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The Relationship Between Digital Literacy and Information Literacy With Medical Students' Academic Performance: A Cross-Sectional Study

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A R T I C L E I N F O

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A B S T R A C T

Digital literacy and information literacy are important competencies in medical education, but their relationship with academic achievement remains inconsistent. This study aimed to analyze the relationship between digital literacy and information literacy, as well as the relationship of both with academic achievement. This cross-sectional study involved 95 medical students in the PSEMN Block. Digital literacy was measured using a digital literacy questionnaire, information literacy was measured using the Information Literacy Self-Efficacy Scale, and academic achievement was obtained from the PSEMN Block academic assessment. Data were analyzed using Partial Least Squares Structural Equation Modeling with bootstrapping. The results showed that digital literacy was positively and significantly associated with information literacy (β=0.451; T=5.882; p<0.001), but was not significantly associated with academic achievement (β=−0.166; p=0.331). Information literacy was also not significantly associated with academic achievement (β=0.156; p=0.452), nor was the indirect relationship (β=0.070; p=0.470). The model explained only 2.9% of the variance in academic achievement. In conclusion, digital literacy was associated with information literacy but not with academic achievement, indicating that other factors played a major role

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INTRODUCTION

The academic evaluation of the Endocrine, Metabolism, and Nutrition System Pathology Block (PSEMN) for the 2024/2025 academic year at the Faculty of Medicine, Islamic University of Malang, shows that the average scores for Weekly Exams, Final Block Exams (UAB), and OSCE tend to be lower compared to the Skin and Venereal Disease Pathology Block in the same semester. The PSEMN block was chosen because its material is complex and involves many body systems simultaneously, so students need to search for and combine information from various scientific sources. Evaluation through UAB and OSCE focuses on understanding concepts and clinical thinking, not just memorization, making this block suitable for testing the relationship between digital literacy and information literacy with students' academic performance.

In digital-based learning, skills in accessing, evaluating, and using information are important for academic achievement (Muthukumar et al., 2025). Digital literacy is the ability to use digital technology to access, manage, evaluate, and use information, and it is different from similar terms like digital learning or digital competence (Kirschner & Bruyckere, 2017). Its relationship with academic achievement varies across populations (Ravikumar et al., 2024; Fatkhiyah et al., 2025; Holm, 2025), so it needs to be specifically tested in medical education.

Being skilled at using digital technology doesn't automatically mean you can evaluate and use information for academic needs. Digital literacy gives access to information sources, while information literacy—which is the ability to identify information needs, search for sources, evaluate credibility, and use them in learning—determines whether that access turns into useful understanding. So, information literacy is positioned as a bridge between digital literacy and academic achievement. Information literacy itself is positively related to academic achievement (Momanyi et al., 2024; Ngozi, 2024; Jones & Mastrorilli, 2022; Kusunarningsih, 2018), whereas in other student groups, the relationship between digital literacy and academic achievement is linked to lifelong learning, self-regulation, and confidence in using digital technology (Naveed

et al., 2023; Chen, 2025; Zakir et al., 2025).

In block-based learning, medical students need to access and integrate information from various sources within a limited time. However, research on medical students generally only looks at digital literacy separately (Fatkhiyah et al., 2025; Holm, 2025; Ravikumar et al., 2024), while information literacy is evaluated separately from digital literacy in different groups (Jones & Mastrorilli, 2022; Kusunarningsih, 2018). No studies have examined both together in medical students, and it's still unclear whether information literacy fully connects digital literacy with academic performance in this group, even though digital literacy has been found to be related to confidence in academic abilities and academic procrastination (Yuan et al., 2024).

