Evaluating digital literacy and media awareness: Impacts on middle school students' digital security knowledge in Indonesia

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ABSTRACT

In an increasingly complex technological landscape, digital literacy is essential for adolescents to navigate digital risks and advancements effectively. This quantitative study investigates the impact of digital literacy and media awareness on middle school students' understanding of digital security and technological issues in Indonesia. Using a cross-sectional survey of 902 participants, data was analyzed through Partial Least Squares Structural Equation Modeling (PLS-SEM). The results indicate that digital literacy has a significant positive effect on students' media use, digital security management, and awareness of technological developments. Furthermore, Importance-Performance Map Analysis (IPMA) reveals that digital literacy is the most influential factor among the variables studied. The findings emphasize the importance of integrating digital literacy education into school curricula to foster responsible and secure digital behavior among students.

Keywords: digital literacy, awareness of owned digital media, usage of digital media, digital media security management, awareness of technology issues and developments

INTRODUCTION

It is challenging to balance the benefits and drawbacks of technology when considering middle school students' usage of digital media (Bauwens et al., 2020). Middle schoolers' digital identities and online safety are at an elevated risk of cyberbullying due to the widespread use of social media (Montiel et al., 2020). There is a substantial risk of developing an addiction to smartphones due to their excessive use, which can disrupt classroom instruction, impede concentration, and reduce students' overall academic performance (Ganefri et al., 2019; Hidayat, Zainuddin, et al., 2024). A problem of academic dishonesty already exists, and smartphones have made it even simpler to cheat on tests and homework (Anwar et al., 2022; Paudel, 2020). Assume students spent an excessive amount of time conversing with their friends in person and not enough time glued to their phones. In that case, their social and emotional well-being may be negatively impacted (Eberle & Hobrecht, 2021). The prolonged use of a technology media can create further health problems, such as eye strain and improper posture interruptions of sleep habits, which can result in lower academic performance and exhaustion (Haryati et al., 2021; Hidayat et al., 2024). Many applications collect user data without purpose, which raises privacy concerns and raises concerns about data protection and security (Ribeiro-Navarrete et al., 2021). The most effective

approach for schools and parents to address smartphone usage is to establish a compromise (Thapa & Camtepe, 2021). Schools should enforce phone locker policies, encourage parental supervision, and establish clear policies for non-academic use during school hours to instill responsible digital habits in students (King et al., 2021).

It is crucial to ensure that middle school students can use digital media safely, as they are becoming more susceptible to online threats (Bauwens et al., 2020). Students must acquire cybersecurity knowledge, as they utilize a variety of platforms (Hidayat et al., 2019; Khan et al., 2022). They must be aware of how to utilize privacy settings and exercise caution when disclosing personal information online, as an excess of information can result in identity theft and other criminal activities (Khan et al., 2022). Teaching students how to verify identities, identify online scams, and comprehend the consequences of leaving digital footprints is a critical component of a comprehensive digital citizenship curriculum (Lauricella et al., 2020; Saari et al., 2024). Additionally, students should be instructed on how to disable location services on their devices to prevent potential predators from tracking them without their consent. By meticulously integrating digital media into classrooms and enforcing appropriate usage guidelines, educators can assist their pupils to maximize the benefits of technology while also mitigating its negative impacts (Abidin et al., 2017). A comprehensive strategy that encompasses instruction, monitoring, and the implementation of policies is necessary to ensure that middle school students use digital media responsibly and safely (Kingston et al., 2018).

Digital literacy requires the ability to access, evaluate, and share information across several digital platforms (Tinmaz et al., 2022), it is more important as technology becomes more pervasive, it is crucial to middle school education (Farias-Gaytan et al., 2023). This means understanding how to access, create, and share digital information as well as using technology. Digital literacy involves using technology, making things, and communicating, consuming digital content requires online research and evaluation (Hidayati et al., 2022; List, 2019). This includes searching effectively, verifying sources, and distinguishing trustworthy information from untrustworthy. Digitally literate people can use search engines, sort results, and find trustworthy websites and articles (Ali et al., 2023). Knowing digital literacy lets you create content with digital tools, includes video, blog, presentation, and website creation. Students learn to express themselves creatively and communicate through various media (Hidayat et al., 2024; Tsortanidou et al., 2019). Communication on digital platforms is another important part of digital literacy, this requires smart and useful use of social media, email, and other communication tools (Milenkova & Lendzhova, 2021; Razak et al., 2022). Learn how to use the right tone, behave, and how long your digital traces last when communicating online (Hidayat et al., 2024; Wu, 2020). As digital citizens, they must know their rights and responsibilities when playing games or sharing content online.

