The Impact of Digital Parenting and Neuroparenting Integration on Early Childhood Continuing Education in Indonesian Muslim Families

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Abstract

This study analyzes the influence of digital parenting and neuroparenting integration on early childhood sustainability education in Indonesian Muslim families. Using a quantitative survey design, data were collected from 200 parents of children aged 4-6 years old through a standardized questionnaire and analyzed using multiple linear regression. The results indicate that the integration of both parenting styles significantly impacts all sustainability education indicators, including digital literacy, environmental adaptation, learning motivation, religious character, and ecological responsibility. Digital parenting contributes more strongly to technological literacy and adaptation, while neuroparenting predominantly influences emotional regulation and character. These findings emphasize the importance of combining values-based parenting, neuroscience, and digital mentoring in building the foundation for sustainability education in early childhood. Practical implications are provided for parents, early childhood educators, and family education policy makers.

Keywords: digital parenting, neuroparenting, sustainability education, early childhood, Indonesian muslim families

Introduction

The development of digital technology over the past two decades has resulted in significant changes in the way children interact, learn, and obtain information. Young children now grow up in an environment saturated with gadgets, the internet, and digital media, providing unlimited access to information. This situation requires parents to have the ability to manage, supervise, and support their use of technology to prevent negative impacts on their children's development (Maulidya, 2021). It is in this context that the concept of digital parenting emerged as a relevant parenting strategy in the digital age. Digital parenting encompasses regulating the duration of digital device use, providing guidance in selecting content, and strengthening media ethics for young children (Hasanah & Sukri, 2023). Several studies have shown that consistent digital parenting can improve children's digital literacy, analytical skills, and responsible behavior in using technology (Rahmatika, 2022). However, early use of digital technology is not without risks. Exposure to negative content, device

addiction, reduced in-person social interaction, and increased vulnerability to cyberbullying are serious challenges that can hinder a child's development if parents do not take an adequate supervisory role (Wahyudi & Irawan, 2021). These risks require parents to focus not only on usage rules but also on providing ongoing education, dialogue, and support. Therefore, digital parenting is not simply about control; it must include a pedagogical approach that emphasizes communication, reflection, and positive role modeling (Putri, 2023).

While important, digital parenting alone cannot fully meet the holistic developmental needs of early childhood. Child development involves neuroscience aspects related to brain development, emotions, and social skills. The neuroparenting approach presents a parenting strategy that emphasizes the need for sensory stimulation, warm interactions, consistent routines, and a safe emotional environment to optimize a child's neurological development (Suryani, 2021). Neuroparenting is based on the finding that a child's brain develops rapidly at an early age and requires an environment that supports the formation of neuronal connections, especially in the aspects of empathy, emotional regulation, and intrinsic motivation (Maulidya, 2021). Research shows that neuroparenting can improve children's ability to adapt, manage emotions, and build a strong foundation of social-emotional character (Sumarni et al., 2020). The integration of digital parenting and neuroparenting is crucial because these two approaches have distinct yet complementary contributions. Digital parenting fosters technological competence, digital literacy, and media ethics, while neuroparenting strengthens children's emotional regulation, attachment, and moral character. When these two approaches are implemented simultaneously, children not only become digitally proficient but also develop mature social emotional intelligence and a strong religious character. Thus, the integration of the two supports the development of executive function, including decision-making, self-control, and flexible thinking critical skills in early childhood education and preparation for lifelong learning (Sari, 2022).

The concept of sustainable education is gaining increasing attention as part of efforts to meet the Sustainable Development Goals (SDGs), particularly SDG 4 on quality education (UNESCO, 2017). Sustainable education for early childhood encompasses not only academic skills but also technological literacy, self-regulation, environmental awareness, and character development oriented toward moral values. Early childhood is expected to be able to adapt to social and technological changes, as well as to possess critical and creative thinking skills. To achieve these goals, family care plays a central role because the home is the first environment that shapes a child's mindset, behavior, and learning habits (Rahmatika, 2022). In the context of Indonesian Muslim families, continuing education has a distinct religious dimension. Muslim parents are not only responsible for meeting their children's cognitive and socio emotional developmental needs, but also carry the task of instilling religious values as a foundation for morality and character. Therefore, digital parenting in Muslim families must align with Islamic teachings, such as ensuring children access to sharia-compliant content, practicing media etiquette, and integrating technology to reinforce religious values, such as reading a digital Quran or participating in online Islamic learning (Amalia & Syafruddin, 2020). Meanwhile, neuroparenting which emphasizes affection, attention, empathy, and emotional validation is very much in line with the concept of Islamic parenting which emphasizes mercy, education, and the formation of morals (Hidayat et al., 2022).