The novelty of this research lies in examining not just whether digital literacy is related to academic achievement, but also whether that relationship is linked to students' ability to find, evaluate, and use information properly. Academic achievement is defined as the students' final grades in the PSEMN Block, which is a combination of Weekly Exam scores, UAB, OSCE, and

Assignment grades according to the weighting of the Faculty of Medicine at Islamic University of Malang, used as a reflective indicator of the academic achievement construct in PLS-SEM analysis. This study aims to analyze the connection between digital literacy and information literacy with the academic performance of medical students in the PSEMN Block, as well as to explore the indirect relationship of digital literacy with academic achievement through information literacy and examine the role of information literacy as a mediator.

LITERATURE REVIEW

Conceptual Framework

This study places digital literacy as an enabling competency, meaning it opens access to information; information literacy as a processing competency, which transforms information into knowledge; and academic achievement as the outcome of this process. This structure refers to the view of Martin & Grudziecki (2006) that digital literacy develops in stages, from basic technical skills to the ability to process information into knowledge. This means that mastering digital technology becomes the foundation that allows students to practice information literacy, which is then expected to also influence academic achievement. From here, four paths are tested: digital literacy on information literacy (H1), information literacy on academic achievement (H3), the direct effect of digital literacy on academic achievement (H2), and the indirect effect through information literacy as a mediator (H4). These four paths were tested on students of the Faculty of Medicine at Islamic University of Malang in the PSEMN Block, with academic achievement measured through written exams and OSCE.

Digital Literacy and Information Literacy

Digital literacy is the ability to use digital technology to access, understand, evaluate, manage, and communicate information. This skill includes technical abilities as well as cognitive skills in critically using technology (Martin & Grudziecki, 2006). Just being able to access digital sources doesn't necessarily mean you can assess the credibility and relevance of the information you get. This is where information literacy comes in, helping you recognize your information needs, track down the right sources, evaluate their credibility, and use them effectively and ethically (Kurbanoglu et al., 2006).

In medical education, students are always faced with scientific sources of varying quantity and quality, so it's important to pay attention to the difference between the ability to access information and the ability to evaluate it (Maidin et al., 2022). Along the same lines, research on medical students found that searching for and assessing literature is an important component of information literacy (Maidin et al., 2022). Therefore, good digital literacy may also contribute to better information literacy.

H1: Digital literacy is positively related to students' information literacy.

Digital Literacy and Academic Achievement

The argument that digital literacy is related to academic achievement usually rests on one simple logic: students who are digitally literate have access to a wider and more flexible range of learning resources. A meta-analysis by Lei et al. (2021) supports this, showing a moderate positive correlation between ICT literacy and academic achievement. However, for medical students, the relationship doesn't seem to work directly that often. Yuan et al. (2024), studying 659 medical students, found that digital literacy is related to academic self-efficacy mainly by reducing procrastination, while Rehman et al. (2024), looking at 633 medical students, found that its contribution to self-efficacy partially works through reducing cognitive load**.** Although both measure self-efficacy rather than academic achievement directly, this pattern aligns with Chen's (2025) findings on general university students: digital literacy more often works through intermediary variables rather than having a direct impact.

The characteristics of the PSEMN Block, with structured material and some assessed via OSCE, make it more understandable why extra digital access doesn't directly show up in exam scores.

H2: Digital literacy is related to academic achievement.

Information Literacy and Academic Achievement

Digital literacy is more related to the ability to access information, while information literacy is more about how information is processed into useful knowledge. This includes the ability to identify information needs, search for sources, assess the credibility and quality of sources, and use them for academic and professional purposes (Naveed et al., 2023). These skills are important to help students access and process important information during their learning process. In the context of medical education, information literacy skills are crucial because students need to evaluate various scientific sources based on their quality and relevance**.**

Research by (Soleymani, 2014) found a positive correlation between information literacy and academic achievement among medical students. Similar results were found by (Banik & Kumar, 2019), who showed that information literacy skills are related to students' academic performance. These findings suggest that skills in finding, evaluating, and using information support academic success.