Digital literacy in middle schools includes a variety of skills and knowledge that equip students to navigate the digital realm successfully and responsibly (Falloon, 2020; Haryati et al., 2021; Perdana et al., 2020). As students increasingly engage with technology for educational purposes, understanding digital literacy becomes essential (Praherdhiono et al., 2022; Sadaf & Johnson, 2017). Middle school students are often unprepared for the complexities of the internet, making it crucial to teach them about protecting personal information, managing their digital footprints, and recognizing cyberbullying (Potyrała & Tomczyk, 2021). A comprehensive curriculum should cover topics like verifying identities online, identifying scams, and understanding the ethical implications of their online actions (Jalinus et al., 2022).

Awareness of Owned Digital Media refers to the understanding and recognition of the digital content and platforms that an individual or organization controls and manages (Masiero & Ravishankar, 2019; Rusydiyah et al., 2020; Tinmaz et al., 2022). Nevertheless, the significance of understanding and respecting the intellectual property rights of digital asset owners has grown as the production of digital content has increased (Masiero & Ravishankar, 2019). Critical thinking is necessary to distinguish between excellent and bad material and identify biased sources in the context of media literacy (Hidayat et al., 2024; Jones-Jang et al., 2021). Technology abilities are essential for the evaluation of sources in an era in which fake news is disseminated rapidly online (Nechushtai, 2018).

Digital literacy encompasses the ability to evaluate information and comprehend the influence of media on our thoughts and behaviors (Ku et al., 2019). These dynamics are essential for individuals to make informed decisions regarding their online reading and viewing habits (Turner et al., 2020). This encompasses an knowledge of the workings and potential of propaganda for bias in certain media outlets, it is imperative that creators, consumers, and society comprehend the concept of owned digital media (Rodrigo-Ginés et al., 2024). It necessitates comprehension of digital content laws, media ownership, and critical thinking in order to effectively navigate the intricate digital landscape. Promoting responsible digital media usage and safeguarding the intellectual property of creators can be achieved by raising awareness of these issues (Zeilinger, 2018). This knowledge enhances individuals' intelligence and engagement, enabling them to make informed decisions regarding online information.

This aspect of digital media should instruct us on how to effectively manage time and technology (Haleem et al., 2022). When utilized appropriately, technology offers numerous advantages; however, excessive usage can have detrimental effects on one's mental and physical well-being (Lacka et al., 2021). Be cognizant of these hazards and establish strategies to encourage positive digital behaviors, mental health and behavioral issues may disrupt the lives of overuses (Kirschner & De Bruyckere, 2017).

This modification is a component of a broader narrative that explores the ways in which individuals of varying ages utilize technology to tailor it to their preferences and comfort (MacRitchie et al., 2024). If the appropriate tools and support systems are in place, digital media can assist older individuals in keeping in touch with friends and relatives and improving their standard of living (Siegel & Dorner, 2017). The utilization of digital media presents both opportunities and obstacles (Ferri et al., 2020). Remember that our experiences in this world that is constantly evolving are influenced by our socioeconomic status and generational differences (Hidayat et al., 2021). We can ensure that no one is left behind in this always-connected world by maximizing the benefits of digital media and teaching digital literacy to all individuals (Cladis, 2020).

In a world that is becoming more interconnected and technology-driven, Digital Media Security Management is a critical component of safeguarding digital assets (Oyedokun & Campbell, 2023; Zwilling et al., 2022). Digital Media Security Management is an important aspect of education for high school students, especially as they increasingly use various online platforms (Jerman Blažič & Jerman Blažič, 2022). As students explore the digital landscape, they face a variety of risks, including cyberbullying, privacy violations, and exposure to inappropriate content (Dwinggo Samala et al., 2024; Saxena et al., 2020).

