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The Influence of Social Media on Problem Solving Abilities Through Digital Literacy in Adolescents

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Abstract

In the digital era, social media has become an integral part of teenagers' lives, playing a significant role in shaping their behavior and cognitive abilities, particularly problem-solving skills. Research indicates that social media can have both positive and negative impacts on these abilities, depending on the quality of interactions and digital literacy. Further research is needed to deeply understand how social media use affects problem-solving skills and the role of digital literacy as a mediating variable that strengthens the relationship between social media use and problem-solving abilities in teenagers. This study employed a quantitative method using path analysis. The subjects were teenagers aged 15-18 living in Semarang City, with a sample of 369 students. The results show that social media significantly influences teenagers' digital literacy by 40%, but does not have a direct effect on problem-solving skills. Instead, social media affects problem solving indirectly through digital literacy, with a total effect of 19.2%. Digital literacy itself has a significant impact of 23.1%, aiding teenagers in problem solving through skills in searching, evaluating, and managing digital information. These findings underscore the need to focus on digital literacy to optimize the positive impact of social media on teenagers' problem-solving skills.

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INTRODUCTION

In the next few years, Indonesia will experience a demographic bonus, with a population of productive age greater than unproductive age. This condition puts adolescents as an important element that needs to be prepared in order to be able to contribute optimally in society. In today's digital era, social media has become an inseparable part of everyday life, especially for adolescents. According to Triastuti et al. (2017) social media are internet-based sites and applications that allow users to connect with anyone, both individuals and groups. In addition, the selection of the adolescent category is important because they are the dominant users of social media and thus are at a critical developmental phase that affects PSDM capabilities. This study analyzes the effect of social media usage on problem solving and decision making skills, with digital literacy as a mediating variable among adolescents in Semarang City.

Based on the data from Badan Pusat Statistik Kota Semarang (2024), 94.16% of Indonesian adolescents aged 15-30 years have accessed the internet in the last three months. Of this group, 84.37% of young people stated that they used the internet to access social media, and the majority of them used the internet to access social media. Based on a report from We Are Social in 2023, the average social media user in Indonesia spends more than 3 hours per day browsing social media, indicating a high level of youth engagement with social media (We Are Social, 2023). Thus, social media has a significant role in shaping adolescents' behavior and cognitive abilities.

Problem solving skills are important cognitive skills for an individual's development. Today, good problem solving skills are critical to the social and academic success of adolescents (Gomulya, 2015). Adolescents with these skills tend to be more capable of coping with the daily challenges that appear in their lives. Several studies have highlighted the impact of social media use on adolescents' problem solving skills. Peco et al. (2023) showed that social media can have a positive impact on mental health, especially in terms of easy access to information. This easier access to information can contribute to improved problem-solving skills. On the other hand, research by Khalaf et al. (2023) showed that excessive use of social media can affect focus and attention, which in turn hinders adolescents' ability to make informed decisions.

Digital literacy is an individual's ability to obtain information and knowledge through digital devices, which includes the skills to manage information effectively and ethically. Park & Kwon (2018) added that good digital literacy allows adolescents to critically evaluate information and use it to solve problems. Previous research by Jang (2019); Maisuroh et al. (2024); Schreurs et al. (2017); Appel et al. (2020); and Jin & Ibrahim (2023) show that digital literacy plays an important role in reducing the negative impact of social media, improving problem-solving skills in adolescents, and encouraging their productive participation in digital environments.

However, there is a gap in understanding how the type and quality of interactions on social media specifically affect adolescents' problem solving skills. Most studies tend to focus on the general impact of social media use without considering the different forms of interactions on these platforms. This indicates that there is still ample room for further exploration of the relationship between social media and adolescent cognitive development.

This study aims to fill the gap by further examining how social media usage affects abilities in adolescents. In addition, this study also aims problem solving to explore the role of digital literacy as a mediating variable that can strengthen the relationship between social media use and problem solving skills in adolescents. The results of this study are expected to provide new insights that are useful for educators, parents, and policy makers in managing and maximizing the potential of social media for adolescent cognitive development in Indonesia.

