

Digital Literacy and Children's Social Behavior: The Role of Parental Interaction Quality in Parenting in the Gadget Era

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Abstract

The extensive proliferation of digital technology among elementary school-aged children frequently poses the risk of social behavioral issues and diminished empathy, attributed to insufficient self-regulation and inadequate supervision. This study seeks to investigate the intricate mechanisms underlying the relationship between children's digital literacy and their social behavior by analyzing the dual function of parental interaction quality (Parenting Style) as both a mediator and a moderator. Data were gathered from 105 elementary school students in Surakarta City utilizing a quantitative correlational methodology. The hypothesis testing yielded significant results: The study demonstrated that parenting style serves as a mediator, indicating that the beneficial effects of digital literacy on social behavior primarily manifest through the perception of positive parenting. Additionally, Parenting Style served as a moderator, validating that the beneficial effects of digital literacy are amplified when the quality of parental engagement is elevated. These results highlight the need to improve Digital Parenting programs that stress the importance of open communication and active parental involvement as key elements in making sure that children's digital skills lead to good behavior.

Keywords: Digital Literacy; Parenting Style; Social Behavior; Mediation; Moderation

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INTRODUCTION

The rapid growth of digital technology has led to the creation of Generation Alpha, a group of young people who are growing up in a connected world (Swargiary, 2024). Strong data backs up this trend in Indonesia. The Indonesian Internet Service Providers Association APJII (2023) just released a new study that says that 78.19%

of the population now has access to the internet. More interestingly, statistics from the Ministry of Communication and Informatics (Kominfo) and Statistics Indonesia (BPS) shows that about 39.71% of Indonesian kids use mobile phones and 48% of internet users in Indonesia are under 18 years old (BPKAD JABAR, 2025).

This is certainly the case at the regional and primary school levels. Reports from Central Java show that young children are already familiar with technology. For example, 38.48% of young children are already playing with cell phones (Ari Sony. Statistisi BPS Kabupaten Semarang, 2023). In the elementary school setting, a survey conducted in Banyumas, Central Java, revealed that most sixth-grade pupils possess personal gadgets and utilize them often outside of school hours, even late at night (Putri Sella Adelia dkk., 2025). According to the Indonesian Child Protection Commission (KPAI), 60% of youngsters use electronics for more than 2 hours a day outside of school (KPAI (Komisi Perlindungan Anak Indonesia), 2021). This poses difficulties as children in primary school are still cultivating self-regulation and lack sufficient digital literacy (Ramadhani, Khairin Revalia; Adrias; Zulkarnaini, 2025).

While technology offers educational benefits, excessive digital exposure without adequate supervision can have serious psychological and social consequences. A case study at an elementary school in Surakarta showed that low digital literacy among elementary school students presents a new challenge requiring special supervision (Aulia dkk., 2025). In the realm of social behaviour, research has found a negative correlation between excessive digital exposure and decreased empathy and prosocial behaviour (Hariyanto, B., Santoso, A., & Wijaya, 2024). In fact, data from the Indonesian Child Protection Commission (KPAI) in 2024 recorded 41 cases of children becoming victims of pornography and cybercrime, with the most frequently reported cases being child victims of sexual crimes and cyberbullying, which ranked third in child protection complaints (DPR RI, 2025). Weak self-control and social skills are among the main triggers for this vulnerability.

Facing this urgency, the quality of parental interactions plays a crucial role in the implementation of Digital Parenting. This concept involves effective parental mediation, which encompasses both active approaches (discussion and guidance) and restrictive approaches (setting time and content limits) (Livingstone & Byrne, 2018). A warm, responsive, and democratic parenting style, in which parents are actively involved in their children's digital activities, has been shown to reduce the risk of device addiction and enhance children's social development (Sisbintari & Setiawati, 2021; Supartiwi dkk., 2020). Effective mediation serves as a bridge that determines whether children's digital literacy will produce positive social impacts, such as increased empathy and cooperation, or the opposite (Drupadi dkk., 2022).

