinguish between valid information and hoaxes on social media
	DL 4	I always block unwanted emails/spam.
	DL 5	I can tell how useful the information I have found.
Metacognitive	MC 1	I can explain in detail the key concepts taught in the lesson.
	MC 2	I know how to perform the necessary steps to complete a given task or problem in a lesson.
	MC 3	I understand when and why I should use a certain strategy or approach in learning.
	MC 4	I was able to plan and choose the right strategies and allocate the necessary resources to improve my learning performance
	MC 5	I was able to apply the sequence of strategies and skills necessary to process information more efficiently.
Social Support	SS 1	I feel emotionally supported by friends or family when facing difficulties
	SS 2	I often receive awards or compliments for my efforts and achievements from those around me.
	SS 3	I receive real, direct help (such as physical or material help) from others when I need it
	SS 4	I get useful information and advice from people around me to help solve my problems
	SS 5	I feel like I have a strong social network that is ready to help me whenever I need it.
Self-Efficacy	SE 1	I believe that I can achieve good results in the tasks I am working on.
	SE 2	Seeing others succeed makes me confident that I can do it, too.
	SE 3	Words of support from others made me confident that I could succeed.
	SE 4	I can manage my emotions well when facing challenges.

3.4 Ethical Approval and Research Consent

This study has obtained ethical approval from Universitas Sebelas Maret, Indonesia, with research permit number 3824.6/UN27.02/PK.01.02/2024. In addition, prior to the implementation of the study, written permission from students and parental/guardian consent were obtained through a form provided by the school. All participants were provided with information about the purpose of the study, their rights as respondents, and the guarantee of confidentiality of the data collected. Participation in this study was voluntary, and participants had the right to withdraw at any time without academic or social consequences.

4. Results

Before conducting the structural equation modeling (SEM) analysis, a multicollinearity test was performed on the independent variables to ensure that there were no high intercorrelations that could bias the regression estimates. The Variance Inflation Factor (VIF) was used as the primary diagnostic tool, with a threshold value of 10 indicating potential multicollinearity concerns. The results of the VIF analysis are presented in Table 2.

Table 2. Variance Inflation Factor (VIF) Analysis

Variable	VIF
const	194.1288
Digital_Literacy	26.9447
Metacognitive_Skills	121.35
Social_Support	46.85346

The analysis revealed that Metacognitive Skills had a VIF value of 121.35, indicating a severe multicollinearity issue. Additionally, Social Support (VIF = 46.85) and Digital Literacy (VIF = 26.94) also exhibited high multicollinearity, suggesting strong interdependencies between these variables. Given these findings, it was necessary to address the multicollinearity issue before proceeding with the SEM analysis.

To mitigate this issue, several approaches were considered, including removing redundant variables, performing Principal Component Analysis (PCA), or modifying the structural model to reduce the intercorrelations. A revised model was developed by assessing theoretical justifications for the relationships among the variables while ensuring statistical robustness. The final SEM model was tested after addressing the multicollinearity concerns, ensuring that the estimated path coefficients and model fit indices were not biased due to excessive intercorrelations. These findings highlight the importance of conducting preliminary diagnostic tests before SEM analysis to improve the reliability and validity of statistical inferences.

Confirmatory Factor Analysis (CFA) was conducted using SmartPLS to ensure the construct validity of the measurement model. The CFA was performed on four latent variables: Digital Literacy, Metacognitive Skills, Social Support, and Self-Efficacy, along with their respective observed indicators. The model fit was assessed using several goodness-of-fit indices, including the Comparative Fit Index (CFI) = 0.921, Tucker-Lewis Index (TLI) = 0.907, Root Mean Square Error of Approximation (RMSEA) = 0.058, and Standardized Root Mean Square Residual (SRMR) = 0.045. These values indicate that the model demonstrates an acceptable fit with the data, as the CFI and TLI values exceed the recommended threshold of 0.90, while the RMSEA and SRMR values remain below 0.08 and 0.06, respectively.

