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Development of MAKID (Interactive Digital Learning Media for Mathematics) to Enhance the Cognitive Abilities of 5 to 6-Year-Old Children with ADHD in Kindergarten

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ABSTRACT

Attention Deficit Hyperactivity Disorder (ADHD) can affect children's concentration, learning, participation, and cognitive development, particularly in understanding basic mathematical concepts. This study aimed to develop and evaluate MAKID (Math Interactive Kids Digital) as an interactive digital mathematics learning application designed to enhance the cognitive abilities of children with ADHD. The research employed a Research and Development (R&D) approach using the ADDIE model, comprising analysis, design, development, implementation, and evaluation stages. The study was conducted at The Baby School Tuban Kindergarten and involved six children with ADHD aged 5–6 years, as well as special education, mathematics, media, and classroom practitioners. Data were collected through observations, interviews, expert validation sheets, and pre-test and post-test assessments. The developed application contains four mathematics learning modules, namely numbers, shapes, sizes, and patterns, supported by interactive activities and self-regulation features specifically adapted to the characteristics of children with ADHD. The results indicated that the application was valid and feasible for use, based on expert evaluations, and demonstrated effectiveness in improving children's mathematical cognitive performance, as reflected in higher post-test scores than pre-test scores. The novelty of this study lies in the development of an ADHD-centered digital learning application that integrates cognitive stimulation strategies with interactive mathematics instruction. Therefore, MAKID has the potential to serve as an innovative educational medium to support mathematics learning and cognitive development among children with ADHD.

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1. INTRODUCTION

Media Early Childhood Education (PAUD) is a structured educational effort designed to optimize all aspects of children's development, including physical, cognitive, emotional, and social dimensions. As a foundational stage of pre-school education, PAUD

is implemented from birth until the age of six through educational stimulation that supports children's growth and development holistically, both mentally and physically [1].

One of the most important developmental domains in early childhood education is cognitive development, particularly in relation to early mathematical abilities. Early mathematics learning introduces children to basic numerical concepts, shapes, counting, and problem-solving activities that support logical and critical thinking. Mastery of basic counting skills, such as recognizing numbers one to ten, serves as an essential foundation for later academic learning [2].

However, many early childhood learners struggle in maintain concentration during classroom activities. Children with low attention spans are often easily distracted by environmental stimuli, have difficulty following instructions, interrupt peers during learning activities, and tend to leave tasks unfinished. These behaviors reduce children's engagement in the learning process and negatively affect their academic and social development [3]. Concentration plays a crucial role in helping children absorb information, participate actively in learning, and achieve optimal developmental outcomes.

The challenge becomes more significant in children with Attention Deficit Hyperactivity Disorder (ADHD). ADHD is characterized by symptoms of inattention, impulsivity, and hyperactivity, which can interfere with cognitive, social, physical, and behavioral development. Children with ADHD show decreased attention span and increased hyperactive behavior [4]. Children with ADHD often experience learning difficulties due to their limited ability to focus and regulate attention [5]. If not addressed appropriately at an early age, these difficulties may lead to low academic achievement, behavioral problems, and challenges in social adaptation [6].

Among the various domains of intelligence that should be stimulated during early childhood, mathematical-logical intelligence is particularly important because it contributes to the development of reasoning, problem-solving, and pattern-recognition skills. Mathematical-logical intelligence refers to the ability to think logically, understand sequences and patterns, process abstract concepts, and solve numerical problems [7]. Therefore, effective mathematics learning strategies are necessary to support children's cognitive development, especially for children who experience attention difficulties [8].

Based on classroom observations, mathematics stimulation activities in many PAUD institutions are still dominated by worksheet-based learning focused mainly on geometry recognition and basic counting exercises. Such conventional approaches provide limited opportunities for children to engage in higher-order cognitive processes. Previous studies have also shown that early mathematics achievement among young learners remains relatively low, partly because learning activities are often limited to repetitive reading, writing, and counting exercises that do not sufficiently stimulate cognitive development [9]. Furthermore, many PAUD educators still lack appropriate assessment instruments to measure children's understanding of fundamental mathematical concepts as preparation for entering the next level of education [10].

In addition, previous studies on digital learning media in early childhood education have generally focused on improving basic numeracy skills in typically developing children. Limited research has specifically explored the use of interactive multimedia

applications designed to support mathematical learning and concentration abilities in children aged 5–6 years with ADHD characteristics. Existing applications also tend to emphasize general learning activities without integrating cognitive stimulation, attention support, and game-based mathematical learning into a single platform.

To address these limitations, interactive multimedia learning has emerged as a promising approach to increasing children's motivation and engagement in learning. Digital game-based learning can provide attractive visual stimulation, interactive activities, immediate feedback, and adaptive learning experiences that are suitable for the characteristics of children with ADHD. Through engaging multimedia features, children are expected to maintain attention more effectively while learning basic mathematical concepts [11].

Therefore, this study proposes the development and implementation of MAKID, an interactive multimedia-based learning application designed specifically to support early mathematical learning and concentration abilities in children aged 5–6 years with ADHD characteristics. Unlike previous applications, MAKID integrates elements of cognitive stimulation, mathematical-logical learning, and attention-focused interactive activities tailored to the learning needs of early childhood learners with concentration difficulties.

