Development of the Dangerous Road Maze Game to Stimulate Critical Thinking Abilities in Children Aged 5-6 Years

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Abstract

Technological developments can make learning more interesting and varied. In addition, children's development components will increase faster than before. Dangerous Road is an application-based game where players must complete road-finding missions by composing meaningful words that are relevant to the game theme. The ADDIE development model was used to develop the digital maze game "Dangerous Road". This research uses a Likert scale questionnaire filled out by material experts, media experts and teachers, using qualitative and quantitative data analysis techniques. According to research and development results, the Maze Dangerous Road game is an effective, efficient and interesting learning medium for children aged 5 to 6 years. Small group trials were carried out on 5 children at Dharma Wanita Kencong 2 Kindergarten, with an effectiveness value of 80%, attractiveness 77.5%, and efficiency 72%; Large group trials were carried out on 28 children at the Dharma Wanita Kencong 2 Kindergarten with a total of 8 children and the Elbaith Rif'a Islamic Happy School Kindergarten with a total of 20 children, with an effectiveness score of 95%, attractiveness of 88.2%, and efficiency of 81.7%.

Keywords: Early Childhood; Digital Maze Games; Critical Thinking

1. Introduction

Critical thinking skills are thinking abilities that involve analysis, cognitive, rational and logical, and encourage children to think critically (Hamdani, Prayitno, & Karyanto, 2019). To face the 21st century, this ability is very much needed. Early childhood critical thinking abilities vary and are influenced by many factors, especially the environment. From the research results of Rahmasari, Pudyaningtyas, and Nurjanah (2021), early childhood children have various critical thinking abilities. Most of them have fairly good critical thinking skills, some have very good critical thinking skills, and a small portion do not even have good enough critical thinking skills (Rahmasari et al., 2021). Critical thinking skills are thinking skills that involve analysis, cognitive, rational, and logical, and encourage children to think critically. Children's critical thinking abilities vary and are influenced by many factors, especially the environment.

To determine the characteristics and needs of children's critical thinking development at this stage, researchers analyzed the results of previous research to determine children's needs in supporting critical thinking abilities. From previous research (Sutama et al., 2022) which discussed the development of digital maze games as a solution to overcome the critical thinking problems of children aged 5-6 years. The results of the game experiment in this research regarding the level of children's critical thinking abilities obtained a score of 76% which can be said to be "Decent". In this game, several shortcomings were found, such as in the game application system, there were correct answers that could not be immediately detected, there was a lack of space for children to explore the words they found, the level of the game

was still lacking, and the game instructions were still unclear. Meanwhile, when analyzing games directly from children aged 5-6 years, there were children who were less enthusiastic about playing, children who lacked creativity, and children who were less able to think critically because the game application still could not be said to be perfect (Sutama, Astuti, Anisa, Laila , & Ulfah, 2022).

The results of this research are in line with previous research which revealed that maze games can help young children think logically, count lots of numbers, understand number symbols, remember the differences in shape and size from small to large, and solve puzzles (Faizah, 2023). Other research results show that maze games can teach children about numbers 1-10 at the age of 5-6 years (Ramadhani, Cici, & Zulminiati, 2021). Apart from that, this game can also help children's physical motor development in a fun and easy way (Anggraeni & Na'imah, 2022). This study revealed that maze games can help children learn logic, count numbers, understand symbols, differentiate shapes and sizes, and memorize puzzles. This game also helps children develop their motor skills.

Critical thinking skills are a component of cognitive development. In the field of education, science and technology can have a positive impact, such as improving the quality of learning, easy access to learning references that can help children's learning, developing children's creativity through web development and interactive games, and ease of communication (Monalia et al., 2022). In addition, because of advances in science and technology (IPTEK), teachers must have an understanding of technology that can be applied in the learning process. Technological Pedagogical Content Knowledge (TPACK) is knowledge that teachers must have in the modern era. TPACK is a framework that can be used to analyze teachers' knowledge about technology integration in the learning process (Ni Wayan Ayu Utari Sri Maharani et al., 2022).