METHOD

The method used in this research is a quantitative method using path analysis, which is a statistical technique designed to examine the cause-and-effect relationship between variables. According to Sandjojo (2020), path analysis allows identifying the direct and indirect effects of independent variables on the dependent variable, and helps understand the complexity of the

relationship between variables in the research model. The research subjects in this study were adolescents aged 15-18 years old living in Semarang City, who came from 9 high schools/vocational schools/equivalents including SMA Negeri 4 Semarang, SMA Negeri 9 Semarang, SMA Negeri 12 Semarang, SMA Negeri 15 Semarang, SMA Hidayatullah, SMA PL Don Bosko, SMA Teuku Umar, SMK Hidayah, and SMK Teuku Umar with a total of 369 respondents. The selection of schools and respondents used purposive random sampling method. The data collection techniques used are observation techniques and questionnaires. The data analysis technique used is quantitative analysis.

RESULT AND DISCUSSION

The Impact of Social Media on Digital literacy

The impact of social media on digital literacy was analyzed through the first path analysis, which resulted in structural equation 1. In this test, there is only one independent variable, social media, which was analyzed using simple linear regression after ensuring the data met the classic assumption of normality.

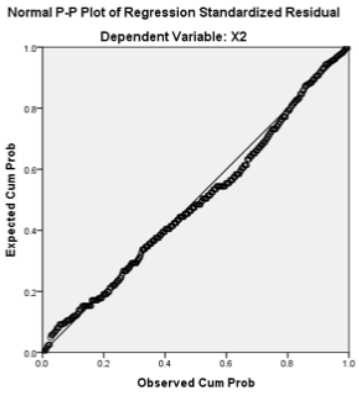

Figure 1. Normality Test P-P Plots Structural Equation 1

Based on the results of the normality test using P-P Plots in Figure 1, the structural equation model 1 showed a normal distribution. This was indicated by the distribution of residual data that followed a straight line, so the normality assumption was met.

Table 1. Structural Equation Test Results 1

	X1 → X2
R Hitung	0,400
R Square	0,160
Sig. 2-tailed	0,000
Standardized Koefisien	0,400

Source: Research Data, 2024.

The test results in Table 1 showed that social media has a significant influence on digital literacy with a coefficient of 0.400. This meant that each increase of one unit of social media increased digital literacy by 0.400. The calculated R value showed a moderate relationship with a correlation of 0.400, and the R square value indicated that social media influenced digital literacy by 16%, while 84% was influenced by other variables. The e1 value was calculated using the formula $e_1 = \sqrt{(1 - 0{,}160)} = 0{,}917$.

Based on the analysis results, the structural equation 1 is presented as follows.

$$Literasi\ Digital = 0{,}400 \times Media\ Sosial + 0{,}917$$

The results showed that the intensity of social media usage was positively related to individual digital literacy skills. Social media acted as a source of information that increased understanding and ability to process digital information. This finding was in line with previous studies by Fitriani (2021) and (Nur Cahya et al. (2023) which showed a positive relationship between social media usage and digital literacy, and strengthened the view that social media can act as an educational platform.

Research by Mulyani et al. (2023) and Milena et al. (2021) showed that improved digital literacy skills in students not only positively correlate with their academic performance when using social media for educational purposes, but also equip them with wise media skills, as well as the ability to recognize accurate information to make positive social contributions. Research by Latif et al. (2023) showed that good digital literacy enables one to engage in information-based decision-making that has clarity and reliability of sources.

In addition, Safitri et al. (2019) stated that digital literacy can strengthen adolescents' social skills and help them face challenges that arise on social media. Therefore, it is important to maximize the potential of social media in improving digital literacy.

The Impact of Social Media on Problem solving through Digital literacy

The impact of social media on problem solving through digital literacy was tested with the second path analysis, which resulted in structural equation 2. This test included three effect analyses: direct, indirect, and total. The direct effect was analyzed using multiple linear regression, while the indirect effect was processed by Sobel test and indirect effect calculation. The total effect was calculated by summing the direct and indirect effects. Before multiple linear regression, classical assumptions such as data normality, multicolonierity, and heteroscedasticity must be met.