Based on the background presented above, this study aims to investigate the design and development process of the MAKID application as an interactive multimedia learning medium for children aged 5–6 years with ADHD characteristics. In addition, this research seeks to examine the effectiveness of the MAKID application in improving early mathematical abilities among children with ADHD characteristics, and to analyze how the application supports children's concentration and engagement during mathematics learning activities.

Formulation Problem: How can a development application help increase cognitive ability in children with Disturbance Centralization Attention Deficit Hyperactivity Disorder (ADHD). How level validity applies in the measure suitability function: its use. How level practicality application in the process of using it. How level effectiveness application in support of the implementation activity learning. Research purposes: Produce development applications that can help improve cognitive abilities in children with Centralized Attention Deficit Hyperactivity Disorder (ADHD) aged 5-6 years. Analyze the level of validity application based on the set criteria. Test the practicality of the application's use, aligning in with its benefits and functions. Measure the effectiveness of the application in supporting improvement in student learning outcomes.

2. METHOD

This study employed a quantitative approach using a Research and Development (R&D) [12]. design aimed at developing and evaluating the effectiveness of MAKID (Math Interactive Kids Digital), an interactive mathematics application designed to improve the cognitive abilities of children with Attention Deficit Hyperactivity Disorder (ADHD). The study adopted the ADDIE instructional development model consisting of Analysis, Design, Development, Implementation, and Evaluation stages.

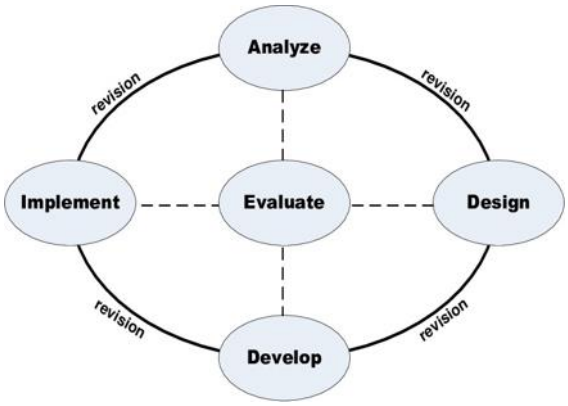

Figure 1. ADDIE Model (Source: Sugiono, 2015)

Procedure development in the study follows the ADDIE model as the main guidelines.

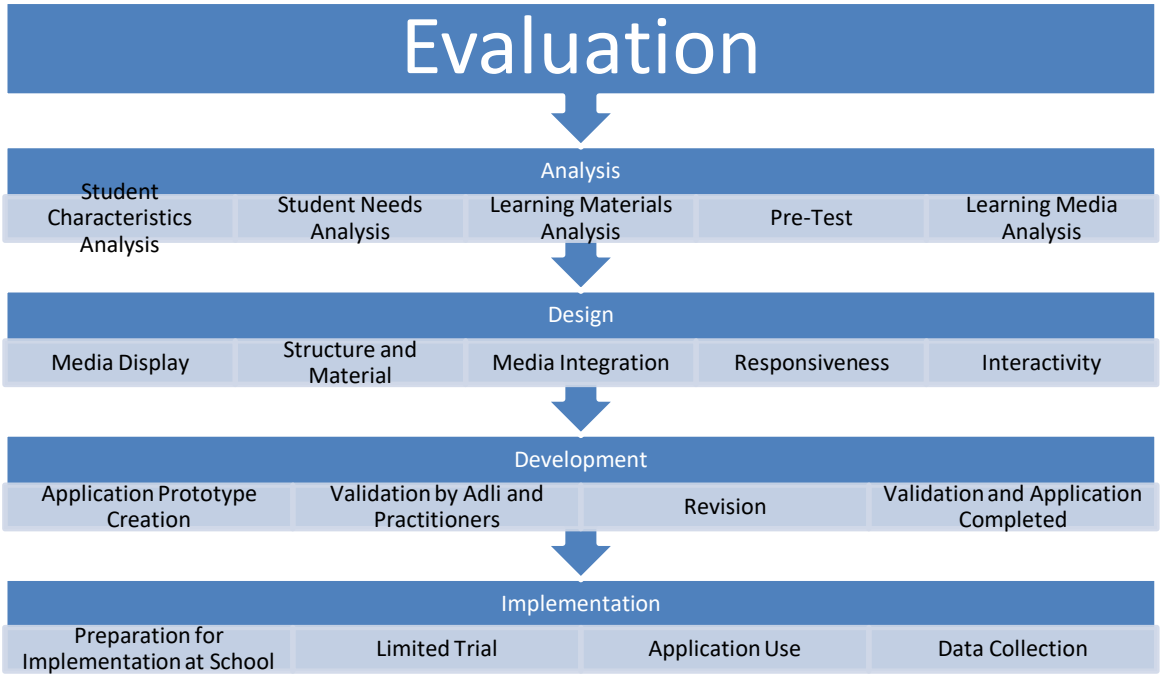

Figure 2. Procedure ADDIE Development

The ADDIE model is applied in this study. This includes five main stages, namely Analysis, Design, Development, Implementation, and Evaluation. Explanation about the fifth stage served as follows:

1. Stage Analysis is one of the steps in the process of developing learning media, serving to set the direction of development and to specify the learning product to be designed.
2. Design Stage / Design is a drafting process framework, flow, and learning media components based on the results analysis needs.

