



Research article

Does digital literacy influence students' online risk? Evidence from Covid-19

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ABSTRACT

The adoption of online-based learning and the internet has had both a positive impact on students. This study aims to understand how digital literacy, parental mediation, and self-control affects online risk during the Covid-19 pandemic in Indonesia. This paper elaborated a quantitative method with SEM-PLS to raise the comprehension of the phenomenon studied. A questionnaire was voluntarily responded to approximately 300 elementary school students who engaged in online-based learning. The structural equation modeling estimation indicates that digital literacy, parental mediation, and self-control influences online risk. However, parental mediation failed in promoting students' self-control. These findings suggest that both digital literacy and parental mediation needs to be penetrated to reduce the impact of online risk in the teaching and learning process. This is the first step for schools and parents' alertness in assisting and considering the appropriate and safe media using technology.

1. Introduction

The Covid-19 pandemic has hampered various sectors of human life, and the government has implemented mass gathering restrictions and the health distancing policy to tighten the transmission (Favale et al., 2020; Elliston, 2020). In the educational field, managing students' learning activities has been transformed with distance learning using technology and the internet (Churiyah et al., 2020; Narmaditya et al., 2020). The adoption of online-based learning provides opportunities for students to enhance their competencies. This new learning activity potentially retains students' time to simplify the overwhelming tasks in modern learning using the internet. The Internet allows students to communicate, entertain, and learn the recent news as well as obtaining information that drives different perspectives of knowledge.

Despite providing positives sides, the distance learning using the internet harms online risks for users primarily for children. The most drawback is the social isolation coupled with the lack of interaction between peers and teachers that promotes inadequate communication skills (Bokayev et al., 2021; Lemay et al., 2021). In fact, the relationship between teachers and students is crucial in determining learning motivation and educational success (Koutsoupidou, 2014; Muenks et al., 2018). Another disadvantage for online-based learning and the internet offers

students potential to cheat during examination, playing games, accessing harmful websites, chatting online during the lesson.

To deal with, having the ability to adopt technology is required for individuals or well-known as digital literacy ability (Phuapan et al., 2016). With the high digital literacy, it will obtain benefits for students to deal with online risks (Helsper and Smahel, 2020). Phuapan et al. (2016) noted that digital literacy is the most important skill in utilizing technology, a communication tool to access, organize, coordinate, estimate, and provide information in society. The aforementioned study by Tejedor et al. (2020) found the need to improve digital skills, especially communication, teaching, and methodology. The rationale behind this is that digital literacy can affect the output of learning outcomes on students' academic achievement (Yustika and Iswati, 2020).

In addition to digital literacy, parental mediation also takes a great role in coping with online risks for their children (Livingstone et al., 2017). The fundamental rationale is that children tend to operate technological matters by observing from their parents. A positive parenting style and its principle are a form of parental mediation that can prevent children from being exposed to negative influences when conducting online activities. Parents also implement various mediation strategies, such as active co-use and interaction rules to reduce online risk (Rodríguez-de-Dios et al., 2018). A study from Lee (2013) documented that

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parental mediation has an effect on reducing online risk but is not related to the addictive use of children.

This study proposes three main contributions. First, it enhances the literature of factors affecting online risks by providing some essential variables such as digital literacy, self-control, and the role of parental mediation that are missing in the preliminary literature. Second, the focus of studies in Indonesia is unique due to the significant change in e-learning use during the Covid-19 pandemic that potentially affects online shocks. Third, this study provides scientific information that can potentially be used by policymakers for certain purposes in students learning activities.

This article is presented as follows. Section 2 is a literature review that provides a general overview of digital literacy, parental mediation, and online risks. Section 3 outlines the method used in this study, followed by findings and discussion in section 4. The paper then provided discussion in Section 5 and followed by conclusion in Section 6.