H3: Information Literacy is related to academic achievement

Information Literacy as a Mediating Variable

Digital literacy opens access to information spaces, while information literacy processes that access into knowledge. Access without the ability to evaluate information doesn't automatically result in academically valuable knowledge. Therefore, digital literacy is suspected to influence academic performance through information literacy, rather than directly.

This argument aligns with Martin & Grudziecki's (2006) view that technical-level digital competence is beneath knowledge processing competence. Two pieces of empirical evidence support this: information literacy is linked to medical students' academic achievement (Soleymani, 2014), and the relationship

between digital literacy and academic performance involves a mediating mechanism (Chen, 2025).

Studies on medical students show a similar pattern. Yuan et al. (2024) and Rehman et al. (2024) found that digital literacy affects academic outcomes through intermediary variables, namely procrastination and cognitive load. Both used self-efficacy, not information literacy, as the mediator, but the results still support the idea that the relationship between digital literacy and academic outcomes in medical students tends to be indirect. Maidin et al. (2020) also looked at information literacy among medical students in Malaysia using the Seven Pillars of Information Skills framework.

Based on that explanation, this study examines information literacy as a mediator of the relationship between digital literacy and academic achievement. Since the design is cross-sectional, this test only assesses the fit of the data pattern with the proposed model, not proving cause and effect.

H4: Digital literacy is indirectly related to academic achievement through information literacy as a mediating variable.

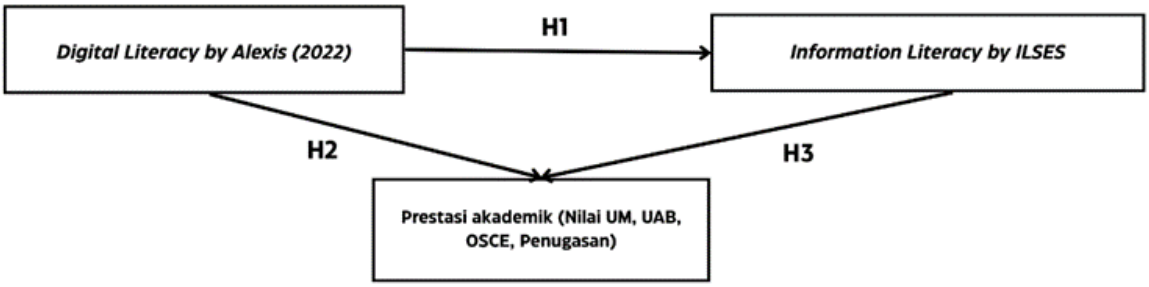


Figure 1. Concept Framework

METHODOLOGY

Research Design

This cross-sectional analytical observational study analyzes the relationship between digital literacy and information literacy on students' academic achievement. The research was conducted at the Endocrine, Metabolism, and Nutrition Pathology Block (PSEMN), Faculty of Medicine, Islamic University of Malang, in the 2025/2026 Academic Year, after obtaining ethical approval from the Health Research Ethics Committee (KEPK) with number 81/KEPK/RSI-U/XI/2025.

Research Subjects

The research population consisted of all students of the Faculty of Medicine at Islamic University of Malang who were enrolled in the PSEMN Block in the 2025/2026 Academic Year, totaling 96 students. The sample was taken using a total sampling technique. Inclusion criteria were active students currently undergoing the PSEMN Block during the study period and willing to participate in all procedures and complete the instruments. Exclusion criteria were students who were not participating in the PSEMN Block during that period or did not fully complete the instruments. A total of 95 out of 96 students met the criteria

and had complete data, so they were included in the analysis (analytical participation **rate** 99.0%).

Instruments and Data Collection

Data were collected in April 2026 using an electronic questionnaire (Google Forms) after participants received an explanation and gave informed consent. Digital literacy was measured using the Digital Literacy Questionnaire from Harerimana et al. (2022), in an Indonesian version that had been translated and adapted to the student context. This instrument consists of 12 items across three sub-dimensions: Computer Competence, Information Competence, and Use of Digital Devices, with Likert scales of 1–4 and 1–5 depending on the item format. A trial with 32 students outside the sample yielded a Cronbach's Alpha of 0.899. In the PLS-SEM analysis, 9 indicators were retained in the final model based on the measurement model evaluation results.