3. Stage Development is a realization process that designs a product and makes it real in the form of an application learning, including prototyping, validation by experts (materials, media, and practitioners), and revision.
4. Stage Implementation is the process of applying the application to users, namely, ADHD students and teachers, as facilitators. Steps taken at the stage of implementation. This includes: preparation, implementation in schools, trials, limited-use applications for ADHD students, and data collection during implementation.
5. Stage Evaluation (on all stages)
6. Research design: This adopts a pre-experimental One-Group Pretest-Posttest Design, which involves a single group of participants without a control group. Participants' measurement ability was assessed before (pre-test) and after (post-test) the intervention. To evaluate influence, use a digital-based application. Design scheme is depicted as follows:

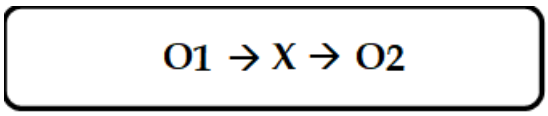

Figure 3. Research Design Scheme

Information:

a. O1 (*Pre-test*): Measurement initial (pre-test) conducted before the implementation of the application as a learning medium.
b. X (Treatment): Usage application in the learning process.
c. O2 (Post-test*):* Measurements taken after use of the application aim to evaluate changes and improvements. Study participant education.

Subject study covering six children aged 5–6 years experiencing ADHD and attending The Baby School Tuban Kindergarten, as well as involving expert material education outside the ordinary, expert material in mathematics, media experts, and classroom teachers/practitioners.

Data collection techniques used in the study: These included observation, interviews, and questionnaires

Test Try Product Development, including:

1. Design Test: Try early. Trial beginning carried out by media experts and experts in the field, to evaluate the validity of content and the quality of learning media design. Stage this also aims to gather input and suggestions for improvement as a base product before implementation for students. In the second trial stage, the assessment focused on practicality and product, conducted by teachers or practitioners.
2. Subject Test Try, covering stage review by experts, as well as the trial phase of the subject study.

Instrument data collection consists of one test of the ability of a child with ADHD, sheet validation by expert material, sheet validation by media experts, and sheet evaluation of practicality.

Techniques used consisted of two approaches. The first was quantitative descriptive analysis, which included an assessment of the validity and practicality of

the media. Media validity was established through validation by media and material experts, aimed at ensuring the suitability of the content and the quality of the developed application. Meanwhile, media practicality was assessed based on practitioner trials to determine ease of use and the application's effectiveness in learning activities.

The data were analyzed using a Likert scale (1–5), and the average, percentage, and distribution frequency were calculated. For a known level eligibility application, level satisfaction of users, as well as a change in cognitive ability of children after use of the application.

Table 1. Likert Scale Criteria

Score	Rating Scale
5	Very good
4	Good
3	Enough Good
2	Not good
1	Not good

The second use of Analysis statistics is the nonparametric Wilcoxon Signed Rank test. Testing: This is done by counting the average difference in paired data within a group.

The retrieval decision hypothesis is tested by comparing T count and T table values in two-sided tests at the significance level $\alpha = 0.05$. If the mark significance shows results more from 1 or $T > 1$, then the null hypothesis (H_0) is accepted, indicating no significant difference between pre-test and post-test results.

3. RESULTS AND DISCUSSION

The study was held at The Baby School Tuban Kindergarten on March 3-13, 2026, and continued on March 30 -April 10, 2026. Implementation study coincides with the month of Ramadan and halal bihalal activities Eid al -Fitr 1447 H.

Result of media development

Study This produces learning media products in the form of interactive digital applications named MAKID, an acronym for Digital Interactive Kids Math. An application developed as a game for educational purposes to improve cognitive abilities in children aged 5–6 years with ADHD in Kindergarten, but this tool can also be used by children who need it.

The material contained in application This consists of from four module main learning mathematics children, namely: (1) module numbers that include introduction numbers 1 to with 10, (2) modules forms that include introduction form triangle, circle, square, and rectangle length, (3) modules size that includes draft comparison size small-medium-large as well as low-medium-high; and (4) module patterns that include introduction ABAB pattern.

As for the flow content in application This includes: (1) page cover, (2) pages

Happy come, (3) pages explanation module, (4) pages module learning, (5) pages exercise 1 and exercise 2 on each module, (6) pages mark as well as giving present or the title of "The Champion" in every module, (7) pages support and assistance, and (8) pages information.