Digital Media Security Management is a crucial part of protecting priceless digital assets in today's digital environment (Shandilya et al., 2024). Organizations can significantly mitigate the risks associated with unauthorized access and cyber threats by implementing proactive Digital Media Monitoring and Digital Rights Management (Ahmad et al., 2020). Middle school students need to learn about the importance of privacy settings on social media accounts and how to protect their personal information online (Jerman Blažič & Jerman Blažič, 2022). Educators should emphasize the importance of not over-sharing sensitive information, such as addresses and phone numbers, which can lead to identity theft or online data theft (Abdullah, 2021). Teaching students how to create strong passwords and recognize phishing attempts is crucial in helping them protect their digital identity (Korać et al., 2022).

To navigate the intricate realm of contemporary technology, one must remain cognizant of emerging issues and advancements in the sector, it entails comprehending the implications of emerging technologies, identifying potential issues, and promoting informed decision-making (Nguyen & Habók, 2023; Parry & Battista, 2023). Technology has significantly transformed perceptions of mental health issues and enhanced public awareness. Individuals can discuss mental health on social media, which has contributed to diminishing stigma and enhancing awareness (Newell & Marabelli, 2015). Conversely, Overuse of social media can result in mental health problems like loneliness, anxiety, and depression (Meshi & Ellithorpe, 2021). Conversely, mobile applications, online discussion platforms, and teletherapy sessions have all been utilized to assist individuals with their mental health (Thomas et al., 2021). These digital platforms have

enhanced accessibility to mental health resources, ensuring greater privacy and convenience, particularly for individuals residing in remote locations or facing mobility challenges (Kaihlanen et al., 2022).

Awareness of technological issues and changes is essential for fostering a society that reaps the benefits of technological advancement while mitigating its adverse effects (Selian & McKnight, 2017). Altering the trajectory of technological advancement by enhancing awareness, tackling mental health challenges via technology, acknowledging variances in digital media usage, and ensuring equitable access to the technology sector for all individuals (Rich et al., 2019). This proactive strategy ensures that technology aligns with ethics, values, and environmental considerations for the long term (Singh et al., 2019). Ultimately, technology can harness to its fullest potential while fostering a more equitable and diverse future, provided we are adequately informed (Petteway et al., 2019).

Middle school students need digital literacy as they navigate an increasingly complex technological environment (Statti & Torres, 2020). Educators can assist students in the responsible management of their digital lives by imparting skills such as ethical behavior, cybersecurity awareness, and critical evaluation (Saeed, 2023). This fundamental knowledge not only equips them for academic success but also allows them to be informed citizens in a digital world that is rapidly evolving (Falloon, 2020; Farias-Gaytan et al., 2023). By integrating the knowledge about digital into their academic curriculum, high school students can cultivate the skills necessary to succeed in a technologically advanced society (Dashtestani & Hojatpanah, 2022; Razak et al., 2022).

Prior study on digital literacy has predominantly concentrated on technological usage and technical skills, neglecting the correlation between digital literacy and awareness of digital media security, as well as comprehension of technological challenges. Research by Farias-Gaytan et al. (2023) and Falloon (2020) underscores the significance of digital literacy in education; nevertheless, they have yet to incorporate a conceptual framework that concurrently connects digital literacy with media awareness and digital security. The majority of digital literacy frameworks remain predominantly cognitive (access–evaluation–production of information), failing to encompass protective behaviour and sustainable technology awareness. A deficiency exists in theoretical models that elucidate the causative and moderating links among digital literacy, media awareness, digital media security management, and understanding of technological concerns and advancements within the setting of secondary school students.

The significance of digital literacy in enhancing the awareness of technological issues and advancements among high school students is becoming more widely acknowledged in the contemporary digital landscape, which delves into a technologically advanced world. However, a significant number of students lack the necessary skills and comprehension to use technological devices responsibly and effectively. The issue of security is also significant, especially for students who are not yet fully cognizant of the significance of maintaining certain privacy aspects in the digital age. This is the basis for the effect of digital literacy on understanding technical problems and developments as well as managing digital media security, particularly among middle school students who already utilize digital technology in their daily lives.

The ability to use digital media critically and effectively is known as digital literacy. The primary variable that can influence or be influenced by other variables is digital literacy. Higher digital literacy correlates with a more profound understanding of the digital media utilized. Digital literacy will be improved through a thorough understanding of digital media, enabling individuals to utilize technology more efficiently. An individual's capacity to employ digital media will be determined by their degree of digital literacy. Individuals possessing advanced digital literacy generally exhibit greater efficiency and criticality in their utilization of digital media in contrast to people who don't know much about it. Another facet of digital literacy is the capacity to comprehend and handle digital security. An individual's comprehension of the value of security and the techniques for maintaining it is directly correlated with their level of digital literacy it in digital media.

