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Cognitive Development Media of Children: Development of Educational Toys Mandalika Cockroach Racing Circuit

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Abstrak
Penelitian ini bertujuan untuk mengembangkan Sirkuit Mandalika kecoa *Racing yang memiliki nilai edukasi dalam menstimulasi perkembangan kognitif anak usia dini dan mengetahui kelayakan Sirkuit Mandalika Kecoa Racing*. Metode penelitian ini adalah metode pengembangan *Research and Development* dengan model *ADDIE*. Subjek dalam penelitian ini adalah guru dan anak usia 5-6 tahun di TK Aisiyah Menaming, sedangkan objek penelitian yaitu pengembangan alat permainan edukatif sirkuit mandalika kecoa racing untuk mengembangkan aspek kognitif anak usia 5-6 tahun. Teknik pengumpulan data menggunakan angket, observasi, dan dokumentasi. Teknik analisis data dalam penelitian adalah menggunakan data yang di peroleh dari masukan validator pada tahap validasi, masukan ahli media dan menggunakan statistik perhitungan skor yang didapatkan dari jawaban responden pada skala likert. Hasil penelitian ini diperoleh berdasarkan penilaian dari ahli media dengan hasil persentase 81,25%, penilaian ahli materi sebesar 93,3%, penilaian kepala sekolah dan guru sebesar 92%, sehingga penilaian dari angket validator dikategorikan "Sangat Layak". Sedangkan penilaian uji coba produk pada anak memperoleh persentase 93% dengan dikategorikan "Sangat Layak". Adapun temuan dalam penelitian ini adalah anak mampu memahami simbol, anak mampu memahami identitasnya, anak mampu memahami sebab akibat, anak mampu mengklarifikasi bentuk, warna, ukuran, dan lain-lainnya. Sehingga dapat disimpulkan bahwa produk hasil Pengembangan Alat Permainan Edukatif Sirkuit *Mandalika Kecoa Racing* (Sim Kerang) Untuk Menstimulasi Aspek Kognitif Anak Usia 5-6 Tahun Di TK Aisiyah Menaming Layak Untuk Digunakan.

Kata Kunci: Alat Permainan Edukatif, Sirkuit Mandalika Kecoa *Racing*, Perkembangan Kognitif, Anak Usia Dini

Abstract
This study aims to develop the *Mandalika Cockroach Racing Circuit*, an educational play tool designed to stimulate the cognitive development of early childhood learners, and to evaluate its feasibility. The research employs a Research and Development approach using the ADDIE model. The subjects involved were teachers and children aged 5–6 years at TK Aisyiyah Menaming. Data were collected through questionnaires, observation, and documentation, and analyzed using expert validation input and Likert scale responses. The results show that media experts rated the product at 81.25%, material experts at 93.3%, and school principals and teachers at 92%, indicating a "Highly Feasible" classification. Product trials with children yielded a score of 93%, also classified as "Highly Feasible." The study found that the tool effectively supported children's understanding of symbols, identity, cause-and-effect relationships, and classification of shapes, colors, and sizes. In conclusion, the *Mandalika Cockroach Racing Circuit* (Sim Kerang) is a viable educational tool for enhancing cognitive development in children aged 5-6 years.

Keyword: *Mandalika Cockroach Racing, Educational Play Tool, Cognitive Development, Early Childhood Children*

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INTRODUCTION

Education is a conscious effort to develop an individual's personality and abilities, both through formal processes at school and through experiences outside of school, and it continues throughout life. This process is carried out in the family, school, and community environments as an integral part of a person's life. Early childhood is a period of rapid growth and development, often referred to as the "Golden Age," meaning that these years are more valuable than the years before (Fadilla, 2019). Children are very sensitive when receiving stimuli through play, which is related to their intellectual development. The world of children is a playground where they learn various skills. Play is an important part of a child's development and transformation into a well-rounded individual. Exploratory activities are also part of play that has many benefits that support all aspects of religious development, motor development, language development, artistic development, social-emotional development, and cognitive development (Ahmad Susanto, 2011).