After using the MAKID application, the value of the mathematics child in the fourth module improved significantly. The results indicate an improvement in cognitive abilities in children, particularly in aspects of thinking and understanding of mathematics. Learning mathematics is a related learning process closely linked to cognitive development in children. Cognitive ability is an important aspect that needs to be developed from an early age. Therefore, the activity of learning mathematics in child play plays a main role as a foundation in supporting cognitive development [13].

Application: This was developed in the form of a fun, educational game and consists of several learning parts and stages. Through application, the child is motivated to study in a way that utilises cognitive ability, and is active in finding principles and drafting through the thought process carried out during problem-solving. Children who initially do not yet understand or still do not understand draft numbers, shapes, sizes, and patterns gradually show improvement in understanding and mastery of the material through interactive, activity-based learning and exercises.

That matters in line with the theory of constructivism proposed by Jerome S. Bruner. This theory states that in the learning process, participants need to be motivated to study in both independent and discovery-based ways. Participants' education is also expected to play an active role in identifying principles and drafting during the process of solving problems encountered in the activity learning [14].

In the process of reconstructing knowledge, participants are educated through three stages or mutually exclusive models that are related to one another. Stage First in the form of action, namely the ability to concentrate in listening, understanding, remembering, thinking, and behaving. Be careful in making a decision. The second stage is the ability to understand visual representations, such as images. As for the stages, the third is understanding symbolic mathematics.

In the application, participants are educated through a number of stages, including four "learning "sessions, four "exercise 1" sessions, four "exercise 2" sessions, and a final presentation in the form of a title, "Champion," in every module. Stages and flow application. This can be seen in the chart structure content following this:

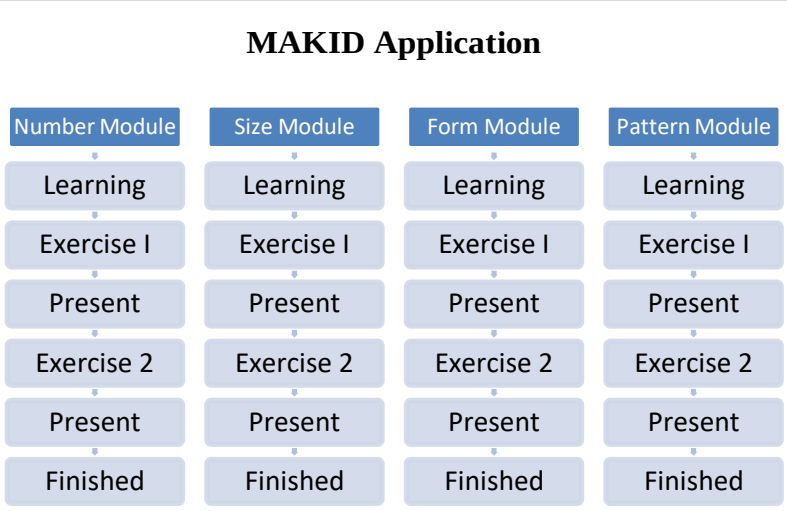

Figure 4. Structure MAKID Content

Stages are a series of thought processes that play a role in increasing human cognitive ability. This is in line with Jerome S. Bruner's visual theory, which states that in the process of reconstructing knowledge, children use three interconnected models: a stage realized enactive through action, a stage iconic embodied through representation, and a stage symbolic manifested through symbols. Third, they are viewed as a series of cognitive processes in learning man [15].

Validation results from expert Special Education (PLB) materials

Application: This was developed as an effort to increase the cognitive aspect of children with ADHD in the park. As for the results validation from expert Special Education (PLB) materials, they are presented in the table following:

Table 2. Results Expert Validation Special Education Materials

No	Indicator
1	Material aspects
2	Learning aspects
3	Mathematical aspects
4	Visual design aspects

Based on the results of score validation carried out by experts in Special Education (PLB) materials, the obtained percentage was 95%. If converted to in in-criterion level validity, the percentage falls in the very valid category, indicating that the application is worthy of use without the need for repair and can be implemented in the learning process.

Presentation material in the application is organized into several smaller, more specific parts. Learning is organized into four independent modules, each consisting of three parts: session learning, exercise 1, and exercise 2. The workflow is structured in gradually facilitate thinking and analysis, foster caution in decision-making, and allow time for restorative support, thereby improving concentration in children with ADHD.

Application: This is equipped with eight filters or mechanisms that self-spread across four module learning, namely through the learning and training menu workmanship question. Error in answering the question or lack of caution in moving fingers can cause the child to have to repeat the workmanship exercise from the beginning. If errors in the workmanship exercise 1, then No can continue workmanship exercise 2, so they must try to get exercise 1 right. Likewise, they must try to correct all in the workmanship exercise 2, so that they can get the title of Champion in every module. Condition the push child to maintain concentration for longer so they can achieve optimal understanding and achievement in learning.

The MAKID application is designed to minimize the use of voice and music. Application: This only displays related instructions directly with the objective learning, and is not equipped with songs or effects that produce excessive noise. The design aim is to help the child focus on activities and learning goals. Arrangement in application: This is designed to accommodate the needs of special children, such as minimizing environmental disturbance and sharing learning materials in more parts , making it easier to understand. Periodically giving pause or time to rest can also help increase concentration in children with ADHD. In addition, the implementation of method learning interactively contributes to improving the participation of children in the learning process so that they are capable of maintaining concentration in longer time [16].