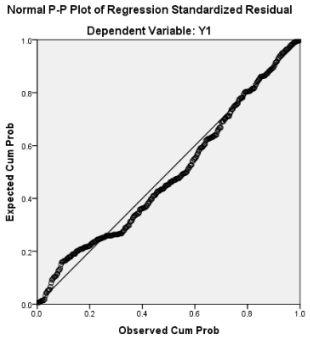

Figure 2. Normality Test of P-P Plots of Structural Equation 2

Based on the normality test using P-P Plots in Figure 2, the structural equation model 2 was normally distributed. This was indicated by the distribution of residual data that followed a straight line, so the normality assumption was met.

Table 2. Multicollinearity Test Results

Variabel	Tolerance	VIF
Social Media	0.84	1.191
Digital literacy	0.84	1.191

Source: Research Data, 2024.

In Table 1, the Tolerance value for the Social Media variable with the Digital literacy variable was 0.84 (> 0.1) and the VIF value was 1.191 (< 10). This indicated that the research data in structural equation 2 did not experience multicollinearity.

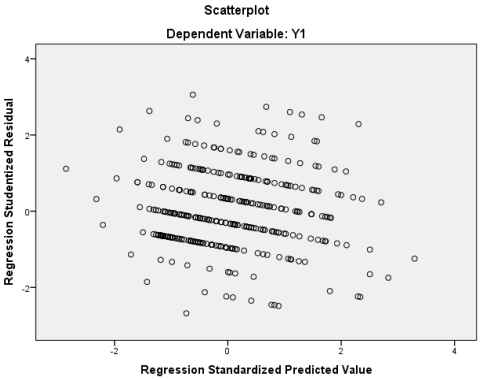

Figure 3. Heteroscedasticity Test of Structural Equation 2

Based on the results in Figure 3, the data distribution on the scatter plot was not clumped and did not form a certain pattern. This indicated that there was no heteroscedasticity in structural equation 2.

Table 3. Direct Effect Test Results Structural Equation 2

	F Simultan	T parsial	
		Media Sosial → Problem Solving	Literasi Digital → Problem Solving
R Hitung	0,263	-	-
R Square	0,064	-	-
Sig. 2-tailed	0,000	0,247	0,000
Standardized Koefisien	-	0,064	0,231

Source: Research Data, 2024.

The path analysis test results in Table 3 showed that there was a significant simultaneous effect of social media and digital literacy on problem solving. The calculated R value showed a low relationship with a correlation of 0.263, and the R square value indicated that social media and digital literacy together affected problem solving by 6.4%, while 93.6% was affected by other variables.

Furthermore, individually (Partial T) social media had a positive but insignificant effect on problem solving of 0.064. In contrast, digital literacy had a positive and significant effect on problem solving with a coefficient of 0.231. This meant that every time social media increased by one unit, it would increase the value of problem solving by 0.064, while every time digital literacy increased by one unit, it would increase the value of problem solving by 0.231. Meanwhile, the value of e2 can be found by the formula $e2 = \sqrt{(1 - 0{,}0{,}64)} = 0{,}967$.

Based on the results of the analysis, the structural equation 2 is presented as follows.

$$Problem\ solving = 0{,}064 \times Media\ Sosial + 0{,}231 \times Literasi\ digital + 0{,}967$$

The indirect effect value was calculated by multiplying the beta value of social media on digital literacy with beta digital literacy on problem solving which resulted in 0.400 x 0.231 = 0.092. The total effect of social media on problem solving is the sum of the direct effect and the indirect effect, which is 0.064 + 0.092 = 0.156. The sobel test analysis is presented in Figure 4.

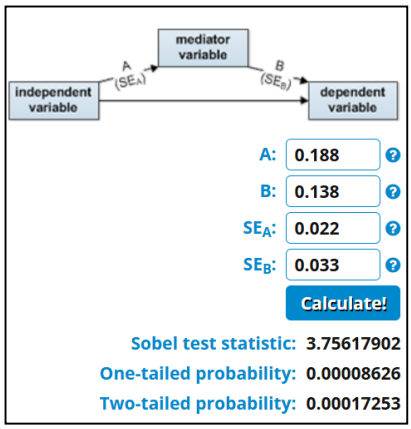

Figure 4. Sobel test

Based on the calculation, the two-tailed probability value of 0.000 (<0.05) indicated that digital literacy significantly mediated the relationship between social media and problem solving. Although social media has a significant effect on digital literacy, it does not have a direct significant effect on problem solving, resulting in full mediation. Thus, there was a positive and significant indirect effect of social media on problem solving through digital literacy of 0.092, with digital literacy as a full mediator.