Information literacy was measured using the Information Literacy Self-Efficacy Scale (ILSES) from Kurbanoglu et al. (2006) in a translated version adapted to the research context, consisting of 23 items with a 1–7 Likert scale. This instrument represents self-efficacy in information literacy, not objective competence. Its Cronbach's Alpha is 0.968, and all items meet the validity criteria without elimination. Academic achievement was obtained from official faculty academic documents, namely Weekly Exams, Block Final Exams, OSCE, and assignment grades according to the applicable weighting, with the necessary permissions. This data represents the students' combined achievements, not perception or self-reported data. All 95 respondents completed the instrument and had academic data, so there was no missing data.

Data Analysis

Descriptive statistics and tests of relationships between categorical variables (Chi-Square, Fisher's Exact Test, or Fisher–Freeman–Halton) were conducted using SPSS version 27. Partial Least Squares Structural Equation Modeling (PLS-SEM) was carried out using SmartPLS (Hair et al., 2022). This method was chosen because it is suitable for predicting relationships between variables, does not require data to be multivariate normally distributed, and can be used with relatively small sample sizes. The measurement model was evaluated through outer loading, AVE, CR, Cronbach's Alpha, and discriminant validity (HTMT). The structural model was evaluated through path coefficients, R^2, and VIF, while Q^2 was reported if relevant. Direct and indirect relationships were tested with bootstrapping at a significance level of $p<0.05$. Since the design is cross-sectional, the results are interpreted as statistical relationships between variables, not causal relationships.

RESULTS AND DISCUSSION

Respondent Characteristics

Chi-Square/Fisher tests showed that owning a gadget is significantly related to digital literacy (p=0.003; Cramer's V=0.387, medium effect), and age is significantly related to information literacy (p=0.010; Cramer's V=0.268, small-to-medium effect). Other respondent characteristics were not significantly related to digital literacy, information literacy, or academic achievement (p>0.05), with effect sizes generally being small (V=0.029–0.220) (Table 1).

Table 1. Relationship Between Respondents' Characteristics And Digital Literacy, Information Literacy, And Academic Achievement (N=95)

Features	Digital literacy		Information literacy		Academic achievement	
	p	Effect size	p	Effect size	p	Effect size
Gender Female (n=69) Male (n=26)	0,334	0,099	0,816	0,045	0,504	0,159
Age 19–21 years old (n=70) 22–24 years (n=25)	1,000	0,029	0,010*	0,268	0,098	0,220
Origin of school Boarding (n=13) Non boarding (n=82)	0,687	0,069	1,000	0,029	1,000	0,103
Ownership of gadgets HP (n=10) HP, laptop (n=24) HP, laptop, tablet (n=57) HP, laptop, tablet, computer (n=4)	0,003*	0,387	0,494	0,159	0,929	0,100
The first age of having a gadget <7 years (n=20) 7–12 years (n=47) 13–17 years (n=26) 18–24 years old (n=2)	0,203	0,220	0,226	0,214	0,723	0,139

Note: *p<0.05 (significant). Digital literacy, information literacy, and academic achievement categories are based on total instrument scores. The p-value was calculated using the Chi-Square/Fisher's Exact test as appropriate for the data. Effect size was calculated using Phi for 2×2 tables or Cramer's V for tables larger than 2×2. The dash – = p-value not available.

Measurement model evaluation

All constructs meet the criteria of AVE > 0.50 and Composite Reliability > 0.70 (Hair et al., 2022) (Table 2). Most indicators have adequate outer loadings, except for the Weekly Exam indicator on the academic achievement construct, which has a value of 0.237. Sensitivity analysis shows that removing this indicator increases the outer loading, Composite Reliability, and AVE, without

noticeably changing the path coefficients or the conclusions of the hypothesis testing.