From the description of the maze game above, there is a desire from researchers to be able to develop the maze game to improve the critical thinking skills of children aged 5-6 years. With the new name "Dangerous Road" which is an application-based game that asks players to determine a route by arranging the right meaningful words to reach a predetermined destination. In this game, researchers will try to improve the quality of the game even better, such as providing game instructions in the form of voice recordings with the aim of making it easier for children who still have difficulty reading.

2. Method

With this type of research, the development of the Dangerous Road maze game uses the ADDIE model. The reason for choosing this model is because the research flow of this model is simpler, more complete and easier to understand, making it suitable for developing game media in research. The ADDIE model consists of five stages, including: 1) needs analysis, design, product development, implementation and evaluation.

This research involved two PAUD material experts from Malang State University, two children's game media experts from Malang State University, and 13 children aged 5-6 years from Dharma Wanita Kencong 2 Kindergarten, Kediri Regency, 20 children aged 5-6 years from Elbaith Rif Kindergarten 'a Islamic Happy School. The data collection technique uses a questionnaire given to experts and teachers. The data obtained is then analyzed to determine the feasibility of the game. Validity analysis refers to 5 choices of numbers, namely 5.4, 3, 2, 1.

These numbers are then qualitative so that it can be concluded about the validity of the learning media used.

In this research, the instrument used was a questionnaire with a Likert scale. The Likert scale is a measurement scale in research created by a figure named Likert in 1932, where this scale measures four or more questions which are combined to create a score or value that shows a person's abilities such as knowledge, attitudes and behavior (Budiaji, 2013). This assessment is based on feasibility standards such as attractiveness, efficiency and effectiveness. The assessment instrument grid for collecting data from expert validators and testing children aged 5-6 years can be seen in the following table:

Table 1. Media Expert Instrument Grid

No.	Eligibility Standards	Aspect	Indicator	Item Number
1	Attractiveness	Appearance	1. Appropriate composition of the use of design colors	1
			2. Attractive color composition	2
			3. Suitability of space	3
			4. Suitability of layout	4
		Picture	1. Image accuracy for children aged 5 to 6 years	5
			2. Elemental attractiveness for children aged 5 to 6 years	6
			3. Accuracy of image colors for children	7
		Text	1. Accurate choice of typeface	8
			2. Font size is appropriate for children aged 5 to 6 years	9
			3. Accuracy in selecting text colors	10
		Audio	1. Voice clarity	11
			2. Sound is right for AUD	12
			3. Speed (tempo) of sound	13
2	Effectiveness	Packaging	1. Accuracy of instructions for use	14
			2. Ease of access	15
			3. The game is easy to understand and play children aged 5 to 6 years	16
		Programming	1. Accurate use of navigation buttons	17

			2. Smooth switching mode	18
			3. Navigation buttons are easy for children to understand	19

Table 2. Material Expert Instrument Grid

No.	Eligibility Standards	Aspect	Indicator	Item Number
1	Effectiveness	Game goal	1. Suitability to learning objectives	1
			2. Can foster children's curiosity	2
			3. Can maximize children's critical thinking abilities	3
2	Efficiency	Use	1. Suitability to the child's age level	4
			2. There are buttons to stop, start, pause, return, next, exit.	5
			3. Use of the game does not interfere with electronic devices	6
		Contents	1. Interesting topic raised	7
			2. Material that is easy for children to understand	8
			3. Sentences are easy for children to understand	9

Table 3. Grid of Trial Assessment Instruments for Children Aged 5-6 Years

No.	Eligibility Standards	Aspect	Indicator	Item Number
1	Effectiveness	Enthusiasm	1. Be active while playing	1
			2. Be enthusiastic while playing the game	2
			3. Quick response while playing the game	3
			4. Respond well	4
2	Attractiveness	Interest	1. Child focus	5
			2. Ability to explore letters	6
			3. Length of time playing	7
			4. Duration of completing the game	8
		Creativity	1. Wayfinding ability	9
			2. Children's curiosity	10