Cognitive refers to a series of mental processes that enable individuals to acquire, understand, remember, and use information. These processes include various brain activities such as thinking, memory, perception, language, problem solving, and decision making. Simply put, cognition relates to how we process and understand the world around us through our thoughts and experiences (Ujang Khiyarusoleh, 2016). Cognitive development in early childhood is a fundamental aspect that determines a child's ability to think, understand, and interact with their surroundings. Play is one of the main activities that can stimulate a child's cognitive development. Through play, children not only have fun, but also learn about the world around them, solve problems, and develop logical thinking, problem-solving, and symbolic abilities. It is important to emphasize that various types of games, such as role-playing, constructive, and social-cognitive games, have a significant impact on developing children's thinking, language, and mathematical skills. The cognitive development of children requires a learning environment that incorporates different types of games, one of which contains educational elements or values, such as the use of educational toys (Khadijah, 2016).

Because educational toys can energize early childhood development. Guidelines for selecting, using, and introducing educational toys are one way to support child growth and development, namely by encouraging managers to select, introduce, and use available tools and materials in the environment, such as cardboard, bottles, used plastic, bottle caps, and natural materials such as wood, leaves, stones, water, soil, coconut husks, and others, as stated by Yoan Ida Ringu Paubun as a resource person in the Training on Utilizing the Surrounding Space as Educational Toys held online by the Directorate General of Islamic Education, Ministry of Religious Affairs (Ahmad Nuril Fahmi, 2020).

Educational toys can make learning activities fun for children. These educational toys allow children to exercise and play with their friends. Educational toys can also reduce the mortality rate of the younger generation in this modern era where technology is developing rapidly (Godiygo, 2020). Educational games in Early

Childhood Education are also known as attractions. Educational Game Tools are useful for providing educational toys to early childhood children. Without educational games, children easily get bored while learning. According to the Director General of Early Childhood Education at the Ministry of Education and Culture, educational games are something that can be used as children's games, as tools that have educational value that influences the growth and development of a child (Yayu Laila Sulastri, dkk, 2017). In addition to preventing children from getting bored with learning, the introduction of educational toys makes children happier and increases their desire to explore thematic learning. Therefore, parents or teachers should equip children with learning materials and choose the right tools to assist them in each learning activity.

A problem has arisen at the Aisiyah Menaming Kindergarten in Rambah District, Rokan Hulu Regency, where educators use learning media in the form of images that do not attract children's attention during the learning process at the school. The tasks given to children are also presented in the form of worksheets, which tend to be monotonous and do not motivate children to actively participate. As a result, the learning process becomes less interesting, making children feel bored and reluctant to participate in learning activities. The educational toys at the school are still limited and lack variety. Most children only play with blocks as their main activity. In addition, observations show that some children are unable to recognize patterns, think logically, understand symbolic concepts, recognize colors, shapes, letters, and other basic concepts.

METHOD

This study uses quantitative research employing a research and development approach. Research and development (R&D) is a series of processes or activities aimed at developing a new product or improving an existing product so that it can be considered. According to i(Sugiyono, 2022) ipenelitian idan ipengembangan Research and development (R&D) is a research activity aimed at creating specific products and testing the effectiveness of those products. Research in the form of needs analysis is used to create specific products, and research on product effectiveness is used to test the effectiveness of products so that they can be used by the wider community. The method used in this research is the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. This research was conducted for approximately one year from 2024 to 2025 at Aisiyah Menaming Kindergarten in Rambah District, Rokan Hulu Regency. The subjects of this study were teachers and students at Aisiyah Menaming Kindergarten. Meanwhile, the object of this study was the development of the Mandalika Cockroach Racing Circuit (Sim Kerang) Educational Game Tool to develop the cognitive aspects of 5-6-year-old children at Aisiyah Menaming Kindergarten, Rambah District, Rokan Hulu Regency. The ADDIE model research method must be used systematically and comprehensively to ensure effective learning outcomes that stimulate the cognitive development of children of this age. The steps of the ADDIE model are as follows:

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Analysis is the first step in analyzing children's needs and characteristics. The goal is to identify the skills and abilities that need to be developed in children. Therefore, the solution to this problem is to develop educational games to stimulate children's interest in learning. Design is an activity carried out by researchers to determine the selection of educational games and the initial design of the APE structure. The selection of APE was developed based on the analyzed problems in the form of the Mandalika Circuit Cockroach Racing (SIM Ikerang). APE was designed based on the characteristics of APE and the cognitive characteristics of children aged 5-6 years.