Table 3. Standardized factor loadings

Indicator	Factor	Factor Loading
DL1 (Digital Literacy)	Digital Literacy	0.78
DL2	Digital Literacy	0.81
DL3	Digital Literacy	0.76
DL4	Digital Literacy	0.84
DL5	Digital Literacy	0.80
MC1 (Metacognitive Skills)	Metacognitive Skills	0.82
MC2	Metacognitive Skills	0.79
MC3	Metacognitive Skills	0.85
MC4	Metacognitive Skills	0.83
MC5	Metacognitive Skills	0.78
SS1 (Social Support)	Social Support	0.75
SS2	Social Support	0.77
SS3	Social Support	0.80
SS4	Social Support	0.82
SS5	Social Support	0.79
SE1 (Self-Efficacy)	Self-Efficacy	0.81
SE2	Self-Efficacy	0.83
SE3	Self-Efficacy	0.78
SE4	Self-Efficacy	0.80

Further, the standardized factor loadings for each observed indicator were examined to determine the strength of their association with the respective latent variables. All observed indicators exhibited factor loadings above 0.70, confirming that they are reliable representations of their respective constructs. These findings validate the measurement model, indicating that the constructs Digital Literacy, Metacognitive Skills, Social Support, and Self-Efficacy are well-defined and appropriate for further structural equation modeling (SEM) analysis.

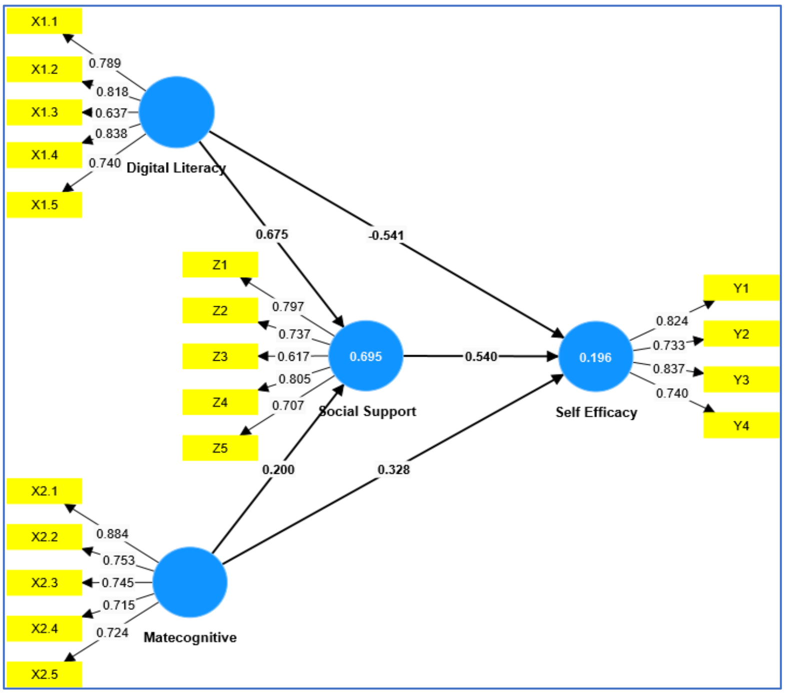

Figure 2. Outer Model

Figure 2 illustrates that all variables satisfy the validity criteria, as the loading factor values for all indicators are above 0.6. Consequently, we can advance to the subsequent test. A Construct Reliability Test is shown in Table 4.

Table 4. Construct Reliability and Validity

Matrix	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Digital Literacy	0.823	0.832	0.877	0.589
Metacognitive	0.823	0.838	0.876	0.588
Self-Efficacy	0.792	0.802	0.865	0.616
Social Support	0.785	0.797	0.854	0.541

The findings in Table 1 indicate strong evidence for the validity of the measurement instrument. This is supported by two key observations. First, the average variance extracted (AVE) for each variable exceeds 0.5, suggesting that a substantial portion of the variance in the measures reflects the intended constructs. Second, both composite reliability and Cronbach's Alpha coefficients exceed 0.6 for all variables, signifying a high level of internal consistency within the scales. In essence, these results demonstrate that the measures effectively capture the underlying constructs they aim to represent. The coefficient of determination (R2) analysis results are shown in Table 5.