			3. Children's independence	11
			4. Ability to express opinions	12
3	Efficiency	Critical thinking	1. Ability to avoid traps	13
			2. Ability to complete levels	14
			3. Ability to refute answers	15
			4. Kemampuan menarik kesimpulan manfaat game	16

3. Results and Discussion

3.1 Result

The results of this research will discuss the process and results of research into the development of the Dangerous Road maze game. The digital maze game in this research was designed to help stimulate the critical thinking abilities of children aged 5-6 years as training to solve everyday problems. The aim of this follow-up research is to provide learning experiences for children aged 5-6 years that are more interactive, creative and skilled while maintaining relevant educational values. The concept in this research uses the ADDIE model which consists of five stages: needs analysis, design, product development, implementation and evaluation.

In the first stage of needs analysis, researchers conducted observations at schools and brief interviews with school principals regarding technology-based learning in the classroom. Researchers found that the use of technology during learning is still limited. From the results of the researcher's observations and interviews with the school principal, the results were that learning more often uses worksheets without involving children in using technology, so learning is more monotonous. Children are given material about technology, but learning has not been carried out using technology directly. When researchers tried to give children the opportunity to try using or operating a laptop, the children's response was very enthusiastic, and had high curiosity with lots of questions and trying.

The second stage of design design, at this stage the researcher creates a storyboard design with an interesting and interactive game concept for children aged 5-6 years, determines elements or features that are suitable for children aged 5-6 years, creates a navigation structure, and designs inter- an attractive face for young children. This story board will be used as a guide in the product development process.

In the third stage of product development, the researcher develops the product based on the storyboard that has been prepared. Researchers are also trying to find animation and transition references to increase the attractiveness of the media. We strive to select elements such as colors, images, font type, font size and sound that are suitable for children aged 5-6 years. The following game design will be used:

Figure 1. Game design

In the fourth stage of implementation, the researcher requested validation from material experts and media experts with the aim of getting feedback on the validity and suitability of the product by paying attention to efficiency, attractiveness and effectiveness when used by children aged 5-6 years. After the product could be said to be suitable for use by children aged 5-6 years, the researchers conducted small group and large group trials in 2 school institutions, namely for a small group of 5 children from Dharma Wanita Kencong 2 Kindergarten, Kediri Regency, a large group test of 8 children from Dharma Wanita Kencong Kindergarten 2 and 20 children from Kindergarten Elbaith Rif'a Islamic Happy School.

The fifth stage of evaluation is an important stage to determine the success of product development for the Dangerous Road maze game. The aim of this evaluation is to improve the product by looking at feedback from expert validation and game trials on children aged 5-6 years. This evaluation process is carried out at each stage of the ADDIE development model. The evaluation results show that, based on the assessment of material experts, media experts, and game trials it is acceptable. In summary, the results of product trials and validation can be seen in the following table:

Table 4. Validation and Game Testing Results

No.	Subject	Results (%)	Qualification
1.	Material expert validation	93%	Very worthy
2.	Media expert validation	82,1%	Worthy
3.	Test play		
	a. Small group trials		
	• Effectiveness	80%	Worthy
	• Attractiveness	77,5%	Decent enough
	• Efficiency	72%	Decent enough
	b. Large group trials		
	• Effectiveness	95%	Very worthy
	• Attractiveness	88,2%	Worthy
	• Efficiency	81,7%	Worthy

Based on table 5 above, it is known that the material expert validation results got a percentage score of 93%, which means it is very feasible, the media expert validation results got a score of 82.1%, which means it is suitable for use. Then the results of small group trials in the aspect

of effectiveness reached 80% (feasible), attractiveness 77.5% (quite feasible), efficiency 72% (quite feasible). And the results of large group trials on the effectiveness aspect obtained a score of 95% (very feasible), attractiveness 88.2% (decent), efficiency 81.7% (decent)..