Development is APE iSim iKerang, which has been developed for the development of psychological characteristics in children aged 5-6 years based on professional verification and product evaluation. The stages of the development process are as follows: a) Expert validation is a guarantee aimed at obtaining the strength and quality of the product in accordance with its characteristics. This is done by conducting product design validation by APE and subject matter experts to obtain input and criticism from verifiers regarding the product to be developed. b) Product Revision is a project evaluation based on usability as input for evaluating product development. It is verified by experts. Receive input and criticism from reviews.

Implementation is the place where the iAPE SimiKerang product is tested with children aged 5-6 years. The purpose of implementation is to obtain data on the effectiveness of APE Sim Kerang in improving the cognitive development of children aged 5-6 years. Evaluation is the final stage of the ADDIE development process. This stage can be achieved through formative evaluation and summative evaluation. Positive review is a product evaluation based on criticism and input to determine the need for revision. Meanwhile, assessment and summative evaluation are developed and implemented to evaluate the results of the analysis of the Sim Kerang AEP for children aged 5-6 years.

TableiII.2
Steps in R&D Development ADDIE

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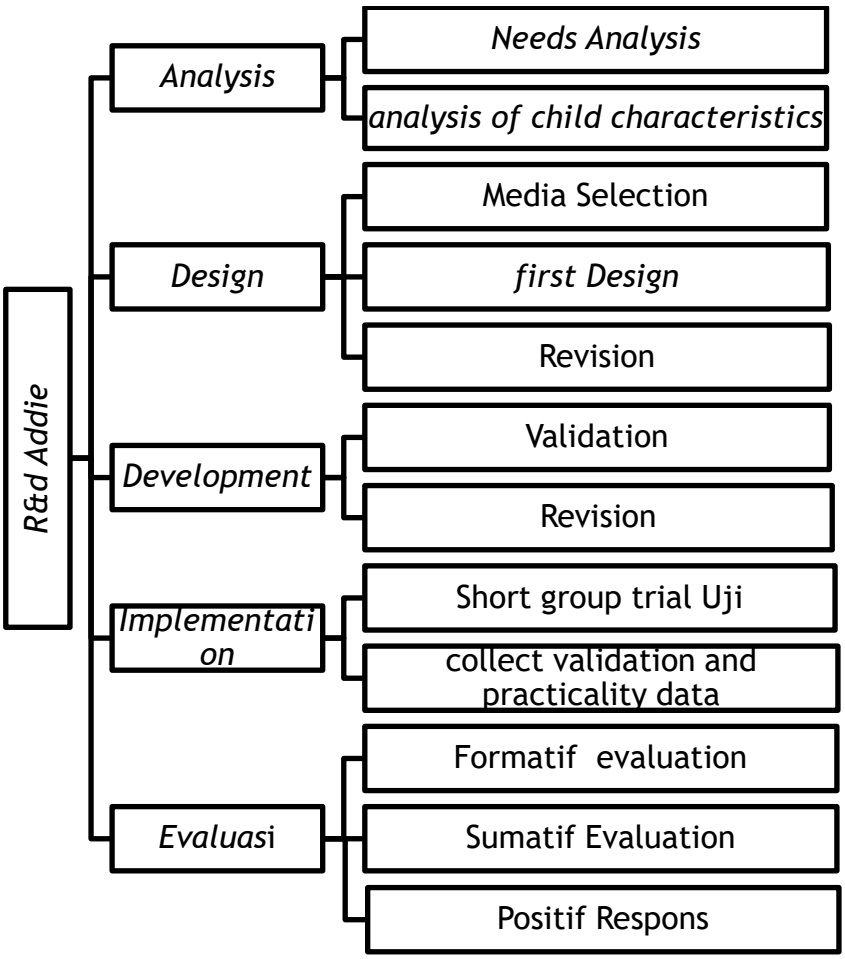

Observation is a data collection technique that has its own characteristics and is a complex process. The method of collecting observational data in this research concerns the characteristics of student participants, aspects of child development that are observed and the number of student participants. A questionnaire is a technique for collecting personal data in which respondents or participants complete questions or statements and provide responses to the researcher after completion. Documentation is a record of past events. Documents can be in the form of written text, images, or personal memories. Written documents, for example diaries, life histories, health records, regulations, policies. iText in visual form, such as photos, live graphics, idiagrams, etc.