However, a crucial research gap lies in examining more complex mechanisms. Most studies in Indonesia and Central Java have focused on simple two-variable relationships. This study aims to fill this gap by examining the mediating and moderating roles of parental interaction quality in the relationship between children's digital literacy and social behaviour (Qian dkk., 2024). An empirical understanding of this dual role of parenting as both a mediator and a reinforcer will provide specific and implementable recommendations for elementary school-based digital parenting programs in Central Java (Maryati et. al., 2025). Therefore, this study aims to quantitatively examine the mediating and moderating roles of parental interaction quality in influencing digital literacy on children's social behaviour.

METHOD

This study uses a quantitative correlational approach with a mediation and moderation analysis model. The aim is to explain the relationship between digital literacy and the social behaviour of elementary school-aged children by exploring the role of parenting styles (based on children's perceptions) as mediating and moderating variables. This approach was chosen because it is effective in analysing causal pathways and the complexity of the role of mediating/reinforcing variables in the context of family psychology in the digital era. (Hair, J. F., Black, W. C., Babin, B. J., & Anderson, 2019).

Design

This research design is a quantitative correlational explanatory one. The analytical model used is path-based regression to test a structural model involving three main variables: Children's Digital Literacy (Independent Variable), Parenting Patterns Based on Children's Perceptions (Mediating and Moderating Variables), and Children's Social Behaviour (Dependent Variable). This analysis aims to provide a detailed explanation of the mechanisms behind the influence of digital literacy on children's social behaviour, specifically how parenting variables can act as a bridge (mediator) and as a determinant of the strength of the relationship (moderator) (Hayes, 2022).

Participants

The subjects in this study were 105 students aged 10–12 years (equivalent to grades 4–5 of elementary school). The study was conducted at a public elementary school in Surakarta (Solo), Central Java. Purposive sampling was used. Subjects were students who were willing to participate and obtained permission from their parents/guardians. Only students became respondents, completing questionnaires regarding digital literacy, perceptions of parenting styles, and their social behaviour. The final number of respondents used in the analysis was 105 students. This sample size was deemed adequate for Structural Equation Modelling (SEM) analysis by testing complex mediation and moderation models (KPAI (Komisi Perlindungan Anak Indonesia), 2021; Sisbintari & Setiawati, 2021).

Instruments

Data collection used three sets of instruments, consisting of structured questionnaires with a Likert scale, self-constructed by the researcher based on relevant theories and completed entirely by the students: (1) Children's Digital Literacy Questionnaire: This questionnaire, based on the dimensions of digital literacy Livingstone & Byrne (2018), measures children's functional and critical abilities in accessing, evaluating, and using digital media wisely; (2) Digital Parenting Perception Scale: This scale was designed to measure students' perceptions of their parents' digital parenting mediation, focusing on the dimensions of warmth, involvement, and monitoring (Nikken, Peter; Jansz, 2014); (3) Child Social Behaviour Scale: This scale was designed to measure students' self-reports of their social behaviour tendencies, encompassing aspects of prosocial behaviour and problem behaviour, referring to the theoretical framework of social behaviour in elementary school children (Hariyanto, B., Santoso, A., & Wijaya, 2024).

Each instrument underwent content validity testing by experts, empirical validity (CFA), and reliability (Cronbach's alpha). The instrument test results demonstrated excellent reliability: the Parenting Scale ($\alpha = 0.876$), Digital Literacy ($\alpha = 0.915$), and Social Behaviour ($\alpha = 0.882$). A high level of reliability (above 0.80) indicates that all instrument items have adequate internal consistency and are suitable for use in further analysis (Yusup, 2018).