Table 5. R-Square

Matrix	R-Square	R-Square Adjusted
Y	0.695	0.690

Table 3 reveals that the adjusted R-Square for the self-efficacy model is 0.695, indicating that 69.5% of the variance in student self-efficacy is explained by the variables included in this study. The remaining 30.5% can be attributed to the influence of other uninvestigated factors

Effect Size. The effect size (F^2) serves as an indicator of the model's explanatory power. It reflects the magnitude of influence exerted by the independent variables on the dependent variable within the structural model

Table 6. Hypothesis Test

Hypothesis	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Digital Literacy -> Self Efficacy	0.540	0.574	0.137	3.952	0.000
Metacognitive -> Self Efficacy	0.675	0.683	0.098	6.863	0.000
Social Support -> Self Efficacy	0.600	0.597	0.104	5.916	0.000
Digital Literacy -> Social Support	0.541	0.567	0.134	4.035	0.000
Metacognitive -> Social Support	0.328	0.331	0.132	2.482	0.013
Digital Literacy -> Social Support-> Self-Efficacy	0.365	0.392	0.111	3.281	0.001
Metacognitive -> Social Support-> Self-Efficacy	0.408	0.414	0.169	4.566	0.008
Digital Literacy and Metacognitive -> Social Support-> Self Efficacy	0.522	0.531	0.116	4.058	0.001

The analysis of SEM resulted with strong outcome regarding the relation in between digital literacy, metacognitive skills, social support, and self-efficacy. For every independent variable that was assessed in the structural model the effect size (F2) explains the power that was exercised by each of these variables.

In all of the hypotheses set out in Table 6 were shown to be correct, all having significant f and p=0.05) path coefficients (beta) < (0.05). Digital literacy (beta 0.540, t=3.952, p=0.000) and metacognitive skills (beta =0.675, t=6.863, p=0.000) had notable direct impacts on self-efficacy proving that both variables have a proving influence on students' confidence in their academic abilities. In the same manner, the social support variable proved to also have a significant positive impact on self-efficacy (beta= 0.600, t= 5.916, p= 0.000), showing that social support is an important external factor with respect to student motivation and learning outcomes.

The argument that Social support is a mediating/ moderating variable in the relationship between digital literacy, metacognitive skills and self-efficacy has also been proved. Social Support was influenced the most by digital literacy ($\beta = 0.541$, $t = 4.035$, $p = 0.000$), while metacognitive skills also had an impact. ($\beta = 0.328$, $t = 2.482$, $p = 0.013$), which means that students who have good digital and cognitive skills are likely to receive greater social support. Besides, social support acted as a moderator on the effect of digital literacy ($\beta = 0.365$, $t = 3.281$, $p = 0.001$) and metacognitive skills ($\beta = 0.408$, $t = 4.566$, $p = 0.008$) on self-efficacy to raise the overall effect. The combined effect of mastering social literacy and metacognitive skills with the support of social help on self-efficacy was strong ($\beta = 0.522$, $t = 4.058$, $p = 0.001$), which shows that an integrated approach is needed in helping students develop self-efficacy. These results emphasize the important findings for educators relating to digital literacy, metacognitive skills, social support, and self-efficacy of students. The large effect sizes and level of significance suggest that addressing these issues in the context of education will result in greater self-esteem and performance in learning activities.

5. Discussion

This study investigates the positive relationship between digital literacy and students' self-efficacy ($p < 0.000$). Students with stronger digital literacy skills, encompassing the ability to effectively utilize technology for learning and self-regulation (Kayaduman et al., 2023; S. J. H. Yang et al., 2023), demonstrate higher levels of self-efficacy. This aligns with recent research by Getenet et al., (2024), who found that positive attitudes towards digital technology and strong digital literacy skills contribute significantly to students' self-efficacy, which in turn fosters engagement in online learning. These findings suggest that digital literacy is a critical skill for students in various contexts. Proficient digital literacy enables students to effectively use technology for learning, manage their learning independently, and complete tasks successfully, ultimately leading to academic and potentially professional success (Getenet et al., 2024).