Data analysis techniques were developed to produce the best product APE Sim Kerang (Mandalika Kecoa Racing Circuit) with high quality and practical performance. The steps to analyze the parameters of the developed product are as follows: Feasibility analysis where validation evaluation is used to analyze the probability. Data validation evaluates the product by calculating the average verification value using the formula:

$$\bar{x} \frac{\sum x}{n}$$

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Information:
$\bar{x}$: average
Σ : total score obtained
n : many question

Table. 2.
Scoring Guidelines Scoring Sheet Media Expert and Material Expert

Score	Categori
4	Very Worthy
3	Worthy
2	Not worthy
1	Unworthy

Practicality Analysis The observation form is used to analyze the cognitive skills of children aged 5-6 years. The learning speed of children through the APE ISim Shell can be calculated using the following formula and expressed in percentage:

$$P = \frac{results\ score}{ideal\ score}\ x\ 100$$

Table. 3.
Practicality Criteria Based on Children's Observation Sheets in iAisiyah Kindergarten iMenaming

Persentase	Categori
81-100	Very Practical
61-80	Praktical
41-60	Not Praktical
21-40	Unpractical

RESULTS AND DISCUSSION

The research conducted at Aisyiyah Menaming Kindergarten, Rambah District, Rokan Hulu Regency aims to develop an educational game tool "Sim Kerang" which is designed to resemble a cockroach racing circuit to stimulate the cognitive aspects of children aged 5–6 years. This research uses the Research and Development (R&D) method with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model, which is very suitable in the process of developing educational products. The research subjects consisted of teachers, principals, and children aged 5–6 years at Aisyiyah Menaming Kindergarten. The main object of the research is the Sim Kerang APE, which was developed as a medium for playing and fun learning.

Validation and trial results

The results of the media expert validation show that the navigation aspect has a score of 9 with a total of 12 questions, the media display has a score of 12 with a total of 16 questions, the media presentation has a score of 15 with a total of 16 questions, and the innovation/development has a score of 16 with a total of 20 questions. So that a percentage of 81.25% can be obtained based on the percentage obtained from the imedia validator which can be categorized as "Very Eligible". In addition, the imedia assessment table by the imedia expert above explains that the score of the percentage results from the validation results carried out by media experts with the navigation aspect has a percentage of 75% which is stated as very valid, the media display aspect has a percentage of 75% which is stated as very valid, the media presentation aspect has a percentage of 94.75% which is stated as very valid. While the percentage results of the innovation aspect developed with a total of 80% which is stated as very valid.

The results of the validation by material experts show that the content aspect has a score of 18 with a total of 20 questions, the aspect of the elements of Paediatrics has a score of 20 with a total of 24 questions, the aspect of the elements of Islam has a score of 8 with a total of 8 questions, and the aspect of the elements of local wisdom has a score of 8 with a total of 8 questions. So that a percentage of 93.3% can be obtained based on the percentage obtained from the material validator, which can be categorized as "Very Feasible". In addition, the material assessment table by the validator expert above explains that the percentage score from the validation results carried out by material experts with the content aspect has a percentage of 90% which is stated as very valid, the aspect of the elements of Paediatrics has a percentage of 83.3% which is stated as very valid, the aspect of the elements of Islam has a percentage of 100% which is stated as very valid. Meanwhile, the score for the local wisdom element aspect was 100%, which was stated as very valid.

The results of the assessment of the principal and teachers, teachers are known that the navigation aspect has a score of 10 with a number of questions of 12, media display has a score of 14 with a number of questions of 16, media presentation has a score of 15 with a number of questions of 16, innovation/development has a score of 17 with a number of questions of 20, content aspect has a score of 20 with a number of questions of 20, aspects of the elements of Paediatrics have a score of 24 with a number of questions of 24, aspects of Islamic elements have a score of 7 with a number of questions of 8, and aspects of local wisdom have a score of 7 with a number of questions of 8. So that a percentage of 92% can be obtained based on the percentage obtained from the material validator which can be categorized as "Very Feasible".