While there has been considerable research on digital parenting and neuroparenting separately, studies integrating these two concepts within the context of early childhood

continuing education are still very limited. Previous research has focused more on the influence of digital parenting on children's digital literacy or device use (Syah et al., 2019), Meanwhile, studies on neuroparenting focus more on children's emotional development, moral intelligence, or academic readiness (Pratiwi, 2025). To date, there has been little research examining how these two approaches contribute simultaneously to the development of digital literacy, learning motivation, religious character, environmental adaptability, and ecological awareness, five important aspects of early childhood sustainable education (Sari, 2022). This research gap becomes even more significant considering that Indonesian Muslim families have specific cultural needs and values that differ from the Western research context.

Based on this gap, this study aims to analyze the influence of digital parenting and neuroparenting integration on early childhood sustainability education in Indonesian Muslim families. This research makes an important contribution by providing new empirical evidence on how these two parenting styles can work synergistically to improve children's technological competence, moral character, digital literacy, emotional regulation, and learning abilities. Furthermore, this study offers a contextual perspective on parenting practices in Muslim communities, which is often underrepresented in international literature. The integration of digital parenting and neuroparenting is expected to become a sustainable parenting model capable of preparing a generation of Indonesian Muslims to become lifelong learners who are digitally literate, possess strong character, are adaptive, and possess noble morals in accordance with Islamic values.

Methods

Research Design

This study uses an explanatory quantitative approach to analyze the influence of digital parenting and neuroparenting integration on early childhood continuing education in Indonesian Muslim families.

Participants

The study population was all Muslim parents with children aged 4-6 years and residing in Indonesia. The sample size was 200 respondents. The samples came from various provinces in Indonesia, including West Java (40 respondents), Central Java (30 respondents), East Java (30 respondents), Special Region of Yogyakarta (20 respondents), Jakarta (20 respondents), Kalimantan (20 respondents), Sulawesi (15 respondents) and Sumatra (25 respondents), thus reflecting the cultural diversity and parenting practices of Indonesian Muslim families. Respondents were selected purposively according to the research criteria.

Research Procedures

The research began with the development of a questionnaire instrument consisting of three main sections: digital parenting, neuroparenting, and early childhood continuing education. The instrument's validity and reliability were tested using expert content validity and Cronbach's Alpha tests. Data were collected through online and printed questionnaires distributed to respondents over a two-month period with support from educational institutions and parenting communities in each region.

Data Collection Technique

The primary data collection technique in this study was a survey using a structured questionnaire. The questionnaire was distributed both online and in print to 200 Muslim parents in eight major regions of Indonesia. The online approach was carried out through Google

Forms, WhatsApp, and local parenting groups to reach urban and suburban areas, while printed questionnaires were distributed through PAUD institutions and local parenting communities.

The questionnaire instrument consisted of a digital parenting scale, neuroparenting scale, and indicators for early childhood continuing education, with questions based on a Likert scale (1-5). Prior to distribution, the questionnaire was tested for content validity by experts and reliability on an initial sample of 30. Data completeness was obtained by asking respondents about their profile, daily parenting, technology use, emotional stimulation, and children's motivational habits and religious character. If there were any doubts or omissions, the researcher sought clarification via WhatsApp and a short follow-up interview. All data were collected over a two-month period. Confidentiality, anonymity, and informed consent from respondents were guaranteed in accordance with social and educational research ethics. The collected data were then analyzed using multiple linear regression to determine the simultaneous influence of these variables on the main outcome variables.

Data Analysis Technique

The analysis was conducted using SPSS 26. The main technique used was multiple linear regression to test the simultaneous influence of digital parenting and neuroparenting on early childhood continuing education.

Research Ethics

This research adheres to ethical principles of social research, including informed consent, anonymity, and data confidentiality. Respondents were not asked to disclose sensitive personal information. All data is used for academic purposes only. This research has obtained ethical approval from the researcher's educational institution and adheres to international research ethics guidelines.

