



Development of Audiovisual-Based Parenting E-Modules to Stimulate Children's Cognitive Development in Kindergarten

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Abstract: This study addresses the suboptimal cognitive development of early childhood, particularly in reasoning and problem-solving skills, which is influenced by limited parental knowledge and gaps in digital literacy. The objective of this research is to develop an audiovisual-based parenting E-module that is valid, practical, and effective as a home-based learning guide to stimulate children's cognitive development. This study employed a Research and Development (R&D) approach using the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages. The product was validated by material and media experts, while practicality and effectiveness were examined through limited trials involving parents of children aged 5–6 years in kindergarten. Data were collected using validation sheets and parent response questionnaires, and analyzed using descriptive quantitative techniques. The results indicate that the developed E-module achieved a very high level of validity, with material validation reaching 90% and media validation 86.75%. The practicality test showed a score of 92.7%, categorized as very practical, indicating that the module is easy to use, accessible, and understandable for parents. From the effectiveness perspective, findings reveal an increase in parents' understanding, confidence, and ability to implement cognitive stimulation activities at home. These results suggest that the integration of audiovisual elements facilitates meaningful learning experiences and reduces cognitive load for users. In conclusion, the audiovisual-based parenting E-module is a feasible and effective educational tool to support early childhood cognitive development. It has strong potential to enhance parental involvement and can be utilized as an alternative digital parenting resource, particularly in contexts with limited access to structured learning materials.

Keywords: Audiovisual media; Cognitive development; Early childhood education; E-Module; Parenting

Introduction

Early Childhood Education (ECE) represents a critical phase in human development, often referred to as the “golden age,” during which cognitive structures rapidly evolve and are highly responsive to environmental stimulation (Rochmah, 2024). At this stage, the quality of stimulation provided significantly determines children's readiness for formal learning and their long-term intellectual capacity, particularly in domains such as reasoning, memory, and problem-solving (Izzuddin, 2021; Rijkiyani et al., 2022).

Cognitive development in early childhood encompasses essential mental processes, including logical thinking, classification, and symbolic representation, which form the foundation for later academic achievement (Woga et al., 2023). From a constructivist perspective, children actively construct knowledge through interaction with their environment, as emphasized in Piaget's theory of cognitive development, which highlights the importance of concrete and meaningful experiences during the preoperational stage (Junaedi et al., 2025).

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However, empirical evidence indicates that the implementation of cognitive stimulation in early childhood settings remains suboptimal due to limited innovation in learning media and the predominance of conventional instructional approaches (Pangarti et al., 2023). This limitation is further exacerbated by insufficient parental involvement, despite strong evidence that responsive parenting practices significantly contribute to children's cognitive outcomes (Swari et al., 2022).

In the contemporary digital era, parenting practices face increasingly complex challenges, particularly related to gaps in digital literacy and the uncontrolled use of screen-based media among young children (Khotimah et al., 2024; Swider-Cios et al., 2023). While digital media has the potential to enhance learning when used appropriately, unstructured exposure without parental mediation may negatively impact attention, self-regulation, and cognitive development (Rai et al., 2023; Tangkin et al., 2025). Therefore, parental guidance plays a crucial role in ensuring that digital media functions as a constructive learning tool rather than a source of developmental risk.

Theoretically, the integration of multimedia in learning environments is supported by Mayer's Cognitive Theory of Multimedia Learning, which posits that the combination of visual and auditory elements can optimize information processing and reduce cognitive load when designed appropriately (Paas et al., 2004; Rai et al., 2023). In addition, Bandura's Social Cognitive Theory emphasizes that learning occurs through observation and interaction, highlighting the importance of parents as primary models in shaping children's cognitive behavior (Astuti et al., 2025; Bandura, 1997). These theoretical frameworks collectively underscore the need for structured, interactive, and contextually relevant learning media that actively involve parents in the stimulation process.

Recent studies further demonstrate that multimedia-based learning and digital educational tools can significantly enhance children's cognitive engagement, motivation, and learning outcomes when aligned with developmental principles (Putri et al., 2025). Moreover, audiovisual media has been shown to provide concrete and contextual learning experiences that are particularly suitable for early childhood learners, who rely heavily on sensory-based understanding (Irawati et al., 2025).