In addition, the assessment table of the results of the practicality test above explains that the percentage score of the practicality test carried out by the teacher with the navigation aspect is 83.3% which is stated as very valid, the display is 87.5% which is stated as very valid, the media presentation is 94.75% which is stated as very valid, the innovation/development is 85% which is stated as very valid, the content aspect is 100% which is stated as very valid, the aspect of the elements of

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Paediatrics is 100% which is stated as very valid, the aspect of the Islamic elements is 87.5% which is stated as very valid. While the score of the results of the local wisdom element is 87.5% which is stated as very valid.

The results of the limited product trial, it is known that the results of the media trial before using the media/learning product to find out whether the cognitive development aspects of children have developed according to their age level or not, which the researcher has conducted research on the iB2 group consisting of 16 students at iTK iAisiyah iMenaming, can be seen in the table above, where it is known that the total number of scores is 515, and the number of statement items is 896, with an average of 100. So that the percentage result is 57% with the category of "Less Feasible" while the results of the limited product trial conducted as a whole obtained a score of 833 and a number of statement items of 896 and an average of 100 so that the percentage value is 93% with the category of "Very Feasible". So it can be concluded that the use of the educational game tool ICircuit IMandalika IKecoa IRacing is very feasible to be used as a learning tool for the development of cognitive aspects of children aged 5-6 years in IK Aisiyah IMenaming can be seen in the table below as follows:

Table. 4.
Limit Produc Trial

No	Nama	Penilaian														Jumlah Skor	Banyaknya Butir	Rata-Rata Hitung	Skor
1.	Aila	3	4	4	4	4	3	4	4	4	4	3	4	4	3	52	56	100	93%
2.	Aisa Jira	4	4	4	4	4	3	4	4	4	4	3	4	4	4	54	56	100	96%
3.	Aiswa Nahla	3	3	4	4	4	3	4	4	4	4	4	4	4	3	52	56	100	93%
4.	Akhdan	3	4	3	4	3	4	4	4	4	4	3	4	4	3	51	56	100	91%
5.	Akhdian	3	3	4	4	4	3	4	4	4	4	3	4	4	4	52	56	100	93%
6.	Akmar	3	4	4	4	3	3	3	4	4	4	4	4	4	3	51	56	100	91%
7.	Alfat	4	3	3	4	4	3	4	4	4	4	4	4	4	4	53	56	100	95%
8.	Azril	3	4	4	4	4	3	4	4	4	4	4	4	4	3	53	56	100	95%
9.	Bastotan	3	4	3	4	4	4	4	4	4	4	3	4	4	3	52	56	100	93%
10.	Elpan	3	3	4	3	3	4	4	4	4	4	3	4	4	4	51	56	100	91%
11.	Haurin	4	4	4	4	4	3	3	4	4	4	3	4	4	4	53	56	100	95%
12.	Hilya	3	3	3	4	4	4	4	4	4	4	3	4	4	3	51	56	100	91%
13.	Nadina Silma	3	4	4	4	3	4	3	4	4	4	3	4	4	3	51	56	100	91%
14.	Najla	3	4	3	3	3	4	4	4	4	4	4	4	4	4	52	56	100	93%
15.	Shopia Orlin	4	3	4	4	4	3	4	4	4	4	4	4	4	4	54	56	100	96%
16.	Syahida	4	3	4	3	4	3	4	4	4	4	3	4	4	3	51	56	100	91%
	Jumlah															**833**	**896**	**100**	**93%**
	Keterangan															**Sangat Layak**			

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Effect for Children

The results of the study after using the media showed that children experienced improvements in various cognitive indicators such as, logical thinking skills where children were able to understand simple causes and effects such as water making objects wet, symbolic skills where children were able to recognize and name symbols of numbers and letters, classification skills where children could group objects based on shape, color, and size, counting skills where children began to understand addition through play activities, and social-cognitive skills where children were more patient in waiting their turn, willing to share, and establish healthy social interactions when playing together.