Table 2. Convergent Validity and Construct Reliability

Construct	Cronbach's alpha	CR (rho_a)	CR (rho_c)	AVE	Remarks
Digital literacy	0,847	0,848	0,929	0,867	Valid
Information literacy	0,971	0,978	0,973	0,614	Valid
Academic achievement	0,689*	0,809	0,823	0,571	Retained

Note: All constructs meet the criteria for Composite Reliability (>0.70) and Average Variance Extracted (AVE) (>0.50). CR = Composite Reliability.

The path coefficients and significance of the structural relationships in Model B (without the Weekly Test indicator) (digital literacy → academic achievement: $\beta = -0.152$, $T = 0.941$, $p = 0.347$; information literacy → academic achievement: $\beta = 0.164$, $T = 0.951$, $p = 0.341$) were not significantly different from Model A ($\beta = -0.166$, $T = 0.973$, $p = 0.331$; $\beta = 0.156$, $T = 0.752$, $p = 0.452$), with an R^2 for academic achievement of 0.028 in Model B (Model A: 0.029). Since the results for H2, H3, and H4 were the same in both models, and the Weekly Test is one of the components of the final PSEMN Block grade, this indicator was kept in the final model.

All Heterotrait-Monotrait Ratio (HTMT) values (0.156–0.471) were below the thresholds of 0.85 and 0.90, so discriminant validity among constructs was satisfied (Hair et al., 2022) (Table 3).

Table 3. Discriminant validity (HTMT)

Construct	LD	LI	PA
Digital literacy (LD)	–		
Information literacy (LI)	0,471	–	
Academic achievement (PA)	0,156	0,181	–

Note: All HTMT values are below 0.85, so the discriminant validity between constructs is met.

Structural Model Evaluation and Hypothesis Testing

The SRMR value of 0.085 for the saturated model and 0.104 for the estimated model indicates that the estimated model does not fully meet the commonly used fit thresholds (Table 4). These findings are still reported, but they are not the only basis for evaluating the model because PLS-SEM focuses more on the ability to explain data variation and predict relationships between variables (Hair et al., 2022). Therefore, model evaluation also considers the quality of the measurement model, VIF, path coefficients, R^2, and bootstrapping results. The VIF values for all relationships range from 1.000 to 1.255, well below the maximum limit of 5.0, indicating no multicollinearity among the independent variables (Hair et al., 2022).

Table 4 Model Fit Measurements

Indicator	Saturated model	Estimated model	Reference criteria
SRMR	0,085	0,104	<0.08
d_ULS	5,345	7,939	n/a
d_G	n/a	n/a	n/a
GoF	-	0,282	0.10 (small); 0.25 (medium); 0.36 (large)

Note: SRMR <0.08 indicates a good fitting model (good fit). GoF = √(average AVE × average R^2) (Tenenhaus et al., 2005; Wetzels et al., 2009).

A relationship is considered significant if T>1.96 and p<0.05 (Hair et al., 2022) (Table 5 and Figure 1). Digital literacy has a positive and significant relationship with information literacy (β=0.451; T=5.882; p<0.001), so H1 (digital literacy is positively related to information literacy) is accepted: the higher the digital literacy, the higher the information literacy. On the other hand, digital literacy is not significantly related to academic achievement (β=-0.166; T=0.973; p=0.331), nor is information literacy (β=0.156; T=0.752; p=0.452), so H2 (digital literacy is related to academic achievement) and H3 (information literacy is related to academic achievement) are rejected.. A T-value way below 1.96 shows that the negative direction in the digital literacy path toward academic achievement is most likely just random variation, not a real effect. The mediation path digital literacy→information literacy→academic achievement is also not significant (β=0.070; T=0.723; p=0.470), so information literacy does not prove to mediate this relationship (H4 is rejected).