This study develops and evaluates a comprehensive model of digital literacy and media awareness utilising PLS-SEM and IPMA methodologies. It provides actual findings from

Indonesian middle school pupils, enhancing the worldwide dialogue on digital citizenship education in developing environments.

METHOD

The methodology that was utilized in this study is what led to the classification of this research as a quantitative research type. In the current investigation, five different factors are being investigated: digital literacy (DL), awareness of owned digital media (AODM), usage of digital media (UDM), digital media security management (DMSM), and awareness of technology issues and developments (ATID). The purpose of this investigation is to determine the causal relationship that exists between the variables that are being investigated. Although the researcher was involved, there is no evidence to suggest that any changes were made to the data. Within the scope of this investigation, which focuses on individuals, the unit of analysis functions as the foundation for analysis. The fact that this study was carried out at a specific point in time results in it being categorized as a cross-sectional investigation.

The study involved 902 middle school students from Indonesia; individuals took part by using website resources to complete an online questionnaire. There were statement questions in this questionnaire for every variable under investigation. Because the distribution method was meticulously controlled, all information gathered from respondents who filled out the questionnaire is regarded as useful. The study utilized simple random sampling, The rationale for employing this sampling method is that the study targets specific criteria, focusing on middle school students who are proficient in using technological devices. This approach also mitigates bias and enables direct identification of any standard errors in the research. This strategy allows any individual wanting to submit the required information to participate in the study, as long as they are willing to disclose it. Table 1 provides specific facts about the sample, 395 (43.79%) respondents were male, while 507 (56.21%) were female. Furthermore, the ownership of the device, only 65 (7.21%) devices belonged to their parents while 837 other (92.79%) were self-owned. Moreover, duration of using internet was also conducted in this study, 239 (26.50%) using internet less than 3 hours a day, while 4-6 hours a day is 395 (43.79%), and more than 6 hours using internet is 268 (29.71%).

Table 1. Participants demographics

	N	Percentage %
Gender		
Male	395	43.79
Female	507	56.21
	902	100.00
Device ownership		
Belonging to parents	65	7.21
Self-owned	837	92.79
	902	100.00
Duration using internet (Hour)		
< 3 Jam	239	26.50
4-6 Jam	395	43.79
> 6 Jam	268	29.71
	902	100.00

This study uses 6 instruments where each variable has indicators to reflect the feelings of respondents, where each of these instruments is adapted from an English study in conducting this study, we translated to Indonesian by involving English language experts who also have the main language Indonesian. The first instrument is Digital literacy (DL) adopted 3 indicators from Farias-Gaytan et al. (2023) a. I look for information about learning on digital media, b. I evaluate the credibility of information sources found in digital media; c. I use some digital tools to support the learning process. The next instruments are awareness of owned digital media (AODM) adopted 3 indicators from Tinmaz et al. (2022), where to represent this instrument, we use 3

indicators a. I know quite clearly about the various types of digital media available today, b. I can explain the usefulness of the digital media platforms that I use for learning; c. I can distinguish between websites and mobile applications in the context of learning. Furthermore, the instrument of usage of digital media (UDM) 3 indicators adopted from Lacka et al. (2021), this instrument represented with a. I actively use digital media (such as online forums, learning videos, and articles) to improve my understanding in learning, b. I feel that the use of digital media in learning helps me understand the material better; c. I join webinars or online seminars relevant to my field of study. Moreover, instrument digital media security management (DMSM) 3 indicators adopted from Zwilling et al. (2022), the indicator such as a. I understand the importance of keeping personal information safe when using digital media, b. I know how to protect my digital accounts from cyber threats; c. I am aware of the risks involved in digital media and take steps to avoid them. Lastly, instrument awareness of technology issues and development (ATID) 3 indicators adopted from Nguyen & Habók (2023), a. I keep abreast of the latest issues related to technological developments that affect education, b. I am able to discuss the impact of new technologies on the learning process; c. I am aware of the latest technological developments and their impact on digital learning.