Improvement mark test. The mathematics obtained also indicates the existence of improvement ability, concentration, and the ability in maintain focus for in longer time, as well as a development attitude, care, and tranquility during the learning process.

Validation Results from Mathematics Material Experts

MAKID application is an application for learning mathematics designed for children in a comprehensive way that covers all modules based on mathematics, namely module numbers, shapes, sizes, and patterns, all of which are integrated in One application.

Modules are in accordance with fundamental concepts of mathematics at the level of development of children, which include: introduction to numbers, introduction to form, introduction to size, and introduction to pattern [11].

The validation results from the Mathematics material experts are presented in the following table:

Table 3. Results Expert Validation Mathematics Material

No	Indicator
1	Material aspects
2	Learning aspects
3	Mathematical aspects
4	Visual design aspects
	Total score 85%

Based on the results of the calculation score validation conducted by experts in mathematical material, the obtained percentage is 85%. If converted to an in-criterion level validity, the percentage is included in the very valid category, so that stated worthy used without need for repair. Learning mathematics requires high levels of concentration and thinking processes in children. Thus, participants can follow complex learning with Good until they achieve an optimal value and show greater understanding of Good than previously. The results show significant improvement in cognitive abilities, including existence, thinking, analyzing, and development abilities in a cognitive child.

Validation Results from Media Experts

The MAKID application is practical for use in the learning process, as in aligns with the need for learning and the characteristics of children with ADHD aged 5-6 years. In addition, the application This also accommodates objective important learning mathematics in children age early as put forward by Apriani and Sarsabilla (2025): The purpose includes: (1) developing ability child in think logical and systematic, (2) introduce draft base number along with its symbol, (3) building understanding about size and measurement, (4) instilling a sense of confidence self and a sense of desire know the child, and (5) prepare child For enter level education Elementary school [17].

Table 4. Results Expert Validation Media

No	Indicator
1	Programming
2	Presentation
3	Text / graphic display
4	Mathematical content
5	Media effectiveness

Based on the results, the media experts' score validation yielded a 91% evaluation. If converted to an in-criterion level validity, the percentage includes in the very valid category, so that it is stated worthy and used without the need for repair".

According to cognitive theory development proposed by Jean Piaget, children ages 5-6 years are at the preoperational stage, namely a stage that develops over a period of time from around 1.5 to 6 years. At this stage, the child has a capable use of symbols and emblems in activity play and learning. In addition, children show significant development in creativity, language processing, reasoning, planning, and imitation. [18]. As put forward by Sarjani et al., interactive learning media can facilitate learning independently and contribute in increased motivation and desire. Study participant educated [19].

Assessment Results practicality from the class teacher

Table 5. Results evaluation Practitioner

No	Indicator
1	Quality of content and purpose
2	Technical quality
3	Quality of learning
	Total score 94%

Based on results, calculation score validation, and practicality, the obtained percentage for teacher/practitioner assessment was 94%. If converted to in-criteria level practicality, the percentage is included in the very practical category, which shows that the application is very easy to use and does not experience significant obstacles in its implementation. An application that can be implemented in a practical, digital-based learning medium for mathematics, proven capable of significantly increasing motivation, understanding, and interest in studying mathematics in a significant way in children aged 5- 9 years old [20].

The practicality of MAKID is also demonstrated through the following aspects. First, in terms of cost, using MAKID is relatively economical because internet access is only required for the initial download and installation of the application. Furthermore, implementing the paperless concept reduces paper use and lowers tutoring costs, as students can complete the learning process independently. Second, in terms of efficiency, learning materials can be accessed repeatedly with consistent presentation and quality standards, thus supporting equitable student understanding. Third, in terms of time, MAKID offers flexibility, as the learning process can be completed anytime, anywhere, tailored to the user's needs. Fourth, the use of MAKID has the potential to increase students' motivation to learn in master learning modules, while simultaneously encouraging optimal achievement as a form of self-actualization. Fifth, MAKID is developed as an interactive and engaging learning medium for students, enabling mathematics learning in a fun, game-based way without coercion, while still leading to the achievement of learning competencies [21].

Effectiveness of the MAKID application media

The Pre-test and Post-Test results are shown in the following table.