Table 5 Path Coefficients and Hypothesis Test Results

Relationships between variables	b	T	p	Remarks
Digital literacy → information literacy	0,451	5,882	<0.001	Signifikan
Digital literacy → academic achievement	−0,166	0,973	0,331	Insignificant
Information literacy → academic achievement	0,156	0,752	0,452	Insignificant
Digital literacy → information literacy → academic achievement	0,070	0,723	0,470	Insignificant

Note: β = path coefficient; T = T statistic value; p = significance value. The relationship is considered significant if p<0.05 (or T>1.96). H1–H4 = hypotheses 1–4.

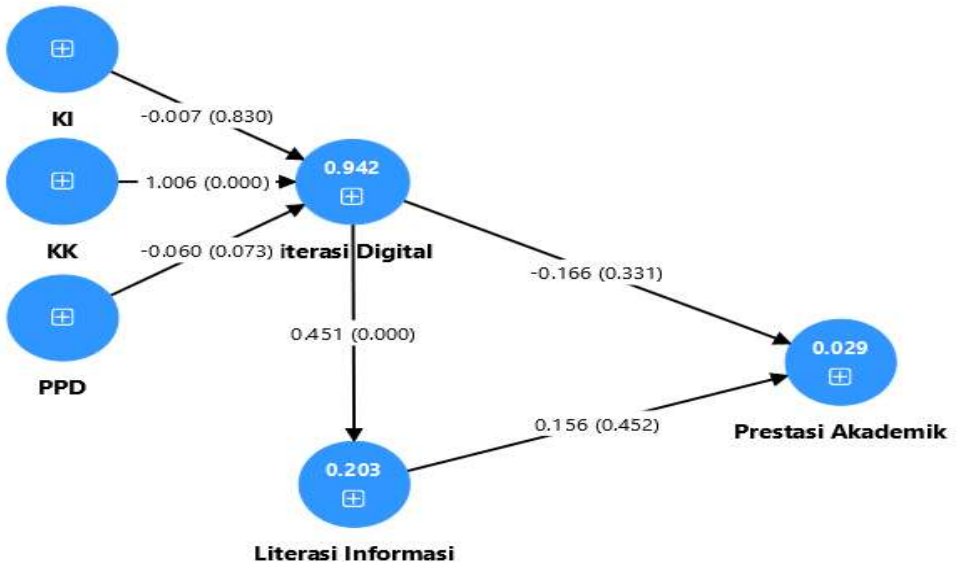


Figure Structural Model of the Relationship Between Digital Literacy, Information Literacy, and Academic Achievement

Note: The numbers on the arrows indicate β (p). KI = information competence; KK = computer competence; PPD = digital device usage.

The model explains 20.3% of the variation in information literacy (R^2=0.203; considered weak), while digital literacy and information literacy together only explain 2.9% of the variation in academic achievement (R^2=0.029), far below the 0.25 threshold, so the model's clarity on academic achievement is considered very low. This pattern is consistent with the path test results, which are also not significant. It is suspected that academic achievement is more influenced by other factors outside the model, such as learning motivation, learning strategies or methods, learning efficacy, number of credits (SKS), and other academic environment factors (Faradila et al., 2021; Ravikumar et al., 2024), which were not measured in this study. In other words, the insignificance of digital literacy and information literacy in this study doesn't mean they don't matter, but rather that their contribution isn't strong enough yet to explain the variation in academic achievement in this model.

The relationship between digital literacy and information literacy

Digital literacy is positively and significantly related to information literacy, so the data supports this study's hypothesis: the better students are at using digital technology, the higher their ability to recognize information needs, search for sources, evaluate credibility, and apply information critically. This result aligns with Holm (2025) with first-year nursing students, which showed that digital literacy at the start of education supports the ability to search for evidence-based information. Nikou (2021) also emphasized that digital literacy and information literacy are two competencies that are closely related in higher education.