3.2 Discussion

Based on the data above, it can be concluded that the digital maze media called Dangerous Road is very interesting and suitable for use by children aged 5-6 years to stimulate critical thinking, creativity, collaboration and communication skills in the modern era. Digital maze games for children aged 5-6 years aim to improve problem-solving skills, literacy and develop cognitive abilities (Wulandari & Sumarni, 2018). From research conducted by Etnawati (2023), it was stated that many educators still use learning in the form of Worksheets (LK), this is considered less attractive for Alpha generation children. Maze games in the form of worksheet have several disadvantages such as being boring, less challenging, confusing for children, many children just scribble, and the game can only be used once. Given these problems, the maze game was developed in digital form.

Most children like games, interesting games can attract children's interest in playing them and make children happy to complete the game (Angwarmasse & Wahyudi, 2021). The Dangerous Road game requires children to think critically to complete missions and improve their cognitive abilities, including problem-solving abilities, creativity, and language skills. Educational games like this, combining mazes and words, can entice children to play and make them happy to solve them. Through direct experience, children complete pathfinding game missions by composing meaningful words, allowing children to try various approaches to achieving goals and increasing children's self-confidence. In this way, children can develop critical thinking skills and creativity. Maze games can also train children's patience when completing the game, children control themselves and their emotions (Kuswanto & Suyadi, 2020). When children successfully complete the game, they not only feel relieved and happy, but also become more confident because children can complete the game in their own way and creativity.

Dangerous Road is a digital maze game that asks children to complete a path-finding mission by arranging relevant words to achieve success. There are three themes in this game that children can choose according to their wishes. These themes include myself, profession, and animals. Children must combine words from the available letters into words that match the theme they have chosen. Before the game starts, children must understand the game instructions to complete it.

The success of developing the Dangerous Road game was influenced by several factors, including: first, it is a game that can stimulate children's critical thinking abilities by giving children the opportunity to complete missions in the game. This is in line with the opinion of Wirasasmita & Putra (2018), who stated that children's critical thinking skills become more complex when children are faced with situations that encourage them to learn and solve problems. Additionally, this Dangerous Road maze game allows children to talk about what they find by stringing together various letters to form a word. Communication skills are considered very important for children's growth because from them, children can solve problems, work together, convey ideas, and understand different points of view (Hayati & Na'imah, 2022). Second, it is available with an attractive appearance, equipped with writing,

audio, colors and images that can increase children's interest in learning while playing. Children's interest in visualizing this media will have an impact on the child's emotional condition, which will make understanding the material easier with image visualization (Hayati & Na'imah, 2022). Third, this digital maze media is very effective and easy to use on various devices, such as laptops, tablets, iPads, iOS and Android. In addition, it is equipped with clear instructions to help teachers and parents help children understand the game concepts in the digital maze game. The use of media that can increase students' active role is very important to achieve success in the learning process because young children are usually bored and find it difficult to focus while studying (Kore et al., 2020).

4. Conclusion

Based on the results and data analysis above, it can be concluded that the Dangerous Road maze game media is very suitable to be used to stimulate the critical thinking abilities of children aged 5-6 years. By following the ADDIE development model procedures, research can run optimally.

References

Anggraeni, D., & Na'imah, N. (2022). Strategi Stimulasi Perkembangan Motorik Kasar Anak Usia Dini Melalui Maze Karpet Covid-19. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *6*(4), 2553–2563. https://doi.org/10.31004/obsesi.v6i4.2103

Angwarmasse, P., & Wahyudi, W. (2021). Pengembangan game edukasi labirin matematika untuk meningkatkan kemampuan pemecahan masalah siswa kelas VI sekolah dasar. *Jurnal EDUCATIO: Jurnal Pendidikan Indonesia*, *7*(1), 46. https://doi.org/10.29210/120212953

Aprilia Dwi Wulandari, Sri Sumarni, Y. R. (2018). *Pengembangan Game Maze Berbasis Media Interaktif Sesuai Tema Untuk Anak Usia 5-6 Tahun Di Tk It Izzudin Palembang*. *80*(1). file:///C:/Users/ASUS/Downloads/26329-66665-1-SM (2).pdf

Etnawati, S. (2023). *Jurnal Pendidikan Anak , Volume 12 (1), 2023 , 88-96 Needs assessment pengembangan media maze game on PC untuk meningkatkan kemampuan pemecahan masalah anak*. *12*(1), 88–96.