Picture.1.
Racing Circuit Products on the Internet Before Development

Picture .2.
APE Products Mandalika Circuit Racing Cockroaches That Have Been Developed

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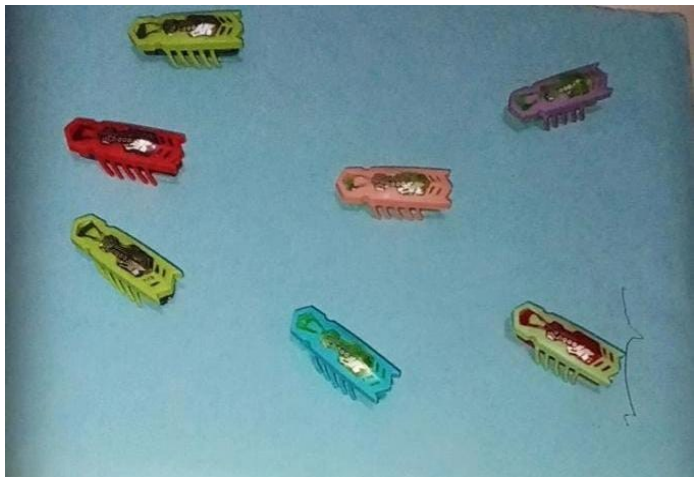
Picture. 3. Desain Pos 1 Playing Flashcard

Picture. 4.Desain Pos 2 Bermain Vocal and Consonan

Picture. 5. Desain Pos 3 Playing Children's Puzzel Card

Picture. 6. Desain Pos 4 playing playing grouping seeds



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Picture. 7. Kecoa Racing

DISCUSSION

Discussion of the results of the research conducted from the beginning of the planning, the researcher conducted observations of what happened in the field by collecting data and information regarding potential problems that occurred in the field at Aisiyah Menaming Kindergarten. From the results of the observations, the researcher found that the problems that occurred in the field were that many children were not able to solve simple problems, think critically, and think symbolic in the surrounding area. Children were more interested in the development of technology which is currently increasingly sophisticated from year to year, developing rapidly, which resulted in children recognizing things that should not be understood at their age. This is seen from the students during the break singing songs that are not suitable for their age, the older children interested in ikpop idols, and children who like to play games that should not be played by children because they are not appropriate for their age and children prefer to play duck-tok, TV games and others. Therefore, educators are responsible for providing integrated learning to their students. In order to lay the foundation for developing attitudes, knowledge, skills and cognitive abilities, children need to be given stimulation and guidance from the closest people, especially their parents/educators. In order for children to be able to adapt to their environment and be ready to enter basic education, the environment where they live and their daily lives also have a big influence on the cognitive aspects of children aged 5-6 years.

Researchers realize that children's learning process can be more effective if they use more interesting and educational media, instead of just relying on reading, writing, and arithmetic with limited tools. These tools are used by educators to make children more enthusiastic in learning. Educational games are very important in children's lives, whether at school, at home, or in the surrounding environment, because early childhood children have a high sense of curiosity and enjoy exploring new things. Based on this, researchers conclude that tools that are fun, interesting, and combine sophisticated technology can trigger children's curiosity. The product developed is an educational game tool, the Mandalika Circuit, Cockroach Racing, which is designed to improve the cognitive development of children aged 5-6 years.

In this educational game, the researcher adapted the material to sharpen children's cognitive abilities, such as problem solving. This is in line with the exposure (Agung iet ial, 2019), Cognitive development is related to the child's ability to think in a complex, rational way and solve problems. According to (Nurhafizah, 2018). Stimulation in cognitive development is obtained by children in their environment, provided by teachers, parents, and peers to build children's knowledge. According to (Cynthia & Sihotang, 2023) The development of these cognitive abilities helps children master general knowledge better, which in turn enables them to interact effectively in everyday social life. According to (Rahmawati iet ial, 2018) School readiness includes physical and psychological preparation of children, including