2. Literature review

2.1. Digital literacy (DL) and online risk (OR)

Academics and policymakers believe that digital literacy needs to be embedded within the educational curriculum. The concept of digital literacy is central for students primarily during the Covid-19 pandemic. The distance education approach drives easy access and convenience of learning opportunities. List (2019) defined digital literacy as the capability to gain an understanding from resources in the computer and the internet. Some scholars asserted that digital literacy is closely linked with cognitive abilities (Traxler and Lally, 2016; Mishra et al., 2017). In addition to learning involvement, online learning activities also enables students to engaging in social media, playing games, and listening to music. According to Higgins et al. (2014), insufficient digital literacy causes low self-control that can lead to deviations in the cyber-world. Low digital literacy skills can also result in children becoming addicted to using gadgets (Bahrainian et al., 2014; Helsper et al., 2019). From a psychological perspective, digital literacy can indicate online behavior in children, including in terms of self-control (Deursen et al., 2015). Digital literacy can affect children's self-control that makes children know their responsibilities when, where, and for how long they can access online learning independently (Wang et al., 2013). A preliminary study by Mohammadyari and Singh (2015) noted that an individual's digital literacy level can affect students' performance in facilitating the use of e-learning and reducing the negative impact from online activities. Thus, a hypothesis is presented as follows:

H1. Digital literacy positively affects students' online risks

H2. Digital literacy positively affects students' self-control

2.2. Parental mediation (PM)

The internet and educational technology are an indispensable part of new students' culture which provides both advantages and disadvantages. As previously mentioned, the drawbacks from internet use harms the users. Therefore, parents have a central role in affecting children's behavior or well-known as parental mediation. The model of parental mediation approaches can in the form of guiding, bounding, and observing. The consequence of regulative mediation on synchronous and online risk was higher for an individual with inadequate self-control. Children's age, parental perceptions of the negative influence of the internet, parental perceptions of low children's self-control, and parental internet skills are significant predictors of restrictive mediation (Lee, 2013). Another study by Nikken and Jansz (2014) documented mediation covers several activities including co-use, active mediation, and restrictive mediation. In addition, strategies that can be utilized include supervision and technical safety guidance.

Parental mediation is a strategy that regulates internet use and maximizes benefits, and minimizes online risks to children (Shin, 2018). Antecedent study showed that active parental mediation can reduce media's influence on children (Lwin et al., 2008). Parental mediation can take the form of strategies and techniques in nurturing and controlling values and behavior in online activities (Kirby, 2020). Two parental mediation strategies are restrictive and instructive (Helsper and Smahel, 2020), restrictive is parental mediation in the form of regulations limiting children to content and social interactions, while instructive is the limitation of social interaction by setting rules and examining children's activities. The restrictive and instructive strategy aims to know messages on online platforms, preventing social conflicts, directing the development of digital skills (Shin, 2018). Therefore, a hypothesis is provided as follows:

H3. Parental mediation positively influences students' online risks

H4. Enjoyment positively influences students' self-control

2.3. Self-control (SC)

Self-control is a central function of self and an important key to success in life (Schneider et al., 2019). Self-control is the first indicator used in predicting crime or similar actions and this is contemporary (Mesch and Dodel, 2018). A previous study mentioned that insufficient self-control can be explained by the lack parental mediation (Deng and Zhang, 1998). Furthermore, Duckworth et al. (2014) self-control also can be used as an indicator of the success of communication skills in children (Eisenberg and Sulik, 2015). Thus, good self-control abilities in children will determine children's attitudes. As technological advancement, sharing information and online communication are fundamental to people of all ages, including children, so that self-control is not only needed when children face situations directly in the real world, but also in terms of behaving online (Nodeland and Morris, 2018). Several preliminary scholars noted that children who have low self-control can lead to addiction to accessing the internet (Helsper et al., 2019), accessing pornographic content (Leukfeldt et al., 2013), the emergence of violence in the form of cyber-bullying (Gillespie, 2007), sexual harassment (Ramsey et al., 2016). In addition, children's health declines because children are in a zone of constantly accessing the internet (Duckworth et al., 2014). Other literature has shown that crime and bad behavior online in children can affect peers, both online and offline (McCuddy and Vogel, 2014; Shin and Lwin, 2017). Therefore, the hypothesis presented is as follows:

H5. Self-control positively influences Online Risk

3. Methodology

3.1. Design and data

This research involved a quantitative approach with the cross-sectional survey of selected elementary schools in Yogyakarta of Indonesia. The underlying rationale is that Yogyakarta is well-known as an educational city in Indonesia. To understand students' online risks (OR), we incorporated several variables including, digital literacy (DL) and parental mediation (PM), with self-control (SC) as intervening variables (see Figure 1). The data in this survey was gathered from online questionnaires using Google form apps distributed to the voluntary respondents. This research was conducted during September and December 2020. This research was administered to approximately 300 responses and found only 90.67 percent completed questionnaires that can be used for further analysis. The voluntary respondents were asked for their anonymity, and Universitas Islam Negeri Sunan Kalijaga performed the ethical issues in this study.

3.2. Variable measurement

We adopted a survey method to gather the data and estimated the provided hypothesis with a structured questionnaire. The questionnaires

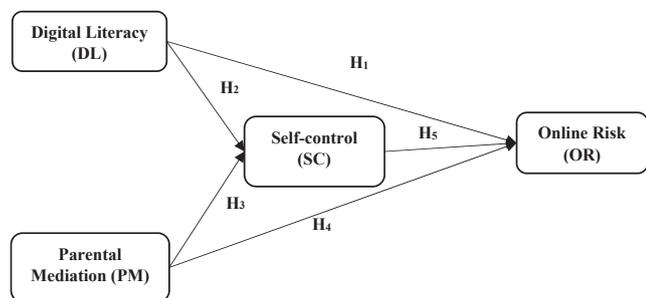


Figure 1. The research framework. Source: own elaboration based on Rodríguez-de-Dios et al. (2018); Bayraktar (2017); Oriol et al. (2017).

in this study were developed according to the literature review and adapted from preliminary research. Therefore, to measure digital literacy (DL), we incorporated 19 questionnaires from the Rodríguez-de-Dios et al. (2018). Parental mediation (PM), we measured by instruments from Rodríguez-de-Dios et al. (2018). As for measuring the students' online risk (OR), we performed 21 question items based upon from Bayraktar (2017). Self-control (SC) was estimated by 30 items adapted from Oriol et al. (2017). The instruments were translated from English into Bahasa Indonesia and it was adjusted with the Indonesia context and research subject. We incorporated a seven-point Likert scale with "strongly disagree" (1) to "strongly agree" (7).

3.3. The Structural Model Estimation

We used the multivariate data analysis method to analyze the completed data. This study followed two main calculations: outer and inner model as the requirement for structural model analysis. The outer model estimation covers convergent validity, discriminant validity and composite reliability assessment to achieve the criteria of SEM-PLS. The criteria to decide the model accomplish the convergent validity when the loading factor is higher than 0.70 and the average variance extracted (AVE) is more significant than 0.50 (Hair et al., 2020). In respect, the construct achieves discriminant validity when the cross-loading value is higher than 0.70 (Hair et al., 2020). To achieve reliability in the model, Cronbach's alpha and composite reliability (CR) must be higher than 0.70. In addition to outer model calculation, this study followed the inner model test of structural model calculation, which assessed the structural model for collinearity issue, evaluated the path coefficient, performed the level of R-square (R²), estimated the effect size (f²), and assessed the predictive relevance (Q²). The R² shows the robustness of the model with the criteria of robust (0.67), moderate (0.33), and weak (0.19). The f² indicates the size impact of the model with the criteria of small (0.02), medium (0.50), and large (0.35). In addition, the criteria to achieve Q² when the Q² is higher than 0, showing that the model has predictive relevance and vice versa. We involved structural equation modeling with partial least square using SmartPLS apps (version 3.0) to estimate hypotheses with the significance at a level of 5%.

4. Results and discussions

4.1. The outer model prediction

Table 1 shows the characteristics of respondents engaged in this study. What is interesting in Table 1 is that the respondents were elementary students between the age of 10–11 years old. Additionally, the majority of respondents were students in last two years of their study and were dominated by female students (63.97%). From the table, it can be known that the respondents involved in this survey have elaborated with online-based learning activities for more than one year.