This study employed an interface application available for downloading onto the smartphones of students participating in the assessment. Diagnostic assessment is a testing approach that offers a comprehensive and meticulous examination of pupils' abilities, skills, and potential. This tool features a more appealing interface, enabling students to conduct evaluations more effectively. In Figure 1, you can see a sample of the use of this application, where from the sample you can also see the results of the assessment that has been carried out.

Figure 1. Comprehensive Diagnostic Psychological Assessment App

We conducted a review of the validity and reliability of each indicator that we used in this study, where the results of the test are described in Table 2, where from these results it can be concluded that this study can be continued with these indicators which are declared valid and reliable in each indicator. Where the average factor loading on each instrument can be declared valid when it is at a number greater than 0.7, and the alpha in the study which is declared good is also at a number above 0.7 (Hair et al., 2021).

We used SmartPLS version 4, which combines the Structural Equation Modelling (SEM) and Partial Least Squares (PLS) methods, to look at the data. It was decided that PLS was the best way to deal with these problems. SmartPLS was used in the study to make sure that both the structural models and the measurement models were accurate. There were two steps to the statistical analysis. Before moving on, it was important to make sure that both the study's theoretical framework and its method for measuring were reliable and accurate. To make sure the measuring tools were accurate, we used the average variance extracted (AVE) and standard item-loading methods. We used the Heterotrait-Monotrait Ratio of Correlations (HTMT) method to figure out how different the variables were.

Table 2. Loading factor and reliability test result

Instrument	Average Loadings Factor	Result	α	Results
AODM	0.803	Valid	0.725	Reliable
ATID	0.795	Valid	0.711	Reliable
DL	0.762	Valid	0.714	Reliable
DMSM	0.827	Valid	0.77	Reliable
UDM	0.73	Valid	0.716	Reliable

Additionally, Cronbach's alpha and CR were used to check how consistent and reliable the models were. In addition, we assessed the effectiveness of each construct by employing importance-performance map analysis (IPMA), thereby enhancing the utility of the PLS-SEM findings. Managers can make decisions about prioritizing actions by analyzing two variables: importance and performance. Therefore, it is advisable to focus on enhancing the efficiency of underperforming elements that play a crucial role in elucidating a specific desired outcome.

FINDINGS AND DISCUSSION

Findings

For this investigation, the methodology utilized a two-step data analysis procedure, beginning with an evaluation of the validity and reliability of the measurement model (Hair et al., 2021). The convergent validity of the study was assessed using standard item loading and average variance extracted (AVE), while the discriminant validity was evaluated using the heterotrait-monotrait ratio of correlations (HTMT). According to Table 3, Composite Reliability (CR) and Cronbach's alpha (α) values are more than 0.7 and AVE is 0.5 above (Hair et al., 2021) Table 3 shows the specific number of the result CR, α and AVE in this study. By the value of alpha on the table can be seen the value is above 0.7, which states that the data are reliable.

Table 3. Cronbach's alpha, composite reliability, average variance extracted

Instrument	α	CR	AVE
AODM	0.725	0.731	0.646
ATID	0.711	0.714	0.633
DL	0.714	0.712	0.582
DMSM	0.77	0.778	0.684
UDM	0.716	0.71	0.506

Furthermore, as indicated in Table 4, the correlation ratio of HTMT is less than 0.9, The information meets the criteria for discriminant validity. It shows that the higher score is on usage of digital media on awareness of owned digital media with number 0.877, while the lowest number is on digital media security management on awareness of technology issues and development with 0.610.

Table 4. Heterotrait-monotrait ratio result

Instrument	AODM	ATID	DL	DMSM	UDM
AODM					
ATID	0.742				
DL	0.787	0.753			
DMSM	0.623	0.61	0.654		
UDM	0.877	0.827	0.852	0.621	

Table 5 presents data on the Fornell-Larcker criterion, which asserts that the construct value exhibits a greater proportion of its variance with the corresponding measurement item. Consequently, it can be concluded that the Fornell-Larcker criterion employed in this study is considered satisfactory. The Fornell & Larcker (1981) criterion is the most effective method for

assessing discriminant validity, which involves comparing the square root of the Average Variance Extracted (AVE) with other latent variables. The Fornell-Larcker criterion is regarded by researchers as a conservative measure for evaluating discriminant validity (Sarstedt et al., 2021). The degree to which a specific construction model differs from other constructs.