Despite these advancements, there remains a significant gap in the availability of structured, evidence-based parenting resources that integrate multimedia approaches with practical guidance for stimulating children's cognitive development at home. This gap is particularly evident in rural or low-resource contexts, where access to quality parenting education

materials and digital literacy support is still limited (Putri et al., 2025; Woodrow et al., 2019). Consequently, parents often lack the necessary knowledge and tools to effectively facilitate cognitive stimulation in daily interactions with their children.

Based on preliminary observations at Kindergarten Negeri 7 Sijunjung, a substantial gap was identified in children's cognitive development, particularly in reasoning abilities, accompanied by low parental knowledge and limited digital literacy. This condition highlights the urgent need for an innovative, accessible, and theory-driven educational intervention that can bridge the gap between school and home learning environments.

Therefore, this study is conducted to develop an audiovisual-based parenting E-module that is systematically designed based on cognitive development theories and multimedia learning principles. The development of this product is expected to provide a practical and effective solution for enhancing parental competence in stimulating early childhood cognitive development, while also contributing to the advancement of research in technology-based parenting education.

Method

Research Design

This study employed a Research and Development (R&D) approach aimed at producing an educational product in the form of an audiovisual-based parenting E-module. The R&D method was selected as it allows for systematic development, validation, and refinement of instructional media grounded in empirical data (Branch et al., 2010; Sugiyono, 2021).

The development process adopted the ADDIE model, which consists of five sequential phases: Analysis, Design, Development, Implementation, and Evaluation. This model was chosen due to its structured yet flexible framework, making it suitable for developing technology-based learning media that integrates pedagogical and contextual considerations.

Time and Location of the Research

This study was conducted at Kindergarten Negeri 7 Sijunjung, located in Sijunjung Regency, West Sumatra, Indonesia. The selection of this site was based on preliminary findings indicating suboptimal cognitive development among children aged 5–6 years, as well as limited parental digital literacy and the absence of structured parenting learning resources. The research was carried out over a six-month period, from August 2025 to January 2026, encompassing the stages of needs analysis, product development, implementation, and evaluation.

Research Subjects

The research subjects consisted of parents of children aged 5–6 years (Group B) enrolled in the selected kindergarten. A total sampling technique was applied, considering that all parents met the criteria as end-users of the developed product. Their involvement was essential in assessing the practicality and effectiveness of the E-module in real-life parenting contexts.

Research Procedure

This procedure refers to the steps in the ADDIE model research and development procedure as shown in figure 1.

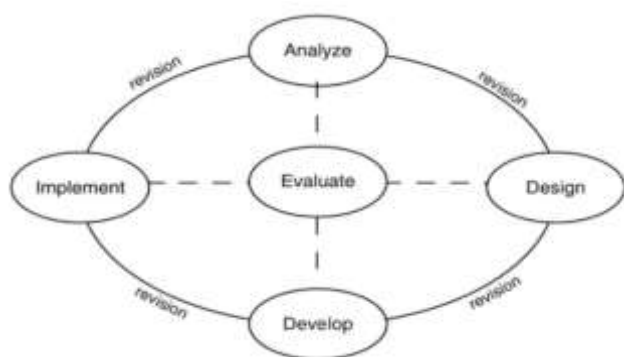


Figure 1. Research procedure

Research Stages

The research procedure followed the systematic phases of the ADDIE model:

Analysis Stage

This stage involved identifying problems, user needs, and characteristics of early childhood cognitive development. Data were obtained through preliminary observations and informal interviews with teachers and parents to determine gaps in cognitive stimulation practices and digital literacy.

Design Stage

At this stage, the structure and content of the E-module were designed, including learning objectives, indicators of cognitive development, and audiovisual components. The design also incorporated principles of child development and multimedia learning to ensure content relevance and usability.

Development Stage

The E-module prototype was produced and subsequently validated by subject matter experts and media experts. Validation focused on content accuracy, instructional design, visual quality, and language clarity. Revisions were made based on expert feedback to improve the overall quality of the product.

Implementation Stage

The validated E-module was tested in a limited trial involving parents. Participants were asked to use the E-module independently at home while engaging in guided activities with their children.

Evaluation Stage

Evaluation was conducted to assess the validity, practicality, and perceived effectiveness of the product. Feedback from users and experts was used to determine the feasibility of the E-module as a parenting learning resource.

Data Collection Techniques

Data were collected using validation sheets completed by experts and practicality questionnaires filled out by parents. The instruments were designed to assess multiple aspects, including content relevance, media quality, ease of use, clarity of instructions, and overall usefulness.