Table 2 informs the calculation of the outer model in this research. Overall, loading factors ranging from 0.721 to 0.826 (>0.70), which

Table 1. The respondents profile.

Characteristics	Frequency	Percentage
Age		
9 years		
10 years	105	38.6
11 years	167	61.4
Level		
IV	102	37.5
VI	170	62.5
Gender		
Female	174	63.97
Male	98	36.03
Online learning		
One course	112	41.17
Two courses	160	58.83

implicating that this study was confirmed to meet the convergent validity. Furthermore, it declares to achieve discriminant validity when the AVE is higher than 0.50 to achieve. As clearly seen in Table 2, it can be depicted that the AVE score is ranging from 0.591 to 0.669, implicating that it confirmed discriminant validity criteria. While the composite reliability is provided by the CR score that should be higher than 0.70 (Hair et al., 2020). From the table, the CR value is ranging from 0.845 to 0.906 and it achieves the composite reliability criteria.

To measure the discriminant validity, this study also estimated as suggested by Henseler et al. (2015) using the heterotrait-monotrait. The discriminant validity is achieved when the ratio is less than 0.90. As informed in Table 3, it shows that the ratio for each construct ranges from 0.203 to 0.330, indicating to confirm the discriminant validity.

4.2. The structural (inner) model estimation

The preliminary calculation showed that the model had fulfilled the validity and reliability test. For further analysis, this study incorporated PLS estimation to construct a structural model by estimating the inner model. This is intended to perform the relationships between constructs. All the data were run using 500 bootstrapped samples through 272 cases.

Table 2. Results of measurement (outer) model.

Construct	Item	Loading	Cronbach Alpha (α)	CR	AVE
Digital Literacy (DL)	DL13	0.731	0.769	0.852	0.591
	DL3	0.731			
	DL6	0.788			
	DL7	0.821			
Parental Mediation (PM)	PM13	0.746	0.764	0.845	0.578
	PM2	0.778			
	PM3	0.769			
	PM4	0.767			
	PM5	0.770			
Self-control (SC)	SC19	0.786	0.876	0.906	0.615
	SC20	0.796			
	SC21	0.759			
	SC23	0.813			
	SC30	0.763			
	SC5	0.787			
Online Risk (OR)	OR15	0.784	0.751	0.858	0.669
	OR16	0.836			
	OR4	0.708			
	OR5	0.785			
	OR6	0.840			

Table 3. Heterotrait-monotrait ratio.

	SC	DL	PM	OR
Self-control (SC)				
Digital Literacy (DL)	0.230			
Parental Mediation (PM)	0.224	0.203		
Online Risk (OR)	0.471	0.581	0.330	

Table 4. Path coefficients and results of hypotheses testing.

Hypothesis	Relationship	T-value	P-value	Decision
H ₁	DL → OR	6.184	0.000	Accepted
H ₂	DL → SC	2.109	0.035	Accepted
H ₃	PM → SC	1.192	0.234	Rejected
H ₄	PM → OR	4.111	0.000	Accepted
H ₅	SC → OR	6.555	0.000	Accepted

Note: DL = Digital Literacy; SC = Self-control; PM = Parental Mediation; OR = Online Risk.

In addition, from the calculation, it can be known that the range of inner VIF ranges from 1.251 – 2.334, implicating that there is no collinearity issue in the model. As shown in Table 4, all of the hypotheses were accepted since the range of p-value for each relationship is within 0.000–0.033, less than 0.05.

4.3. Model fit

The R-square (R²) aims to predict the accuracy of the model. This study followed Hair et al. (2020) categories: 0.75 (substantial), 0.50 (moderate), and 0.25 (weak). According to the preliminary calculation, it shows that the R² for SC was 0.069, implicating that the PM and DL can perform approximately 6.9 percent of SC variance with a weak category. Furthermore, the R² for OR was 0.312, implying that about 31.2 percent of OR variants explained that PM, DL, and SC in moderate levels. In addition, this study also incorporated f² to estimate the size of the variable construct. This research adopted Hair et al. (2014), with the criteria of f²: 0.02 (small), 0.15 (medium), and 0.35 (large) effect. The results

indicate that the value of f² PM and DL toward SC was 0.062 (small), while OR was 0.320, which means the effect of PM, DL, and SC on OR at the medium size effect.