Results

This study involved 200 Muslim parents with young children aged 4-6 years from various regions in Indonesia. The data collected showed that mothers dominated the respondents at 70%, while the remaining 30% were fathers. The respondents' ages ranged from 26 to 45 years. The respondents' educational backgrounds also varied, with 20% having a high school education, 65% a diploma or bachelor's degree, and 15% a postgraduate degree. This distribution shows that the majority of respondents had secondary to higher education, a factor that also influences the quality of parenting patterns, access to information, and the family's digital literacy level. In addition to demographic characteristics, this study also recorded technology usage habits within families. As many as 85% of respondents used digital devices daily and 78% had introduced digital technology to their children from the age of under 4 years. The most common devices used by children include smartphones and tablets, with activities including watching educational videos, reading digital books, playing educational apps, and even attending online classes.

The descriptive analysis results indicate a high level of digital parenting among the majority of respondents, with an average score of 4.12 on a scale of 1-5. This value reflects that parents have generally implemented fairly good digital parenting practices. This finding is demonstrated through parents' consistency in setting time limits for digital device use, with 87% limiting their children's device use to around one hour per day. Furthermore, 72% of parents utilize parental control features to filter appropriate content, and 58% actively engage in dialogue with their children about digital ethics, media behavior, and the risks of harmful content on the internet. Some respondents also reported that they always accompany their

children when watching videos or using certain applications. Overall, the digital parenting pattern is considered high and demonstrates parents' awareness in managing children's interactions with the digital world.

In addition to digital parenting, the study also examined neuroparenting, which achieved an average score of 4.21, higher than digital parenting. This score indicates that parents have a strong tendency to implement sensory stimulation, emotional support, structured daily routines, and interactions that strengthen the affective bond between parents and children. Eighty-two percent of parents set aside specific time for reading books, playing educational games, or engaging in other stimulating activities with their children every day. Furthermore, 78% consistently provided emotional validation, such as responding to their children's sadness or joy with empathy and positive affirmations. Daily routines such as bedtime schedules, study times, and assignments were also implemented by 81% of respondents, which also strengthen the development of children's self-regulation. Warm and stable emotional interactions were characteristic of respondents, with 75% of parents reporting that they regularly engage in activities such as bedtime stories or imaginative play with their children. Overall, these findings indicate that neuroparenting practices have become an important part of the parenting patterns of Indonesian Muslim families.

The third variable analyzed was early childhood sustainability education, which encompassed digital literacy, learning motivation, environmental adaptation, religious character, and ecological responsibility. This variable received an average score of 4.11, indicating that most children were in the high category in terms of sustainability education competency. Children had fairly good digital literacy with a score of 4.01, which was influenced by consistent parental guidance in digital activities. Learning motivation was scored at 4.18, indicating that children tend to have a strong internal drive to explore knowledge and undergo the learning process. Environmental adaptation received a score of 4.09, demonstrating that children are able to cope with changing situations both learning situations and social interactions quickly. Furthermore, children's religious character had the highest score of 4.24, indicating strong internalization of moral and religious values in daily life. Ecological responsibility, with a score of 4.03, indicated that most children already had an initial awareness of environmentally conscious behavior, although it was not yet fully mature.

Instrument validity testing showed that all items used were content valid and reliable, with a Cronbach's Alpha of 0.89 for digital parenting, 0.91 for neuroparenting, and 0.87 for continuing education. This ensures that the instrument is able to measure the intended constructs consistently and accurately. The results of the classical assumption test also indicated that the data met the requirements for analysis with multiple linear regression. The normality test indicated a normal data distribution, the multicollinearity test showed a VIF value below 5 for all variables, and the heteroscedasticity test indicated no problem of unequal residual variances. The results of the multiple linear regression analysis showed that digital parenting and neuroparenting simultaneously had a significant influence on early childhood continuing education. The regression model produced an adjusted R^2 value of 0.56, meaning that the two variables explained 56% of the variation in early childhood continuing education. This figure indicates a significant contribution, considering that continuing education encompasses various complex aspects such as digital literacy, character, learning motivation, and environmental adaptation.