In simple terms, this relationship can be seen as complementary: digital technical skills open access to electronic journals and online learning resources, but that access only really matters if it comes with the ability to evaluate information. Technical skills alone don't guarantee you can judge the credibility of information (Kirschner & Bruyckere, 2017; Wahyuanda, 2025), so the connection between the two isn't automatic. In the context of medical education, this means that just boosting digital skills might not be enough to prepare students to handle the growing amount of medical information. Students also need to learn how to assess the credibility of scientific sources, because in clinical practice they have to carefully sort through information that they use as the basis for making decisions.

The relationship between digital literacy and academic achievement

Digital literacy is not significantly related to academic achievement. Although the path coefficient is negative, the relationship is not statistically significant, so its direction cannot be understood as a meaningful connection. This study aligns with Yuan et al. (2024), who stated that digital literacy is only significantly related to academic achievement when mediated by informal digital learning, self-confidence, and digital competence, as well as with Nikou (2021), who found that digital literacy is not directly related to the intention to use technology.

On the other hand, Chen (2025) noted that digital literacy is directly related to academic achievement among students in China, with learning adaptation and self-regulation acting as mediators. This difference is thought to be related to the learning context (author's assumption, not tested in this study): the PSEMN block prioritizes direct interaction and clinical guidance, while its assessment focuses more on mastering concepts through written exams and OSCEs, rather than digital technical skills. In medical education, these results suggest that simply improving digital literacy may not be enough to boost academic performance in blocks focused on clinical reasoning, so other mediating factors like learning strategies or self-efficacy also need to be considered. This study hasn't evaluated any mediators other than information literacy, so the mechanisms linking digital literacy to academic achievement still need further investigation.

The Relationship Between Information Literacy and Academic Achievement

Information literacy might be a supportive skill in the learning process, but in this study, no direct significant relationship with academic achievement was observed. As an interpretation, these findings suggest that students' abilities to search, evaluate, and manage information do not necessarily correlate directly with academic achievement in the PSEMN Block, considering that academic performance is measured through written block exams and OSCEs, which focus more on mastering the material, integrating concepts, and clinical reasoning.
This pattern aligns with findings in medical students in Pakistan (Naveed et al., 2023), which showed that information literacy is related to academic achievement mainly through the mediation of lifelong learning, rather than through a direct

relationship. Based on that study, this indicates that the ability to search for and evaluate new information has an impact when followed by self-directed learning habits. Ferrer (2024) also reported the same thing, that there was no significant overall relationship, although the ability to specifically evaluate information showed a weak but significant relationship. On the other hand, Ngozi (2024) found a positive relationship in undergraduate students in Nigeria, so this difference is suspected to be related to institutional conditions, population characteristics, and the way academic achievement is measured.

In medical education, this finding opens up the possibility that the ability to evaluate information needs to be accompanied by self-directed learning habits to have a real impact on academic achievement. However, this is an interpretation that hasn't been tested because self-directed learning wasn't measured as a mediating variable in this study, so its role is still just a hypothesis that needs to be tested in future research.

The Indirect Relationship Between Digital Literacy and Academic Achievement Through Information Literacy

Information literacy was not found to act as a mediator in the relationship between digital literacy and academic achievement. Even though digital literacy is positively related to information literacy, information literacy is not significantly related to academic achievement, so the mediation hypothesis must be rejected. The non-significant indirect effect is mainly due to the weak pathway from information literacy to academic achievement, not because of a weak connection between digital literacy and information literacy itself.

The results of this study are different from the research by Lei et al. (2021) on the general student population, which showed a positive relationship between ICT literacy and academic achievement without involving a mediating variable. The difference in results might be related to the characteristics of the respondents, the educational environment, and the way academic achievement was assessed in each study. However, this possibility cannot be confirmed because it was not specifically analyzed in this study. Similar results were also found in research on medical students, where information literacy does not have a direct relationship with academic achievement, but is related through lifelong learning as a mediating variable (Naveed et al., 2023). This finding shows that simply being able to search for and evaluate information may not be enough to support better academic achievement. These skills also need to be accompanied by consistent learning habits. However, this study has not specifically identified the factors that might explain this relationship, so this explanation still needs further research, taking into account variables like lifelong learning or self-directed learning habits.