Data Analysis

The data were analyzed using descriptive quantitative techniques. Scores obtained from validation and practicality assessments were converted into percentages and interpreted based on predetermined criteria of feasibility. The analysis results were categorized into levels such as “very valid,” “valid,” “practical,” and “very practical.”

Data processing was conducted using Microsoft Excel to ensure accuracy in calculating averages and percentages, as well as to facilitate systematic data presentation. The findings from the data analysis were used to determine the quality and feasibility of the developed E-module as an educational intervention for supporting early childhood cognitive development.

Result and Discussion

The development of the audiovisual-based parenting E-module entitled “Pintar Bersama Ayah Bunda” was carried out through a systematic R&D process and evaluated in terms of validity, practicality, and perceived effectiveness. The findings indicate that the developed product meets high feasibility standards and demonstrates strong potential as a digital parenting intervention for stimulating early childhood cognitive development.

Media Validity Result

In table 1, the validation results show that the E-module achieved a score of 90% from material experts and 86.75% from media experts, both categorized as very valid. These findings indicate that the content, structure, and audiovisual design of the E-module are aligned with

early childhood cognitive development indicators and instructional design principles.

Table 1. Develop Assessment Instrument

Validity	Percentage (%)	Feasibility Criteria
Media	86.75	very valid
Material	90	very valid

From a theoretical perspective, the high validity score reflects the successful integration of developmentally appropriate practices (NAEYC, 2020) and constructivist learning principles, particularly those emphasizing active engagement and contextual learning (Piaget et al., 2008). The alignment between content and cognitive stimulation indicators strengthens the instructional relevance of the module.

These results are consistent with previous studies showing that well-designed digital learning media, particularly E-modules, can achieve high validity when developed through systematic instructional design models (Ati, 2023; Az-Zahra et al., 2025; Susilawati et al., 2023). Furthermore, recent studies in high-impact journals confirm that multimedia-based instructional tools that integrate pedagogical alignment and user-centered design tend to demonstrate strong content validity and usability (Ati, 2023; Mayer, 2002; Schindler et al., 2025)

In addition, research by van der Kleij et al. (2020) and Moreno et al. (2021) highlights that effective multimedia design enhances conceptual understanding when content is structured according to cognitive processing principles. Thus, the high validity of the developed E-module indicates that it meets both theoretical and technical standards required for early childhood learning media.

Media Practicality

Based on table 2, the practicality test results indicate a score of 92.7%, categorized as very practical. This finding demonstrates that the E-module is easy to use, accessible via smartphones, and understandable for parents with diverse educational backgrounds.

Table 3. Effectiveness Results Based on User Perception

Aspects Assessed	Initial Conditions	After Use	Data Indicators
Parents' understanding of cognitive stimulation	Low-medium	Height	Questionnaire score > 88%
Parental confidence	Low	Height	Overwhelming positive response
Ease of implementing stimulation activities	Limited	It's easy	Practicality 92.7%
Pretest-posttest anak	Not measured	Not measured	Design R&D
N-Gain	N/A	N/A	Not counted

Based on table 3, these findings suggest that the integration of audiovisual elements facilitates meaningful learning experiences for parents. According to Mayer's Cognitive Theory of Multimedia Learning,

Table 2. Practicality Test of Virtual Reality Media

Yes	Total Score	Max Score	Percentage
1	51	55	92.7
Total	51	55	
		Average	92.7%
		Categories	Very Practical

This result is in line with previous studies indicating that audiovisual-based media and interactive E-modules significantly improve user engagement and usability, especially among adult learners (Doyan et al., 2020; Primastuty et al., 2024; Resfa'ati et al., 2022; Suryana et al., 2024). The use of clear instructions, intuitive navigation, and communicative language supports independent learning, which is essential in parenting contexts.

From a broader perspective, recent empirical studies confirm that digital parenting interventions that are flexible and user-friendly can enhance parental participation and learning outcomes (Awah et al., 2022; Herbell et al., 2022; Yam-Ubon et al., 2023). Similarly, research by (Shipkova et al., 2025) demonstrates that accessibility and ease of use are critical determinants of the effectiveness of parent-focused educational tools.

Moreover, the high practicality score can be explained through the lens of andragogical principles, where adult learners prefer learning resources that are relevant, problem-centered, and immediately applicable. The E-module developed in this study fulfills these criteria by providing practical guidance that parents can directly implement in daily interactions with their children.