Table 6. Value of *Pre-test*, *Post-test*, and the difference

No	Name	*Pre-test* Score	*Post- test* scores	Difference *Pre and post* -test |d|	Difference
1	VN	260	600	340	340
2	MD	320	695	375	375
3	KT	470	770	300	300
4	KN	700	800	100	100
5	US	670	790	120	120
6	A A	620	780	160	160

All over differences show positive value. If the results are served in the form of a bar chart, then comparison of pre-test and post-test scores can be displayed as seen in the following figure:

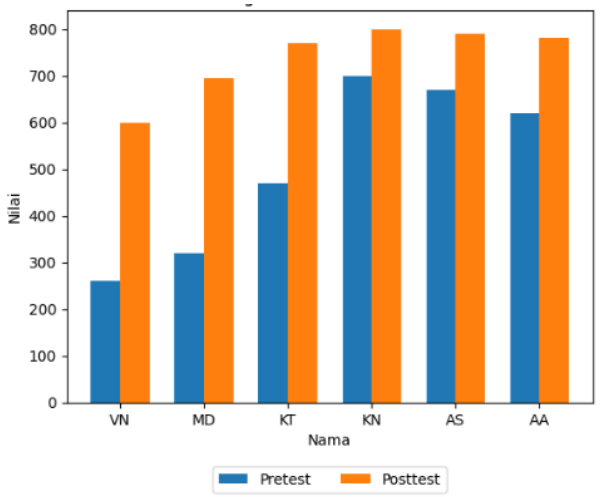

Figure 5. Pre-test and Post-test Scores

Based on the diagram above, there is an increase in post-test scores for students, which indicates an increase in understanding of mathematical abilities.

The statistical test results indicate a highly significant difference in students' mathematical abilities between the pre-test and post-test scores after using the MAKID application. Thus, the MAKID application can be declared effective as a learning medium. As put forward by [22], learning that integrates technology information with activity play is one of the optimal solutions in the learning process. Digital-based games education has potential as a learning medium in mathematics for preschool-age children, not only effective but also fun.

In the current digital era, the utilization game digital education has become an effective strategy in creating an interesting and productive learning experience. Learning mathematics in children's pre-school alone faces challenges, as children tend to prefer more informal and active play compared to formal and academic learning [22].

Nurmala stated that the development of interactive multimedia learning videos focuses on cognitive aspects, viewed as potential solutions to overcome learning problems, especially limitations in the materials and available supporting media for students during the ongoing learning process. The media potential becomes an effective learning in frame, increasing students' cognitive abilities [23].

As stated by Epran and Muhammad, Android-based learning media is rated as effective in supporting the learning process for children, because devices like smartphones allow participants to learn and understand material learning in a way more quickly. Therefore, the use of digital media, especially smartphones, has become increasingly important for educators in implementing active learning [24]. Also, the use of Android-

based smartphone applications has a positive influence on student learning outcomes, motivation, and involvement in learning [25].

This study has several limitations that should be considered when interpreting the findings. First, the research involved a small sample of six children with ADHD aged 5–6 years. Such a small number of participants may limit the generalizability of the findings to broader populations of children with diverse characteristics and educational backgrounds. Second, the study employed a one-group pre-test–post-test design without a control group. Therefore, it is difficult to determine whether the observed improvements in cognitive abilities were solely attributable to the MAKID application or influenced by other external factors. Third, the intervention was conducted over a relatively short period, which limits understanding of the long-term effects and sustainability of cognitive improvement among children with ADHD. Finally, the study was conducted in a single institutional setting, namely The Baby School Tuban Kindergarten, which may limit the generalizability of the findings across different educational contexts. Future studies are recommended to involve larger and more diverse samples, use experimental designs with control groups, extend intervention periods, and include multiple educational settings to strengthen the validity and generalizability of the results.

4. CONCLUSION

This research successfully developed a learning medium, MAKID, an interactive digital application designed to improve the cognitive abilities of children with ADHD aged 5–6 through mathematics learning. The application consists of four modules: numbers, shapes, sizes, and patterns. The learning process is structured in stages, including material presentation, Exercises 1 and 2, and tiered assessments. Mathematics was selected as the primary foundation for learning because it plays an important role in children's cognitive development. Improved understanding and learning outcomes in mathematics indicate an enhancement in children's cognitive abilities. The application features a self-control controller specifically designed for children with ADHD to support concentration, critical thinking, and attentiveness during learning activities. MAKID can be operated on various digital devices, including Android smartphones, tablets, and laptops. An internet connection is required only during the download and installation process; afterward, the application can be used repeatedly offline, ensuring consistent, standardized learning quality.

Based on the validation results, Special Education experts categorized the application as "very valid" and suitable for use without revision. Mathematics and media subject experts also evaluated the application as highly valid and appropriate for implementation. Furthermore, ADHD teachers considered the application practical and effective for supporting cognitive development in ADHD children aged 5–6 years in kindergarten settings. However, this study has several limitations. The research involved a small sample and was conducted only within a specific educational setting, which may limit the generalizability of the findings. In addition, the study did not use an experimental comparison group or long-term follow-up to assess sustained learning outcomes. The application was also specifically designed for ADHD children, so its

effectiveness for children with other disabilities has not yet been examined. Future research is recommended to involve larger and more diverse samples to improve the generalizability of the findings. Further studies could also use experimental designs with comparison groups to more comprehensively assess the effectiveness of the MAKID application. Longitudinal studies are needed to evaluate the long-term impact of the application on children's cognitive development. Moreover, future research may expand the application's implementation to broader disability categories to explore its adaptability and effectiveness in inclusive learning environments.