4.4. Hypothesis testing

Table 4 and Figure 2 provide information about the hypothesis estimation in this study using a significant level of 5%. In general, this study confirmed four proposed hypotheses and rejected one relationship. The hypotheses that were accepted in the model include the effect of DL on SC, PM on OR and SC, SC on OR. However, we did not find a significant relationship between DL and OR. In other words, while hypotheses H₁, H₂, H₄, and H₅ were approved, H₃ was rejected.

5. Discussions

The first set of hypotheses aimed to examine the relationship between digital literacy and online risk in children. This study confirmed preliminary findings by Deursen et al. (2015); Helsper et al. (2019), which revealed that digital literacy skills in children can affect online risks such as bullying, aggression and hatred, sexual harassment, hacking, vulnerability, victimhood, and resilience, and addiction to the internet. The result is also relevant to previous work by Cosma et al. (2020); Keles et al. (2019); Machimbarrena et al. (2018), which noted digital literacy can provide direction in exploring and using the internet with good digital literacy skills will provide security and minimize online crime that is currently happening. Indeed, White (2017) revealed that digital literacy is the ‘literacy’ ability to discover, evaluate, utilize, share and utilize information technology and the internet. Digital literacy is crucial to be implemented in the context of Indonesia, especially during the Covid-19 pandemic, where learning activities are carried out using educational technology and the internet. However, parents must also be involved considering those who during the Covid-19 period intensely accompanied their children. Moreover, collaboration between teachers and parents of students is needed so that digital literacy is effective and has a positive effect on students.

With respect to the first question, digital literacy can promote students’ self-control. This finding supports some previous studies by Higgins et al. (2014); Nodeland and Morris (2018), which stated that digital

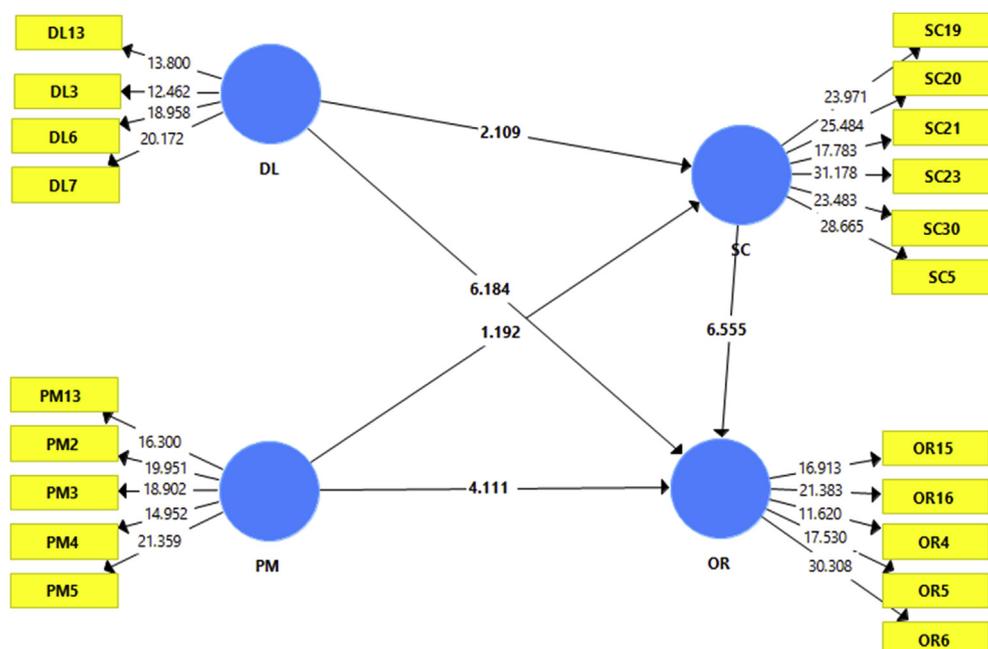


Figure 2. Measurement and structural model estimation.