Media Effectiveness

The effectiveness of the E-module was evaluated based on parental perceptions, which revealed significant improvements in parents' understanding, confidence, and ability to implement cognitive stimulation activities. A summary of the effectiveness results based on user perception is presented in Table 3.

the combination of visual and auditory information enhances information processing and reduces cognitive load (Mayer, 2002; Paas et al., 2004). This is particularly relevant for parents with varying levels of literacy, as

multimedia formats enable more accessible knowledge transfer.

The observed increase in parental confidence is also consistent with Bandura's Self-Efficacy Theory, which posits that mastery experiences and guided practice can

strengthen individuals' belief in their capabilities (Bandura, 1997). When parents are equipped with structured guidance and practical examples, their self-efficacy in supporting children's learning increases, leading to more effective parent-child interactions.



Figure 2. Opening display



Figure 3. Audiovisual-based parenting e-module content stimulates children's cognitive abilities

Empirical support from recent studies further strengthens these findings. Research by Sanders (2023) and Jeong et al. (2021) demonstrates that parenting interventions significantly improve parental knowledge and child developmental outcomes. Similarly, digital parenting programs have been shown to enhance parental responsiveness and engagement (Grodberg et al., 2022; Kempe et al., 2025)

In the context of early childhood education, studies by Wang et al. (2025) and Pesch et al. (2025) emphasize that guided play and interactive learning environments contribute significantly to children's cognitive development. The E-module developed in this study aligns with these principles by providing structured play-based activities that parents can implement at home.

The findings of this study reinforce and extend previous research on the effectiveness of audiovisual and digital learning media in early childhood education. The high validity, practicality, and perceived effectiveness of the E-module indicate that technology-based parenting interventions can serve as a bridge between formal education settings and home learning environments.

These results are consistent with studies highlighting the importance of parental involvement in children's cognitive development (Mutiarasari et al., 2024; Rijkiyani et al., 2022) Furthermore, the integration of multimedia elements supports cognitive engagement, as suggested by contemporary research in educational technology (Fiorella et al., 2021; Schindler et al., 2025).

From the perspective of Relational Developmental Systems (RDS), the interaction between parents and children plays a central role in shaping developmental outcomes. The E-module functions not only as an instructional tool but also as a mediator that strengthens the quality of these interactions.

Additionally, this study contributes to the growing body of literature on digital parenting by providing empirical evidence that contextually designed E-modules can address challenges related to digital literacy gaps and limited access to educational resources. This finding is particularly relevant in rural and underserved areas, where innovative and scalable solutions are needed (Fehlberg et al., 2020; Tangkin et al., 2025).

Although the findings indicate positive outcomes, this study has limitations, particularly the absence of experimental measures such as pretest-posttest design and N-gain analysis to assess children's cognitive improvement quantitatively. Future research is recommended to incorporate experimental designs to provide stronger causal evidence of the effectiveness of the E-module.

Nevertheless, the consistency of validity and practicality scores, combined with strong positive user perceptions, provides sufficient preliminary evidence that the developed E-module is a feasible and promising tool for enhancing early childhood cognitive stimulation through parental involvement.

Conclusion

This study developed an audiovisual-based parenting E-module using the ADDIE model to support early childhood cognitive development, particularly in children aged 5–6 years. The findings demonstrate that the developed product meets high feasibility standards, as indicated by very valid scores from material and media experts, as well as a very practical rating from user trials, reflecting ease of use, accessibility, and relevance for parents. Furthermore, the results reveal that the implementation of the E-module contributes to improving parents' understanding, confidence, and ability to conduct cognitive stimulation activities at home through structured and meaningful play. These outcomes are supported by theoretical perspectives on multimedia learning, constructivism, and self-efficacy, which explain how audiovisual integration and guided interaction enhance learning effectiveness. Although the study did not employ experimental measures to assess children's cognitive gains quantitatively, consistent positive user responses indicate that the E-module functions effectively as a parenting support tool. Therefore, this study concludes that audiovisual-based parenting E-modules have strong potential as an innovative, practical, and scalable solution to strengthen parental involvement and optimize early childhood cognitive stimulation, particularly in contexts with limited access to educational resources.

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Author Contributions

OCR: Research concept, media design, data collection, analysis, article writing. DS: Theory development, methodology, data analysis, article revision. RKM: Initial media design, product trial, data collection, analysis. NH: Field testing, data processing, media evaluation, writing trial results.

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Conflicts of Interest

The authors declare no conflict of interest.

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