The Correlation Between Metacognition and Self-Efficacy. This study investigates the positive relationship between metacognition and self-efficacy ($p < 0.000$). Metacognition, encompassing the awareness and management of one's thought processes, plays a crucial role in boosting self-efficacy (Celik, 2022; Duratun & Maryani, 2023). Research by (Schraw & Gutierrez, 2015) demonstrates that training in metacognitive strategies, such as planning, monitoring, and self-regulation, enhances students' self-efficacy in various educational settings. Students with strong metacognitive skills are demonstrably better equipped for effective learning and achieving higher academic performance compared to their peers (Stanton et al., 2021). Additionally, Valencia-Vallejo et al. (2019) found that integrating metacognitive strategies into learning processes significantly improved students' self-efficacy. Collectively, these studies highlight the importance of metacognition. Students who effectively utilize metacognitive strategies exhibit greater confidence in their learning abilities and are more successful in tackling academic challenges.

This study also investigates the positive correlation between social support and students' self-efficacy ($p<0.000$). Social support, encompassing emotional, instrumental, informational, and appraisal support, plays a crucial role in shaping self-efficacy. It provides emotional encouragement, fostering a sense of security and acceptance (Fernández Lasarte et al., 2020). Practical assistance allows students to focus on their goals, while guidance and information empower them to make informed decisions and feel more confident in their abilities. Recognition and appreciation further bolster self-belief and motivation. Research by Adler-Constantinescu et al. (2013) demonstrates a link between strong social support and higher self-efficacy in learning contexts. Support from peers and family enhances students' motivation and confidence in tackling academic challenges. This translates to higher engagement in online learning and improved academic outcomes (Baria & Gomez, 2022). In essence, social support equips students with the emotional and practical resources necessary to navigate challenges and achieve academic success, ultimately boosting their self-efficacy.

The Correlation Between Digital Literacy and Social Support ($p < 0.000$). Digital literacy encompasses technical skills alongside information access, evaluation, and utilization. Tang & Chaw (2016) and Techataweewan & Prasertsin (2018) significantly impact social support. Research by Khan et al. (2022) suggests that digital literacy fosters participation in diverse social practices, strengthening social connections. Proficient users can leverage technology to maintain connections within educational and professional networks, leading to stronger relationships (Solahudin et al., 2022). This highlights the importance of digital literacy in building and sustaining social ties, ultimately bolstering social support. Furthermore, Baria and Gomez (2022) demonstrate a link between strong digital literacy skills and increased social support in online learning environments. Students with high

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digital literacy can effectively utilize technology for communication and collaboration with peers, enhancing their perception of social support. In conclusion, this research emphasizes the critical role of digital literacy in strengthening social networks and fostering social support, ultimately contributing to increased student academic engagement.

This study explores the positive correlation between metacognitive strategies and social support ($p = 0.013$). Metacognition, encompassing awareness and control of one's thinking processes, can enhance self-efficacy by promoting the utilization of social support. Research suggests that applying metacognitive strategies like planning, monitoring, and self-evaluation strengthens individuals' ability to leverage social support effectively (Fernández Lasarte et al., 2020). For example, social support from teachers and parents can bolster students' cognitive and metacognitive self-regulation, enabling them to set better learning goals and develop strategies to achieve them. Furthermore, Huang and Zhang (2021) found that perceived social support from family and friends contributes to student well-being, with mediating effects from cognitive regulation of learning and academic delay. This suggests that social support goes beyond emotional backing; it also fosters the development of metacognitive skills crucial for academic success (Bae & Kwon, 2021). Students who receive support from teachers, for example, are more likely to implement metacognitive strategies like planning and monitoring their learning, ultimately leading to improved academic performance.