Table 5. Fornell-Larcker criterion

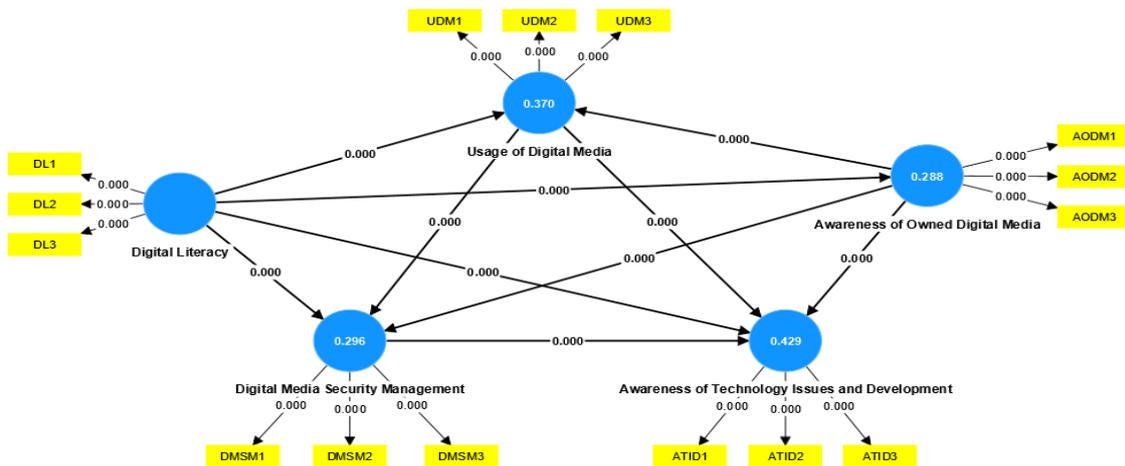| Instrument	AODM	ATID	DL	DMSM	UDM
AODM	0.804				
ATID	0.538	0.796			
DL	0.536	0.51	0.763		
DMSM	0.468	0.462	0.464	0.827	
UDM	0.532	0.543	0.535	0.414	0.712

Figure 2. Hypothesis Testing Result Path

Figure 2 shows the result path analysis of the hypothesis testing result, while the Table 6 gives the information details about the value of the hypothesting result. All hypotheses proposed in this study are acceptable because the p-values in each hypothesis are below 0.5, which also applies to the moderation hypothesis where there are 6 moderating relationships in this study.

Table 6. Hypothesis testing result

Hypothesis	β	t	ρ	Results
H1. DL → UDM	0.35	10.485	0	Accepted
H2. DL → AODM	0.536	21.45	0	Accepted
H3. DL → ATID	0.169	4.598	0	Accepted
H4. DL → DMSM	0.249	6.274	0	Accepted
H5. UDM → DMSM	0.143	4.042	0	Accepted
H6. UDM → ATID	0.261	7.161	0	Accepted
H7. AODM → UDM	0.344	10.709	0	Accepted
H8. AODM → DMSM	0.258	7.05	0	Accepted
H9. AODM → ATID	0.23	6.253	0	Accepted
H10. DMSM → ATID	0.168	4.337	0	Accepted
H11. AODM → DMSM → ATID	0.141	7.133	0	Accepted
H12. AODM → UDM → DMSM	0.049	3.718	0	Accepted
H13. DL → AODM → ATID	0.341	13.268	0	Accepted
H14. DL → AODM → DMSM	0.215	9.414	0	Accepted
H15. DL → AODM → UDM	0.184	9.417	0	Accepted
H16. UDM → DMSM → ATID	0.024	2.994	0.003	Accepted