Data Analysis

Data analysis was conducted sequentially: (1) Descriptive Analysis used to obtain a general profile (mean, standard deviation) of children's Digital Literacy and Social Behaviour; (2) Pearson Correlation Analysis used to test the strength and direction of the linear relationship between the main variables (Digital Literacy, Perceived Parenting, and Social Behaviour). The analysis results showed significant positive correlations between variables (all <0.001), which supports more complex model testing steps; (3) Structural Equation Modelling (SEM) used to test mediation and moderation hypotheses simultaneously. The software used is SPSS (for correlation and prerequisite analysis) and AMOS/PLS (for SEM models): (a) Mediation Test: Perceived Parenting Style was tested as a mediator between Digital Literacy and Children's Social Behaviour. The test was conducted through an indirect path analysis using the Bootstrap method (Hayes, 2018). A significant indirect path ($\beta = 0.258$; $p < 0.001$) and the Sobel test ($z = 3.87$; $p < 0.001$) proved a partial/full mediation role; (b) Moderation Test: Perceived Parenting Style was tested as a strengthening or weakening variable (moderator) in the relationship between Digital Literacy and Social Behaviour. The interaction analysis of the variables showed a significant result ($\beta = 0.189$; $p = 0.023$), confirming a moderating role where more positive parenting styles strengthen the influence of Digital Literacy on Social Behaviour.

RESULT AND DISCUSSION

The results of this study are presented based on the sequence of analyses conducted, including instrument quality testing and primary hypothesis testing (correlation, mediation, and moderation).

Data Description and Instrument Quality Testing

Descriptive data indicate that the 105 research subjects (elementary school students aged 10-12 years at a public elementary school in Surakarta City) had varying profiles in digital literacy, perceptions of parenting styles, and social behaviour. Prior to inferential analysis, instrument reliability and validity were tested. All research instruments (Digital Literacy, Parenting Style, and Social Behaviour) demonstrated excellent results, ensuring that the data collected was accurate and consistent in table 1.

Table 1. Reliability Test Results

Variable	Number of Respondents	Reliability Coefficient (α)	Description
Parenting Patterns (Child's Perception)	105	0.876	Highly Reliable
Digital Literacy	105	0.915	Very Highly Reliable

Social Behaviour	105	0.882	Highly Reliable
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These results indicate that the self-constructed instrument is suitable for use in further analysis (Yusup, 2018).

Pearson Correlation Test Results

Pearson correlation analysis was used to determine the strength and direction of the linear relationship between the main variables.

Table 2. Pearson Correlation Test Results

Variable Relationships	Correlation Coefficient (r)	Significance Value (p)	irection of Relationship
Digital Literacy - Parenting	0.612	< 0.001	Positive Significant
Digital Literacy - Social Behaviour I	0.587	< 0.001	Positive Significant
Parenting - Social Behaviour	0.534	< 0.001	Positive Significant

These findings indicate that the three variables are significantly positively correlated. The higher a child's digital literacy level, the more positive their perceptions of their parents' parenting styles, and the higher their reported positive social behaviour

Mediation Test Results (Structural Equation Modeling)

Path analysis using Structural Equation Modelling (SEM) was used to test the mediation hypothesis, where Parenting Style (M) acts as a mediator in the relationship between Digital Literacy (X) and Children's Social Behaviour (Y). The indirect effect, i.e., the indirect path from Digital Literacy through Parenting Style to Social Behaviour, was found to be statistically significant ($\beta = 0.258$; $p < 0.001$). The Sobel test results ($z = 3.87$; $p < 0.001$) confirmed this finding.

The mediation test concludes that Parenting Style (Children's Perception) mediates the relationship between Digital Literacy and Children's Social Behaviour. This means that most of the influence of Digital Literacy on Social Behaviour occurs indirectly through parenting mechanisms that are perceived positively by children (Hayes, 2022)

Results of the Moderation Test (Structural Equation Modeling)

An interaction test was conducted to explore the role of Parenting Style (M) as a strengthening or weakening variable (moderator) in the direct relationship between Digital Literacy (X) and Social Behaviour (Y). The interaction effect analysis showed a statistically significant moderating effect ($\beta = 0.189$; $p = 0.023$).

This finding supports the role of Parenting Style as a moderator: the more positive the parenting style perceived by the child, the more substantial and more effective the influence of Digital Literacy on the child's Social Behaviour. Conversely, with weak perceptions of parenting, the positive impact of digital literacy on social behaviour tends to be reduced (Livingstone & Byrne, 2018).

The results of this study consistently support the hypothesis that parenting styles play a central role, not only as an independent predictor but also as a key mechanism (mediator and moderator) in the context of digital literacy and social behaviour in elementary school children. This finding confirms that children's

technical competence in the digital world must be managed through a social and ethical framework prepared by the family.