The results showed that social media functions as a complex communication system with feedback mechanisms that influence adolescents' problem solving skills. Effective use of social media provided relevant information and quick feedback, and supported the problem solving process. The research showed that social media had a significant direct effect on digital literacy (Direct Effect = 0.400, Sig. = 0.000), which meant that social media usage could improve adolescents' digital literacy. Good digital literacy then improved problem solving skills (Direct Effect = 0.231, Sig. = 0.000). This finding was supported by research by Greene et al. (2014) who found that social media helps adolescents develop problem solving skills through social interaction and access to information. Nisa (2024) stated that proper use of social media can encourage the development of problem-solving skills, the ability to evaluate information sources and train responsibility. In line with this, Rumawas (2022) in his research stated that social media skills improve the ability to read, evaluate, counteract fake news and solve the problems they experience.

According to cybernetics theory by Küppers (2023) emphasizing the importance of context and information structure in social cybernetics, information must be interpreted correctly to be used effectively in solving a problem. This study supports the finding that the role of digital literacy as an indirect mediator can be very significant in improving problem solving skills. Adolescents with good digital literacy are able to filter information from social media and use it to solve the problems they experience. Conversely, low digital literacy inhibits problem solving ability even though there is a lot of information available.

In line with the results of this study, Rideout & Robb (2018) showed that social media usage can improve digital literacy skills among adolescents, allowing them to critically assess information and better solve problems. Mardiana (2020) and Yassen et al. (2023) found that activities on social media strengthen digital literacy, which is an important part of cybernetics for processing information feedback. Kapucu et al. (2021) and Sagitaa et al. (2019) also asserted that digital literacy improves problem solving skills and enables individuals to search and manage information effectively. In addition, Sudwiarrum et al. (2023) stated that interaction through social media has a significant influence on self-learning ability, where the higher the social interaction, the higher the ability to self-regulate which will improve problem solving ability.

Based on the results of the path analysis in the research conducted, it appears that digital literacy has a direct and indirect positive influence on social media and problem solving in adolescents. Social media as a source of information and communication tool functions as part of a cybernetic

system that allows individuals to get feedback, adapt, and improve their cognitive skills. Digital literacy plays an important role as a mediator that strengthens the influence of social media on cognitive abilities.

Strong digital literacy enables adolescents to process information from social media more effectively, which in turn improves their problem-solving skills. The results of this study support cybernetics theory which emphasizes the importance of communication, information and feedback in the development of individual skills in complex social systems.

This is in line with research conducted by Hampton et al. (2015) and Hwang (2019) which states that social media can expand social networks and resources that help individuals make decisions. In addition, Turner et al. (2017) emphasizes that social media influences the decision-making process by providing various perspectives and information. This is in line with Küppers' cybernetics which emphasizes the importance of communication in social systems to make better decisions. Khalaf et al. (2023) showed that activity on social media increases digital literacy. Digital literacy, in the context of cybernetics, is the ability to manage and process information that is part of the feedback in a communication system.

The research above supports the finding that social media and digital literacy play an important role in improving problem solving skills. This indicates that social media and digital literacy are important components in the social cybernetics system that influences adolescents' cognitive development.

CONCLUSION

Based on the results and discussion, it can be concluded that social media has a significant influence on adolescents' digital literacy by 40%, but has no direct effect on problem solving ability. The influence of social media on problem solving occurs indirectly through digital literacy, with a total effect of 19.2%. Digital literacy, which has a significant effect of 23.1%, helps adolescents in solving problems better through the skills of searching, evaluating and managing digital information. This study contributes to the understanding of the relationship between social media use, digital literacy and problem solving ability, and supports cybernetics theory that emphasizes the role of information systems in smarter and more adaptive problem solving processes. This study also provides a foundation for future research in the field of digital literacy. Practically, these results can be used as a basis for designing more effective educational programs in improving digital literacy through the use of social media.

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