From the hypotesting results, it was found that all indicators tested in this study had a significant effect; to find out further which effects had a big influence we conducted an Importance-Performance Map Analysis (IPMA). The extension of basic PLS-SEM results using latent variable scores is facilitated by the significance of performance matrix analysis (IPMA), which shows in Figure 3 the measurement of IPMA analysis using a structural model (Ringle & Sarstedt, 2016). The importance value is determined by the total effect received by the construct, while the performance value is determined by the latent variable score. This is substantial enough to be considered when enhancing management activity.
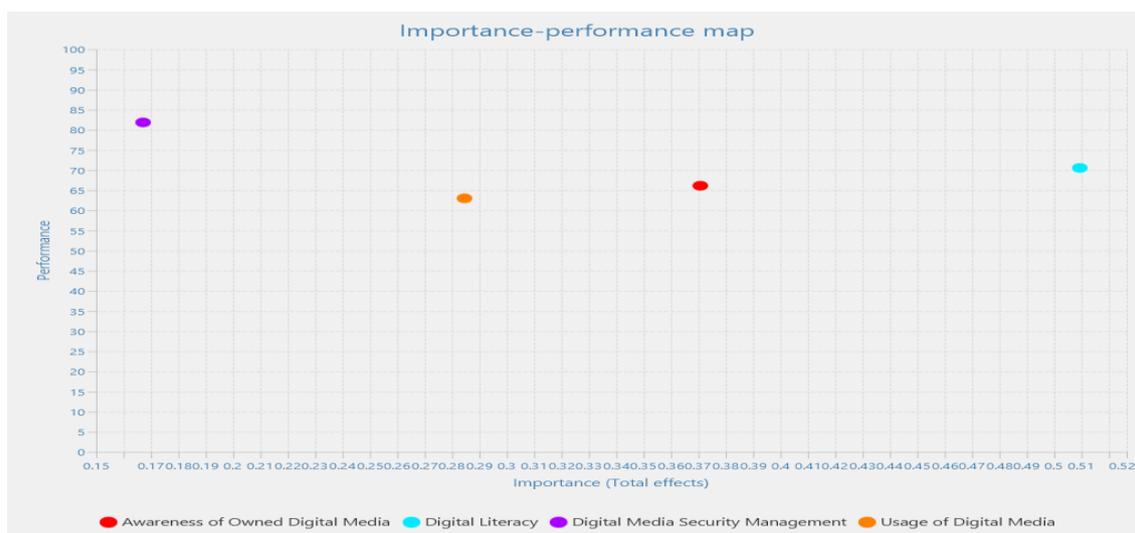

Figure 3. Importance-Performance Map Analysis (IPMA)

Based on the importance-performance map analysis, it is evident that the indicator DL in light blue has the most significant impact on ATID, with a score of nearly 0.51. AODM and UDM are the second and third most significant indicators, respectively. Although DMSM in purple has a relatively low importance level, with a score that does not exceed 0.170, its performance level is at the highest possible level, with a score of approximately 83. DL has a performance score that is slightly above 70, which is the second highest score on the performance line. AODM and UDM have a performance score of approximately 65 on the performance line. The DL indicator is a performance indicator that has a significant impact on ATID, as indicated by the results of this analysis.

Discussion

The results indicate a positive association between students' use of social media and their digital literacy levels. Students who possess advanced digital literacy skills frequently utilize digital media for educational activities, such as lesson preparation, as well as interpersonal communication. The findings indicated that students' digital literacy skills enabled them to navigate these platforms more effectively, thereby reducing their susceptibility to negative situations, even though they typically engaged with social media at a moderate level, this supported previous findings which is shows that the digital literacy are important for the generation to use technology (Farias-Gaytan et al., 2023; Statti & Torres, 2020). The impact of digital literacy on the use of digital media by middle school students is significant. It encourages safer online practices, enhances learning outcomes through the efficient use of resources, and fosters greater engagement with social platforms for constructive purposes. Promoting digital literacy will be essential for students to be prepared for success in a world that is getting increasingly digital as schools seek to incorporate technology into their programs. The academic success of students and their overall well-being in the digital environment will be positively impacted by the promotion of responsible internet use and the provision of essential skills.

As middle school students engage more with digital media, it is crucial for them to comprehend technology-related issues, such as privacy, security, and ethical usage. This study's findings show that students who interact with digital media frequently have a more comprehensive comprehension of these subjects. Suggests that enhanced internet access and consistent engagement with online platforms can augment students' comprehension of digital citizenship and its related responsibilities, which is in line with the previous study where regular use of online resources can improve students' understanding of digital usage (Lacka et al., 2021; Sutarni et al., 2021; Tinmaz et al., 2022). Comprehending this is essential for fostering responsible online behaviour and facilitating informed decisions in a rapidly evolving technological landscape. The significant correlation between digital media usage and technological awareness suggests that educational institutions ought to prioritise the instruction of digital citizenship. Programs designed to instruct students on online ethics, digital rights, and the repercussions of their online conduct can prepare them to navigate the digital environment responsibly. A study highlighted the necessity of comprehensive digital citizenship education to assist students in understanding the consequences of excessive screen time and to promote a balanced technology usage approach. This approach enhances their technical skills while also cultivating critical thinking regarding their interaction with technology.