This study explores the positive influence of digital literacy on students' self-efficacy, with social support acting as a significant moderator ($p = 0.001$). Digital literacy, encompassing the ability to find, evaluate, and utilize information effectively through technology, empowers students (Erwin & Mohammed, 2022). Students proficient in digital literacy can leverage technology to enhance their learning and overcome academic challenges, ultimately boosting their self-belief. However, social support plays a crucial role in moderating this effect. Support from family, friends, and teachers strengthens students' confidence in their academic abilities (Han & Geng, 2023). This support goes beyond emotional encouragement; it provides essential emotional, instrumental, and informational resources that fuel academic success (Janssen et al., 2021). Moreover, robust social support fosters the development of metacognitive skills (planning, monitoring, and evaluating learning) crucial for self-efficacy (Rachmawati et al., 2021). Students with strong social support are better equipped to utilize their digital literacy skills effectively, leading to a significant increase in self-efficacy when tackling academic challenges. In conclusion, this research highlights the importance of fostering both digital literacy and social support as a combined strategy to significantly enhance student self-efficacy.

This study examines the influence of metacognitive skills on students' self-efficacy, with social support acting as a significant moderator ($p = 0.008$). Metacognitive skills, encompassing planning, monitoring, and evaluating learning, empower students to develop effective learning strategies, ultimately boosting their self-belief (Bozgun & Akin-Kosterelioglu, 2023). Social support from family, friends, and teachers further strengthens this link. It enhances students' cognitive and metacognitive self-regulation, fostering confidence in tackling academic challenges (Celik, 2022). This support goes beyond emotional encouragement; it equips students with the necessary skills for academic success. Students with strong social support are better positioned to leverage their metacognitive skills effectively, leading to increased self-efficacy across various situations. These findings suggest that a combined approach, integrating metacognitive skills development with robust social support, can produce more favorable outcomes in improving students' self-efficacy.

This study investigates the interplay between digital literacy, metacognitive skills, social support, and student self-efficacy. Digital literacy empowers students to effectively utilize technology for learning and build broader social networks, potentially strengthening the social support they receive. Similarly, metacognitive skills enable students to develop effective learning strategies, enhancing their self-efficacy. Notably, social support emerges as a significant moderator ($p < 0.001$) according to Getenet et al. (2024); robust social support from family and friends amplifies the positive effects of both digital literacy and metacognitive skills on self-efficacy (Akhter et al., 2022). This support provides emotional encouragement and assists students in developing skills for academic success, ultimately boosting their overall self-belief.

6. Conclusion

This study explores the interplay between digital literacy, metacognitive skills, social support, and students' self-efficacy. The findings suggest that both digital literacy and metacognitive skills positively influence students' self-efficacy, with social support acting as a significant moderator. Digital literacy empowers students to effectively utilize technology for learning and social interaction, thereby enhancing their self-belief. Metacognitive skills, such as planning, monitoring, and evaluating the learning process, contribute to the development of effective learning strategies, boosting students' confidence in approaching academic challenges. Social support from family, friends, and teachers further moderates the effects of digital literacy and metacognitive skills on self-efficacy, providing emotional encouragement and facilitating the acquisition of skills necessary for academic achievement.

7. Suggestion

This study opens additional avenues for further consideration by providing some practical insights. Educational institutions, for example, ought to include and integrate digital literacy programs to teach students the requisite technological skills that facilitate learning and improve self-efficacy. Also, educators ought to enhance the development of metacognitive skills by including components that advance self-evaluation, planning, and self-reflection on academic tasks. Finally, there should be initiatives to strengthen social support systems that include family/workshops, peer mentoring, and teacher training on emotional and academic support so as to enhance the positive effects of digital literacy and metacognitive skills on students' self-efficacy.

Declarations

Author Contributions. All authors contributed equally to this paper. All authors have read and agreed to the published version of the manuscript. All authors confirm that their authorship complies with commonly acknowledged international criteria (every author had made a significant contribution to the development of the concept, conducting the research and preparing the article, read and approved the final version before publication)

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Ethical Approval. Since this article is based on a thesis, the necessary permissions from the ethics committee were obtained during the thesis writing process.

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