Suggestion

MAKID can be utilized as a mathematics learning medium to improve the cognitive abilities of children with ADHD/ADHD in particular, as well as young children in general. The application also has the potential to be further developed into a more comprehensive and adaptive learning system with broader global accessibility. For educational purposes, teachers are encouraged to integrate MAKID into daily PAUD learning activities as a supportive digital medium for introducing basic mathematical concepts in an interactive, structured manner. The application may also align with the PAUD curriculum to support cognitive development indicators, particularly in early numeracy and problem-solving. Parental involvement is equally important in maximizing the application's effectiveness. Parents can accompany children during learning activities at home, provide guidance when using the application, and create consistent learning routines to strengthen children's focus and engagement. Collaboration between teachers and parents is recommended to monitor children's learning progress and ensure continuity between school-based and home-based learning experiences. Future research is recommended to involve larger, more diverse samples in order to obtain more comprehensive, representative findings. Further studies may also examine the effectiveness of MAKID implementation across different educational settings and among children with broader developmental characteristics.

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REFERENCES

[1] T. Yuliasti and W. Vitaloka, "Analisis Penyebab Kesulitan Berhitung Pada Anak Usia 5-6 Tahun," *As-Sibyan: Jurnal Pendidikan Anak Usia Dini*, vol. 10, no. 1 DOI: https://doi.org/10.32678/assibyan.v10i1.11301, p. 113–128, 2025.

[2] C. E. T. W. Feri Faila Sufa, "Pengembangan Instrumen Kemampuan Berpikir Matematika dalam Perkembangan Kognitif anak usia dini," *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, vol. 7, no. 3 DOI: https://doi.org/10.31004/obsesi.v7i3.3646, p. 3819–3830, 2023.

[3] N. P. Z. Salsabil, N. N. Aini, P. Z. D. Ningrum and R. K. Sari, "Pengembangan Media Busy House Untuk Meningkatkan Konsentrasi Anak Usia Dini," *Jurnal Pendidikan Islam Anak Usia Dini*, vol. 3, no.

1. DOI: https://doi.org/10.61104/dz.v3i1.579, p. 1–19, 2025.

[4] I. L. Devi, Y. F. Susetyo and H. Haryanta, "Intervensi Perilaku dan Multisensori untuk Anak dengan ADHD yang Mengalami Gangguan Sensorik," *Gadjah Mada Journal of Professional Psychology (GamaJPP),* vol. 10, no. 2 DOI: https://doi.org/10.22146/gamajpp.93750, pp. 122-133, 2024.

[5] R. Maghfirah, Y. Apriliyani, Hijriati and M. K. Syukri, "Penanganan Anak Attention Deficit Hyperactivity Disorder (ADHD) Di Kelas Therapy SLB TNCC Banda Aceh," *Jurnal Pendidikan Islam Anak Usia Dini*, vol. 3, no. 1 DOI: https://doi.org/10.35905/anakta.v3i1.9369, p. 41–46, 2024.

[6] S. Khoiria, W. Y. Nabila, A. F. R. Rizqillah, A. N. Khusnah, Juhairiyah and N. E. Harsiwi, "Analisis Karakteristik Perilaku Anak Dengan Dugaan Attention Deficit Hyperactivity Disorder (ADHD) di Sekolah Dasar," *HEALTHY : Jurnal Inovasi Riset Ilmu Kesehatan,* vol. 5, no. 3 https://doi.org/10.51878/healthy.v5i3.11360, p. 238–248, 2026.

[7] D. U. Subahiriyah and S. H. Rofi'ah, "Increasing Aud's Mathematical Logical Intelligence through the Use of Puzzle Pipe Media," *Al Yazidiy : Jurnal Sosial Humaniora dan Pendidikan ,* vol. 6, no. 2 DOI: https://doi.org/10.55606/ay.v6i2.1087, pp. 36-46, 2024.

[8] W. Wulansari and E. K. Wati, "Game LoP: Fostering Logical-Mathematical Intelligence in Early Childhood," *Jurnal Pendidikan Anak Usia Dini Undiksha,* vol. 12, no. 2 DOI: https://doi.org/10.23887/paud.v12i2.80858, p. 301–309, 2024.

[9] D. Ernawati, M. Fadlillah and M. Fadhli, "Early childhood mathematical logic skills stimulation game using LLM (logical learning media)," *Journal of Early Childhood Care and Education,* vol. 5, no. 2 DOI: https://doi.org/10.26555/jecce.v5i2.4709, p. 104–113, 2022.

[10] N. Hanifah, N. H. Magfiroh and A. A. Assa'diy, "Analisa Efektivitas Metode Montessori terhadap Kemampuan Atensi Anak ADHD," *Aulad: Journal on Early Childhood,* vol. 7, no. 2 DOI: https://doi.org/10.31004/aulad.v7i2.689, p. 434–444, 2024.

[11] B. Iskandar, H. Hashipah and V. S. Zulaeha, "Integrasi Lingkungan dalam Pembelajaran Matematika: Studi Literatur Pembelajaran Konstektual Berbasis Lingkungan bagi Anak Usia Dini," *JURNAL PAUD AGAPEDIA*, vol. 8, no. 2 DOI: https://doi.org/10.17509/jpa.v8i2.78851, pp. 243-252, 2024.