Clarity of the model regarding academic achievement.

Digital literacy and information literacy in this study only explain a small part of the variation in academic achievement. As a possible interpretation, and not a verified finding in this study, the unexplained variation might be related to other factors beyond literacy skills, which according to some studies are linked to medical students' academic performance (Huang et al., 2024). Motivation and self-regulated learning show a weak but significant relationship with academic achievement (Cheema et al., 2019). A study in China found that motivation is indirectly related to achievement through self-efficacy and learning engagement (Naveed et al., 2023), consistent with the path from information literacy to academic achievement in this study, which was also not significantThe learning-teaching environment also has a pretty strong connection: a study at the University of Geneva found that conscientiousness and perceptions of the educational environment contribute significantly to exam and OSCE performance (Schrempft et al., 2021). Meanwhile, academic self-efficacy, assessment system characteristics, and academic workload haven't been tested alongside digital literacy and information literacy in the context of the PSEMN Block. These factors weren't measured in this study, so their role in medical students' academic achievement in the PSEMN Block is still just a hypothesis that needs to be tested directly in future research, not a conclusion from this study's results.

Implications, Limitations, and Suggestions For Further Research

The results of this study are limited to medical students at the Islamic University of Malang who participated in one learning block, so applying them to students in other blocks or institutions still needs further research. Strengthening digital literacy, along with training on evaluating the credibility of medical information sources, could be one way to support students' information literacy, considering the relationship between the two found in this study.

This study has several limitations. First, the cross-sectional design in a single learning block (PSEMN Block) at one institution limits external validity: the results may not necessarily apply to other blocks, other institutions, or different learning conditions. Second, digital literacy and information literacy were measured using self-report instruments. Therefore, respondents' answers might be influenced by their self-assessment, which could make the measurement results less accurate and affect the reliability of the study results. Third, academic achievement was measured through Weekly Exam scores, Final Block Exams, OSCE, and assignment grades within a single block, so it does not fully reflect students' overall academic performance. Fourth, both literacies only explain a small part of the variation in academic achievement, indicating that there are still many other factors not included in the model, such as previous academic achievement, motivation, self-regulated learning, academic self-efficacy, academic workload, and learning environment characteristics, so research ability only explains a limited part of the variation in academic achievement.

It's suggested that future research use a longitudinal design, involve respondents from various institutions and learning blocks, include additional mediator or moderator variables like self-efficacy, self-regulated learning, learning motivation, academic load, and informal digital learning, and also consider objective measurements for digital and information literacy to strengthen the validity of the findings.

CONCLUSIONS AND RECOMMENDATIONS

Among medical students at the Islamic University of Malang participating in the PSEMN Block, digital literacy has a positive and significant relationship with information literacy. On the other hand, no significant relationship was found between digital literacy or information literacy and academic achievement, and information literacy was not proven to act as a mediator in the relationship between digital literacy and academic achievement, so the mediation hypothesis was rejected. The model only explains 2.9% of the variation in academic achievement (R^2=0.029), meaning that most of the variation has not yet been explained by the two constructs tested.

Within the limits of this study's population and design, digital literacy and information literacy are two related competencies, but their connection to academic achievement in block-based learning hasn't been confirmed yet. Future research needs to look into other variables, like academic workload, learning motivation, self-regulated learning, and informal digital learning, across different medical schools with a longitudinal study design to build a more comprehensive model.

FURTHER STUDY

This research still has limitations, so further studies on the topic 'The Relationship Between Digital Literacy and Information Literacy With Medical Students' Academic Performance: A Cross-Sectional Study' are needed to improve this research and provide more insights for the authors and readers.

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