Partially, digital parenting had the highest regression coefficient with a beta value of 0.42, indicating that this variable plays a significant role, especially in the development of digital literacy and children's ability to adapt to technology. Neuroparenting had a beta coefficient of 0.37, which, although lower than digital parenting, still makes a significant contribution, especially in aspects of emotional regulation, religious character formation, and children's learning motivation. Both variables had a strong level of significance with a p-value <0.001, indicating that their influence is not a coincidence but rather a stable and reliable relationship. Furthermore, the analysis per indicator showed that the influence of digital parenting was most visible in the dimensions of digital literacy and children's technology adaptation. Children from families who consistently implemented digital parenting had better abilities in sorting information, operating devices correctly, and understanding the rules of technology use. Conversely, the influence of neuroparenting was most dominant in learning motivation, religious character, and ecological responsibility. This suggests that emotional stimulation, stable routines, and empathetic validation have a strong impact on the formation of moral values and environmentally conscious behavior.

Overall, the results of this study confirm that early childhood continuing education is the result of a synergy between technological skills and socio emotional intelligence developed through parental guidance. Digital parenting ensures that children are able to use technology wisely, critically, and responsibly. Meanwhile, neuroparenting forms the emotional, moral, and motivational foundations for lifelong learning in children. When both parenting styles are applied integratively, children grow into digitally competent, emotionally mature, religiously imbued, and environmentally conscious individuals. These findings confirm that the integration of digital parenting and neuroparenting is the most effective parenting strategy in preparing the next generation of Indonesian Muslims to face the challenges of a dynamic and complex modern world.

Table 1. Comparative Mean Score of Sustainable Education by Parenting Style

Parenting Group	**Digital Literacy**	**Environmental Adaptation**	**Religious Character**	**Learning Motivation**
Digital Parenting Only	80	72	68	75
Neuroparenting Only	65	79	76	80
Integrated Both	90	85	88	92
Neither	50	60	55	60

Discussion

Integration of Digital Parenting and the Development of Early Childhood Digital Literacy

Research findings indicate that digital parenting has the strongest contribution to improving children's digital literacy and technological adaptability. These results are consistent with previous research that confirms that parental guidance is key to children's digital literacy success (Putri, 2023). Parents who consistently set limits on playtime, choose appropriate content, and implement digital dialogue create a more focused and safe learning environment for their children (Sari & Widodo, 2022).

The increase in children's digital literacy in this study is in line with studies (Syah et al., 2019) which shows that the quality of digital supervision is directly proportional to media

navigation skills, information analysis skills, and ethical technology use. Children who receive direct guidance from their parents are better able to understand the difference between appropriate and inappropriate content and are better able to avoid risks such as cyberbullying or exposure to negative content. (Wahyudi & Irawan, 2021). In addition, the phenomenon of digital adaptation is also related to the concept of digital resilience, namely the ability of children to face technological challenges with an adaptive and critical attitude. (Livingstone & Stoilova, 2021). This study supports this view, as children who regularly engage in dialogue about technology with their parents demonstrate more stable adaptation skills, including in online learning environments. This confirms that digital parenting serves not only as a control mechanism but also as a means of strengthening digital competencies essential for continuing education (Rahmatika, 2022). In other words, digital mentoring provided by Indonesian Muslim families can prepare children to face technological changes in a responsible and safe manner.

The Role of Neuroparenting in Emotional Regulation, Learning Motivation, and Character Formation

The research results show that neuroparenting has a significant influence on indicators of religious character, learning motivation, and ecological responsibility. This aligns with developmental neuroscience concepts, which explain that warm emotional relationships, emotional validation, and stable daily routines can strengthen neural connectivity, which plays a role in regulating children's behavior and learning (Suryani, 2021). Studies (Maulidya, 2021) research shows that sensory and emotional stimulation provided to early childhood directly contributes to the development of executive function, including focus, self-control, and decision-making.

Research(Sumarni et al., 2020) also shows that neuroparenting-based parenting improves empathy, emotional intelligence, and social skills. In the context of this study, this is reflected in the high scores on children's religious character, indicating that loving emotional interactions provide a space for children to understand moral values through behavioral modeling. Furthermore, structured daily routines play a significant role in developing discipline and responsibility. Research (Fitriana, 2023) emphasizes that directed routines help children develop delayed gratification, a crucial skill in character development and social behavior. Thus, neuroparenting not only supports children's neurological development but also provides a strong foundation for the formation of religious character and sustainable values, especially in Muslim families that prioritize moral education.