Faizah, N., Ainol, A., & Kiromi, I. H. (2023). Implementation of Maze Games in Learning for Children'S Cognitive Development At Ra Al-Khairat. *Golden Age : Jurnal Pendidikan Anak Usia Dini*, *7*(1), 17–26. https://doi.org/10.29313/ga:jpaud.v7i1.11640

Hamdani, M., Prayitno, B. A., & Karyanto, P. (2019). Meningkatkan Kemampuan Berpikir Kritis Melalui Metode Eksperimen. *Proceeding Biology Education Conference*, *16*(Kartimi), 139–145. https://jurnal.uns.ac.id/prosbi/article/view/38412/25445

Hayati, S. N., & Na'imah, N. (2022). Analisis Kompetensi Berbicara Anak Usia Dini pada Masa New Normal. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *6*(4), 3203–3217. https://doi.org/10.31004/obsesi.v6i4.2107

Kore, D., Wondal, R., & Samad, R. (2020). Peran Permainan Ludo Dalam Mengembangkan Kemampuan Kognitif Anak Usia 5-6 Tahun. *Jurnal Ilmiah Cahaya Paud*, *2*(1), 106–116. https://doi.org/10.33387/cp.v2i1.2068

Kuswanto, A. V., & Suyadi, S. (2020). Sistematika Lieratur Review: Permainan Maze Dalam Mengembangkan Perkembangan Anak Usia Taman Kanak-Kanak. *PAUDIA : Jurnal Penelitian Dalam Bidang Pendidikan Anak Usia Dini*, *9*(2), 51–61. https://doi.org/10.26877/paudia.v9i2.6712

Monalia, M., Asfiyanti, N. A., & Putri, S. E. (2022). Computers and Information Technology as a Source of Learning Media for Elementary School Teachers. *International Journal of Natural Science and Engineering*, *5*(3), 96–103. https://doi.org/10.23887/ijnse.v5i3.41862

Ni Wayan Ayu Utari Sri Maharani, Putu Nanci Riastini, & I Gede Marguna Yasa. (2022). Instrumen Tes Pengetahuan Technological Pedagogic Content Knowledge (Tpack) Untuk Calon Guru Sekolah Dasar. *Jurnal Pedagogi Dan Pembelajaran*, *5*(3), 428–436. https://doi.org/10.23887/jp2.v5i3.53383

Rahmasari, T., Pudyaningtyas, A. R., & Nurjanah, N. E. (2021). Profil Kemampuan Berpikir Kritis Anak Usia 5-6 Tahun. *Jurnal Kumara Cendekia*, *9*(1), 41–48.

Ramadhani, Cici, & Zulminiati. (2021). Efektivitas Permainan Big Maze Terhadap Kemampuan Anak Mengenal Angka Usia 5-6 Tahun Di Taman Kanak-Kanak an-Nur. *Edukids: Jurnal Pertumbuhan, Perkembangan, Dan Pendidikan Anak Usia Dini*, *18*(2), 90–95. https://doi.org/10.17509/edukids.v18i2.33955

Sutama, I. W., Astuti, W., Anisa, N., Laila, V., & Ulfah, A. (2022). *Permainan Maze Digital Berbasis Masalah Dan Proyek Untuk Meningkatkan Kompetensi Abad 21 Pada Anak Usia 5-6 Tahun*. *10*(2), 1–8.

Wirasasmita, R. H., & Putra, Y. K. (2018). Pengembangan Media Pembelajaran Video Tutorial Interaktif menggunakan Aplikasi Camtasia Studio dan Macromedia Flash. *EDUMATIC: Jurnal Pendidikan Informatika*, *1*(2), 35. https://doi.org/10.29408/edumatic.v1i2.944