[12] Sugiyono, Metode Penelitian Kuantitatif, Kualitatif, dan R&D, Bandung, Indonesia: Alfabeta, 2019.

[13] C. A. Rahmania, F. N. Shalsabilla, G. Aprilia, K. K. Syahira, R. A. Alfiyyah and H. E. Putri, "Analisis Teori Belajar Bruner Untuk Membantu Peserta Didik Dalam Pembelajaran Matematika," *De Fermat : Jurnal Pendidikan Matematika,* vol. 8, no. 1 DOI: https://doi.org/10.36277/defermat.v8i1.2254, pp. 10-21, 2025.

[14] M. T. R. Gunawan, A. T. N. Afriliani, D. A. N. Fitri, N. A. Farida and F. N. Awaliyah, "Implementation of Early Childhood Mathematics Learning at PAUDQU Al-Anshor," *Jurnal Pendidikan Anak Usia Dini,* vol. 8, no. 2 https://doi.org/10.31004/obsesi.v8i2.5455, p. 272–278, 2024.

[15] A. Hatip and W. Setiawan, "Teori Kognitif Bruner Dalam Pembelajaran Matematika," *PHI: Jurnal Pendidikan Matematika,* vol. 5, no. 2 DOI: http://dx.doi.org/10.33087/phi.v5i2.141, pp. 87-97, 2021.

[16] D. T. Susanti, R. Amalia, S. Amara, Nurhidayah, Safrah, Sinar and E. Sari, "Meningkatkan Pemahaman Warna dan Angka pada Anak ADHD melalui Metode Pembelajaran Interaktif di TK Keledang Samarinda," *BOCAH: Borneo Early Childhood Education and Humanity Journal,* vol. 4, no. 1 DOI: https://doi.org/10.21093/bocah.v4i1.10647, pp. 33-48, 2025.

[17] H. A. Yurintama, Irma, V. P. Astuti and N. Hayati, "Analisis Stimulasi Number Sense dan Problem Solving dalam Pembelajaran PAUD," *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, vol. 10, no. 1 https://doi.org/10.31004/obsesi.v10i1.7702, p. 690–700, 2026.

[18] L. Junaedi, M. Arif, V. V. Virdaus, F. Rofiyarti and Q. Faviandhani, "The Design And Efficacy Of Interactive Digital Simulations For Pre-school Cognitive Development: Integrating Piaget's Preoperational Theory And Mayer's Multimedia Principles," *MOTORIC (Media of Teaching Oriented and Children) ,* vol. 9, no. 2, pp. 113-127, 2025.

[19] M. T. Woga and A. K. Juita, "Stimulasi Perkembangan Kognitif Anak Usia Dini Melalui Media Konkret Di Tkk Negeri Harapan Bangsa Koeloda," *Jurnal Citra Pendidikan Anak,* vol. 2, no. 3 https://doi.org/10.38048/jcpa.v2i3.1498, p. 685–690, 2023.

[20] R. W. Ningsih and N. Farida, "Enhancing Critical Thinking in Early Childhood through STEAM-Oriented Busy Board Media: A Development Study," *Golden Age: Jurnal Ilmiah Tumbuh Kembang Anak Usia Dini*, vol. 8, no. 3 https://doi.org/10.14421/jga.2023.83-04, pp. 143-157, 2023.

[21] A. F. Firdaus, "Operationalizing Islamic Values and Humanism in the Merdeka Curriculum: Implementation Barriers, Stakeholder Strategies, and Policy Pathways," *Global Journal of Islamic*

Education, vol. 1, no. 2 https://doi.org/10.58518/gajie.v1i2.3258, pp. 160-166, 2025.

[22] N. E. Lestari, Richa, Rinneke, Fatimatus and Sahrul, "Efektivitas Aplikasi MathCityMap dalam Meningkatkan Hasil Belajar Siswa Pada Materi Jarak," *Pendas : Jurnal Ilmiah Pendidikan Dasar*, vol. 304, no. 2 DOI: https://doi.org/10.23969/jp.v10i02.25987, p. 295, 2025.

[23] N. R and A. S. E. Udiana, "Pengembangan Pocket Book Mathematic (Pockemath) Berbasis Android Sebagai Media Pembelajaran Siswa," *Jurnal Penelitian Matematika dan Pendidikan Matematika*, vol. 5, no. 1 DOI: https://doi.org/10.30605/proximal.v5i1.1477, pp. 19-29, 2022.

[24] Epran and I. Muhammad, "Pengembangan Media Pembelajaran Matematika Berbasis Android pada Materi Matriks," *EDUKASIA Jurnal Pendidikan Dan Pembelajaran*, vol. 4, no. 2 https://doi.org/10.62775/edukasia.v4i2.546, pp. 2051-2062, 2023.

[25] H. Nasution, "Pengaruh Pemanfaatan Aplikasi Smartphone Berbasis Android Sebagai Media Pembelajaran di SMP Negeri 1 Kisaran," *Edukatif*, vol. 2, no. 2 DOI: https://doi.org/10.65311/je.v2i2.647, p. 215–219., 2024.