The Power of Digital Parenting and Neuroparenting Integration

Regression analysis shows that the integration of digital parenting and neuroparenting is the most effective parenting model for supporting early childhood sustainability. This finding strengthens the argument. (Sari, 2022) The integration of two modern parenting styles can have a holistic impact on child development, especially in the context of families facing rapid technological advancements and social change. This integrative approach aligns with the concept of holistic early childhood development, which emphasizes the importance of balancing cognitive, emotional, social, spiritual, and technological stimulation (UNESCO, 2017). Children in the integrative group in this study scored highest across all indicators of sustainable education, including religious character, digital literacy, environmental adaptation, learning motivation, and ecological responsibility. Meanwhile, research (Bettencourt, 2023)

confirms that parental involvement through daily activities such as reading books or discussions improves children's school readiness, intrinsic motivation, and social resilience.

The findings of this study deepen this literature by demonstrating that the integration of digital parenting and neuroparenting can produce children who are not only digitally adaptive but also emotionally and morally mature. In the context of Indonesian Muslim families, this integrative parenting style is becoming increasingly important because it helps parents balance technological developments with religious values, enabling children to manage technology in a manner consistent with Islamic teachings. This aligns with the view (Amalia & Syafruddin, 2020) that Islamic-value-based digital parenting can strengthen children's prophetic character and digital ethics.

Strengthening Religious Character and Pro-Environmental Behavior in Muslim Families

One of the interesting findings of this study is the high scores for religious character and ecological responsibility in children from families implementing integrative parenting. The religious character indicator scored the highest (4.24), indicating that Indonesian Muslim families still place a strong emphasis on moral values and spirituality in parenting. Research(Hidayat et al., 2022) confirms that integrating religious values into parenting impacts children's overall character development, from empathy and honesty to social awareness. In this study, improvements in religious character were associated with neuroparenting practices such as emotional validation, behavioral modeling, and warm emotional relationships, all in line with the principles of mercy and education in Islamic teachings.

At the same time, ecological responsibility scores also increased significantly, particularly in families that balanced emotional stimulation with sustainability-based digital parenting. These findings support a study (Hosany et al., 2022) showing that eco-conscious parenting fosters ecological awareness in children from an early age. In the context of the SDGs, especially SDG 4 and SDG 13, this finding is very important because it demonstrates how the family as the smallest unit in society can be the main agent of environmental education and sustainability values.

Practical Implications for Families and Education

The findings of this study provide a strong foundation for developing integrated parenting intervention packages. The government, educational institutions, and communities must begin expanding access to holistic parenting training and modules: not only providing the technological side (digital literacy), but also emphasizing emotional stimulation, ethics, and internalization of values. Parents should be encouraged to participate in parenting seminars, training, and community groups to be better prepared to serve as facilitators, dialogue partners, and "digital learning buddies" for their children in the technological era. In schools, teachers and early childhood education administrators should engage parents through discussion forums, family projects, and self-assessments with families. The curriculum must be adaptive, combining child-friendly digital technology, sensory stimulation, and discipline based on compassion and ongoing dialogue. Another implication for religiosity, particularly for Muslim families, is the importance of educating children about content filtering based on religious values, modeling Islamic digital behavior, and internalizing morals through daily digital routines. Every digital interaction can be a vehicle for the formation of morals and prophetic character.

Conclusion

This study concludes that digital parenting and neuroparenting have a significant influence on early childhood sustainability education in Indonesian Muslim families. Digital parenting plays a crucial role in improving children's digital literacy and adaptability to technology through supervision, content guidance, and media ethics education. Meanwhile, neuroparenting significantly contributes to strengthening emotional regulation, learning motivation, religious character, and ecological responsibility through warm emotional interactions, positive routines, and neuropsychological stimulation. Key findings indicate that the integrative implementation of both parenting styles results in the most optimal development across all sustainability education indicators, as it combines digital skills with the emotional and moral intelligence needed to face the challenges of the modern era. Overall, this study confirms that sustainability education cannot be achieved solely through improving technological capabilities, but must be accompanied by strengthening character, religious values, and emotional intelligence from an early age. The integration of digital parenting and neuroparenting is an ideal parenting model for Indonesian Muslim families in preparing a generation that is digitally competent, emotionally mature, and has a strong character and is oriented towards sustainability.

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Conflict of interests

The authors declare that they have no conflict of interest, either financial or non-financial, that could have influenced the research process, analysis, writing, or interpretation of the results in this manuscript. All research activities and preparation of this article were conducted independently without any pressure, influence, or affiliation that could potentially lead to bias.

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