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social, emotional, and intellectual abilities. According to my explanation (Siti Fatimah iSoenaryo iet ial, 2023) Preschool period has an important role as preparation for the next education, iPreschool readiness refers to the child's transition to the next stage of education, meaning that the child has sufficient physical, mental, linguistic, and social abilities to learn and achieve learning goals. Elementary school readiness is a form of transition from PAUD to SD, which ideally is done through introduction to a new environment without directly leaving the motherland of learning through play activities. Meanwhile, according to (Susilahati et al, 2023) In practice, to reach the basic education level, a student is given a series of tests, most of which are to test academic abilities, namely reading, writing, and arithmetic (Calistung). This condition becomes a matter that gives rise to learning demands in kindergartens (TK) so that children can master the skills of reading, writing, and arithmetic. However, this is not in line with the government regulations of the Ministry of Education and Culture regarding the independent curriculum, where in the independent curriculum, children are not required to be able to read, write, and count because the early age period that focuses on research conducted from the age level of 5-6 years is included in the golden age period or the golden period where these periods are used by children to play, get to know, and explore their environment.

The development of educational game tools Circuit Mandalika Kecoa Racing researchers designed to develop cognitive aspects of children in addition to cognitive development aspects APE is able to stimulate other developments such as moral and religious development, social emotional, physical motor, language and art because each aspect of development is always linked and cannot be separated from one another and integrated.

Conformity with Cognitive Development Theory

According to (Marinda, Leny, 2020) This research reinforces Jean Piaget's theory that children aged 5–6 years are in the pre-operational stage, which is the period when children begin to use symbols to represent objects and understand cause-and-effect relationships. Through the Sim Kerang game, children are given the opportunity to explore and develop logical and symbolic thinking skills in accordance with their developmental stage. Furthermore, according to (Qiptiyah, T. M., 2024) Lev Vygotsky's theory of the zone of proximal development (ZPD) also seems relevant. When playing with peers and guided by a teacher, children are able to solve challenges that would have been difficult alone. Collaboration in this cockroach circuit game helps children improve their social cognitive abilities.

Learning Media Innovation

Sim Kerang not only presents a new playing experience but also provides a concrete solution to a previously existing problem at Aisyiyah Menaming Kindergarten, namely monotonous and uninteresting learning media. With a game-based approach, Sim Kerang revitalizes an interactive, collaborative, and fun learning atmosphere. This game also successfully eliminates children's boredom in

learning and increases their interest in exploring. Each station in the circuit is designed to stimulate children's critical thinking skills and provides a variety of activities that focus not only on memorization but also on understanding.

Validation and Practicality

In terms of practicality, this tool is easy to set up, can be used repeatedly, and uses safe and durable materials. Teachers also find it helpful because this tool is flexible and can be used for various learning themes. Overall, learning using Sim Kerang is more effective in achieving cognitive learning objectives and more efficient in terms of time and student engagement. The success of this tool is demonstrated by high validation indicators from various parties and tangible positive changes in children's learning behavior.

CONCLUSION

Based on the results of the research and analysis that have been conducted, it can be concluded that the educational game tool "Sim Kerang" (Mandalika Kecoa Racing Circuit) is a very feasible and effective learning media innovation in developing the cognitive aspects of children aged 5-6 years. Sim Kerang is a bridge between the world of play and the world of learning, which is designed to touch and stimulate children's thinking potential in a fun way. This game has succeeded in presenting a more lively, enthusiastic, and interactive learning atmosphere, which has been felt to be lacking in learning at Aisyiyah Menaming Kindergarten. By combining elements of a racing maze and interesting educational activity posts, this tool helps children: Recognize symbols, numbers, letters, colors, shapes, and sizes, Improve logical thinking and classification skills, Sharpen social skills such as cooperation, sportsmanship, and patience. Through a validation process from experts, teachers, and direct trials on children, this tool obtained a very high feasibility percentage - all in the "Very Feasible" category. This fact strengthens that Sim Kerang is not only theoretically valuable, but also has a practical impact in the context of early childhood education. This study proves that when the learning process is designed with creativity, an educational touch, and a spirit of play, then learning is no longer an obligation, but rather a fun adventure full of meaning. Sim Kerang is proof that innovation in children's education can be born from simple imagination but have an extraordinary impact.

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