The evidence suggests that the relationship between digital literacy and awareness of technology issues is moderated by awareness of owned digital media has significant implications for middle school education. Educators can cultivate a generation of responsible, informed digital citizens by promoting self-awareness regarding personal media usage and digital literacy skills, this supported the previous study (Rusydiyah et al., 2020; Saeed, 2023; Zwilling et al., 2022). This comprehensive approach not only provides students with the critical thinking skills needed to understand and confront bigger technological challenges as they arise in society, while also prepares them to manage the intricacies of the digital world. Middle school kids are in a formative stage of their education, and the link between digital literacy and understanding of technological challenges is critical. Digital literacy includes both the technical skills required to use digital tools and critical thinking necessary to evaluate information and comprehend its implications. Nevertheless, this connection is further fortified when students are cognizant of their digital media. For example, students who are aware of their media consumption habits can critically assess the information they encounter online, thereby gaining a more profound comprehension of the ethical implications of their digital actions, as well as concerns such as privacy and security.

Implication and limitation

The results emphasize the importance of comprehensive digital citizenship education that encompasses more than just technical skills. Middle school students should be educated on the ethical implications of digital actions and the appropriate manner of positively interacting with technology. Middle school students must be provided with the necessary education and support to behave responsibly in the digital age through the collaboration of parents, educators, and policymakers. Furthermore, it is imperative to integrate digital media security management into digital literacy programs to provide students with the requisite skills to safely navigate the digital realm and to foster a generation that understands the complexities of modern technology. Educators are essential in directing students' interactions with technology. Teachers can foster the development of responsible digital citizens in their students by integrating digital literacy and responsible social networking skills into their curriculum. By monitoring their children's online activities, encouraging open conversations about their experiences with social media, and emphasizing the significance of maintaining privacy online, parents can contribute to this endeavor. This collaborative approach guarantees that students receive a thorough education in digital citizenship.

This study is limited to 5 variables, where there may be other variables that may affect the performance of using technology media at the middle school level, future research may be able to add other variables that may have an influence on Awareness of Technology Issues and Developments among middle schools. This research was also only conducted in Indonesia, which

may have different influences in other countries. Future research is expected to conduct research in other countries or in several countries to get results that might be generalized.

CONCLUSION

Students who possess advanced digital literacy skills frequently utilize digital media for educational purposes, including interpersonal communication and lesson preparation. This correlation implies that digital literacy improves students' capacity to effectively navigate social media platforms, thereby reducing their susceptibility to negative online experiences. Promoting digital literacy is critical for providing children with the skills they need to thrive in a digital age, as schools increasingly incorporate technology into their curricula. This promotion not only promotes academic success but also improves the general well-being of students in the digital environment by promoting responsible internet use. Lastly, it is essential to comprehend digital security to raise awareness of broader technology issues among middle school students. The abilities acquired in the management of digital media security, including the identification of phishing attempts and the development of robust passwords, are crucial in guaranteeing the safety of students online. Students are likely to adopt healthier online communication habits as they develop a more comprehensive understanding of these security measures, which could potentially reduce the occurrence of cyberbullying and other negative behaviors. In summary, the research emphasizes the necessity of comprehensive educational strategies that incorporate digital literacy, responsible social networking practices, and security management into middle school curricula. By providing students with these fundamental skills, schools can assist them in safely and responsibly navigating the complexities of the digital world, while simultaneously cultivating a generation that comprehends the complexities of modern technology.

This study finds that digital literacy significantly influences students' digital behaviour, security management, and technology awareness. Enhancing reading skills fosters safer and more informed digital participation, enabling kids to negotiate technical intricacies appropriately. Educational institutions and policymakers ought to establish complete digital citizenship initiatives emphasising literacy, ethics, and cybersecurity awareness. Future research may extend this model to include cross-cultural comparisons or longitudinal approaches to improve the generalisability of findings.

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