literacy affects self-control in children. Children who have low digital literacy abilities have negative self-control behavior, and children tend to be suspects or victims of cyber-world crimes, children tend to have impulsive characteristics and can influence children's attitudes in behaving online and offline. This result may be explained by the fact that children's self-control is a major indicator in determining internet use wisdom, and factor that enables children to find, evaluate, and utilize internet technology sources. This is in accordance with the fact in Indonesia that during the Covid-19 pandemic, there was an increase in incomplete information spreading. Children freely use social media platforms and communicate with strangers without knowing the impact that will occur. In fact, it is not uncommon for children to become victims of cyber-kidnapping and cyber-bullying. This finding is an entry point for stakeholders to pay more attention to internet use in children to feel the importance of digital literacy and self-control skills in online behavior.

In addition to the first and second hypotheses, this study found that parental mediation failed in explaining students' self-control. This finding is on the contrary with the prior study by [Livingstone et al. \(2017\)](#); [Soldatova and Rasskazova \(2017\)](#) remarked that parental mediation is a factor in children's self-control ability. At the same time, the results of the study suggest parental mediation can promote students' online risks. This is in agreement with [Nikken and Jansz \(2014\)](#); [Shin \(2018\)](#), which demonstrated that parents have a role as mediators in online behavior. These findings are similar to antecedent studies by [Paat and Markham \(2020\)](#) which has proven that there is an effect of human self-control in preventing negative online behaviors. Likewise, the last finding agreed with [Cava et al. \(2020\)](#); [Nodeland and Morris \(2018\)](#), which stated that online risk in children can be prevented by positive internet recognition by parents from an early age. Indeed, [Shin \(2018\)](#) emphasized that parental mediation is a strategy that regulates internet use and maximizes benefits, and minimizes online risks to children. In short, parental mediation and self-control are indicators that can determine children's online behavior. As previously described, the role of parents in reducing students' online risky behavior is very crucial. The main reason is that parents fully assist students in learning activities, especially those who get the work from home policy. Without the role of parents, students will be very vulnerable to risky online behavior. Furthermore, the role of parents will also increase children's self-control in online risky behavior. Direction, rules, and parental assistance will provide knowledge of the child and how self-control will grow and develop. When self-control in children grows strong, it will minimize and even eliminate risky online behavior. This strategy must be synergistic between teachers, schools and parents, so that students' risky online behavior can be anticipated appropriately and effectively.

6. Conclusions

The main objective of this study was to determine the main factors that can affect digital literacy and online risk in children in Indonesia during the Covid-19 pandemic. We proposed several hypotheses, of which four were accepted. The findings showed that digital literacy positively affects online risk and students' self-control. However, parental mediation can explain students' online risks, but it failed in determining students' self-control. Then, self-control has a positive influence on online risk in children. Finally, our findings confirm that digital literacy can affect online risk in children behaving in the cyber world. The findings pointed out that some children had low self-control, which resulted in a high online risk for children. This is important, given the ever-growing development of technology, children can freely access the internet anywhere and wherever they are. If this is left alone, children will tend to depend on the internet, and sometimes even children become victims of cyber-kidnapping and cyber-bullying. In the context of the Covid-19 pandemic in Indonesia, both children, parents, and teachers should provide positive support and direction to children using the internet, one of which is the parenting mediation strategy. This finding is an entry point for stakeholders to pay more attention to internet use in children to

feel the importance of digital literacy and self-control skills in online behavior. The limitation of this study is that respondents from the study came from elementary school students. Further, scholars need to incorporate various levels of education such as Junior High School, Senior High School, and Higher Education so that digital literacy skills and their impact on online risk can be known in detail. Forthcoming researchers also need to include variables in the form of digital devices and several similar variables to find out the main factors of digital literacy skills in high students or college students.

Declarations

Author contribution statement

Sigit Purnama, Agus Wibowo, Bagus Shandy Narmaditya: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Maulidya Ulfah, Imam Machali: Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data included in article/supplementary material/referenced in article.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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