Parenting styles act as a critical mediating mechanism. The finding that parenting styles significantly mediate the relationship between digital literacy and social behaviour ($\beta = 0.258$; $p < 0.001$) provides strong empirical confirmation of Parental Mediation Theory (Livingstone & Byrne, 2018). High levels of digital literacy in children, encompassing functional and critical skills, are essential prerequisites. However, these skills are neutral and can result in positive social behaviours (e.g., online collaboration, peer support) or negative ones (e.g., cyberbullying, exposure to harmful content) (Hariyanto, B., Santoso, A., & Wijaya, 2024)

According to Nikken, Peter; Jansz (2014) children's perceptions of warm, involved, and monitoring parenting (warmth, involvement, and monitoring) act as a vital socialisation filter. When children perceive open discussion, reasonable supervision, and emotional support, they tend to internalise their parents' ethical values. This internalisation process enables children's digital competence (Digital Literacy) to be effectively translated into positive social behaviour, rather than the other way around. In the context of elementary school children in Surakarta, parenting serves as a crucial bridge that transforms digital cognitive potential into concrete prosocial behaviour.

Parenting as a conditional reinforcer (moderator), the discovery of the moderating role of parenting (Interaction Effect $\beta = 0.189$; $p = 0.023$) is the most important result and demonstrates the novelty of this study. The moderating role of parenting goes beyond mere mediation and suggests that the quality of family interactions determines the strength or weakness of the influence of Digital Literacy on Social Behaviour.

These findings imply that in a highly supportive parenting style, children's digital literacy becomes a maximised asset. Children's digital skills are efficient in fostering positive social behaviour. Parenting acts as a catalyst. In a lowly responsive parenting style, the positive influence of digital literacy is hindered or diminished. Although children may possess advanced technical skills (digital literacy), the lack of parental guidance and warmth prevents these skills from connecting with social norms. In fact, this situation can create the risk that high digital literacy without guidance can exacerbate behavioural problems (Nikken, Peter; Jansz, 2014).

This analysis suggests that in efforts to improve children's social behaviour in the gadget era, interventions must not simply focus on digital literacy training but must fundamentally strengthen the quality of parental digital interactions and parenting (Sisbintari & Setiawati, 2021). These results provide a strong argument for the importance of Digital Parenting programs in elementary schools, particularly in Surakarta City Public Elementary Schools.

CONCLUSION

This study aims to answer questions regarding the mechanisms linking children's Digital Literacy to their Social Behaviour, with a focus on the role of Parenting as a mediator and moderator. The results of the study on 105 elementary school students aged 10-12 years in Surakarta City comprehensively prove that Parenting Patterns perceived positively by children are a crucial mechanism that determines the realisation of the positive impact of Digital Literacy. Conceptually, the study confirms

the mediating role of Parenting, meaning that the influence of Digital Literacy on Social Behaviour occurs largely indirectly through the quality of family interactions. This finding strengthens the Parental Mediation Theory (Livingstone & Byrne, 2018), which asserts that children's digital skills become socially meaningful only when filtered and internalised through a warm and communicative parenting process. Furthermore, the discovery that provides novelty is the evidence for the moderating role of Parenting, where perceived positive Parenting acts as a significant catalyst strengthening the influence of Digital Literacy to produce prosocial behaviour (Nikken, Peter; Jansz, 2014). On the other hand, weak parenting patterns can hinder the effectiveness of Digital Literacy and even potentially increase the risk of behavioural problems, even if the child has high digital competency.

Based on these findings, this study provides strategic recommendations. It is recommended that interventions aimed at improving children's social behaviour in the digital age should shift from a sole focus on teaching digital technical skills to enhancing Digital Parenting capacity (Sisbintari & Setiawati, 2021). Schools, particularly in Surakarta City, are encouraged to design family education programs that emphasise the importance of open communication (warmth), active involvement (involvement), and dialogic monitoring of children's online activities. For future research, it is recommended to use qualitative methods (e.g., in-depth interviews with parents and children) to explore how digital parenting dimensions are implemented daily more specifically, and to test similar mediation and moderation models across the adolescent age range to compare the mechanisms that operate at different developmental levels.

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