

LOGIC ADVENTURE GAME *INTERACTIVE MULTIMEDIA DEVELOPMENT* TO IMPROVE LOGICAL THINKING SKILLS THROUGH GROUP GUIDANCE SERVICES

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Abstract. Logical thinking skills are one of the important cognitive abilities that need to be developed from elementary school, as they play an essential role in helping students recognize patterns, classify objects, compare, sequence, solve simple problems, and make rational decisions. However, the implementation of group guidance services in elementary schools still faces limitations in providing innovative and interactive media that are appropriate to students' cognitive developmental characteristics. This study aims to develop interactive multimedia based on Game Logic Adventure as a medium for group guidance services to support the development of logical thinking skills among first-grade elementary school students. This study employed a Research and Development (R&D) method using the Four-D (4D) development model, consisting of the Define, Design, Develop, and Disseminate stages. Data were collected through a needs analysis questionnaire, expert validation sheets for material and media experts, and a product practicality questionnaire. The developed interactive multimedia integrates text, images, animations, audio, and educational games adapted to the cognitive developmental characteristics of students at the concrete operational stage based on Jean Piaget's theory. The activities included in the multimedia consist of recognizing objects, classifying, comparing, and sequencing, which are designed to stimulate students' logical thinking skills. The results showed that the Game Logic Adventure interactive multimedia achieved a very high level of feasibility based on the validation results from material and media experts and met the practicality criteria based on user responses. Therefore, the Game Logic Adventure interactive multimedia is considered feasible and practical for use as a medium in group guidance services to support the development of logical thinking skills among first-grade elementary school students.

Keywords: *Game Logic Adventure*, interactive *multimedia*, *group guidance*, *logical thinking skills*, *elementary school*.

I. INTRODUCTION

Logical thinking skills are one of the basic cognitive skills that need to be developed from the elementary school level because they allow students to understand cause-and-effect relationships, group objects, recognize patterns, arrange sequences, and solve simple problems systematically. According to Piaget's theory of cognitive development, a child of about seven years of age enters the concrete operational stage, which is the stage when logical thinking skills begin to develop through direct interaction with concrete objects and real experiences. At this stage, students are able to perform simple classification, serialization, and reasoning, although their thinking process still depends on concrete experiences, not on abstract concepts. Therefore, learning activities and guidance services need to be designed in such a way that they are able to provide a concrete, interactive, and meaningful learning experience to support the cognitive development of students.

Although logical thinking skills have a very important role, the results of observations conducted in this study show

that there are still many elementary school grade I students who have difficulty in recognizing patterns, grouping objects, arranging the order of objects, and solving simple logical problems. In addition, the learning process in the classroom is still dominated by a *teacher-centered* approach and memorization activities, so that students' opportunities to actively build knowledge through exploration and problem-solving are very limited. The implementation of group guidance services in elementary schools also still faces obstacles in the form of the lack of availability of learning media that is interesting, interactive, and supported by technology. This condition causes guidance activities to not be able to provide optimal stimulation to students' cognitive involvement and logical thinking skills.

Interactive multimedia is increasingly recognized as one of the effective learning media because it is able to integrate various elements, such as text, images, animations, audio, and user interaction into one complete learning environment. The use of interactive multimedia can encourage active student participation, increase learning motivation, and

create a more meaningful learning experience. On the other hand, educational *games* provide opportunities for students to develop high-level thinking skills through solving various challenges in a fun and motivating learning atmosphere. Through game-based activities, learners can develop reasoning skills while maintaining their attention and engagement throughout the learning process.

Various previous studies have shown the effectiveness of game-based multimedia in improving students' cognitive abilities. Azizah et al. (2025) reported that game-based learning using Scratch was able to significantly improve students' logical thinking and algorithmic thinking skills. Furthermore, Fitria et al. (2023) found that multimedia combined with QR Code-based games can improve computational thinking skills as well as student involvement in learning. The results of the research of Rahman et al. (2023) also show that contextual multimedia is effective in strengthening logical thinking skills through meaningful learning experiences. These findings indicate that interactive multimedia and educational games have a positive influence on the development of students' cognitive abilities. However, most previous research has focused more on the context of classroom learning and the development of computational thinking skills, while studies on the application of interactive multimedia in guidance and counseling services, particularly for grade I elementary school students, are still very limited.

A review of previous research also shows that there is a *research gap* that needs attention. Although there has been a lot of research that has developed educational multimedia for learning purposes, there is still little research that integrates interactive multimedia into group tutoring services with the aim of developing logical thinking skills in early grade elementary school students. In addition, based on the results of the literature search, no research has been found that specifically develops the *interactive multimedia Game Logic Adventure* which is based on Piaget's theory of concrete operational stages as a medium for group guidance services for grade I elementary school students. Therefore, this research offers novelty in the form of interactive multimedia development that integrates educational *adventure games* with group guidance services in one product specifically designed to stimulate logical thinking skills through various concrete activities that are in accordance with the development characteristics of students.

Based on this description, this study aims to develop interactive multimedia based on *Game Logic Adventure* as a medium for group guidance services in improving the logical thinking skills of grade I elementary school students. This multimedia was developed using the Four-D (4D) model which includes the stages of define, design, develop, and *disseminate*. The resulting products are designed to provide an engaging, interactive, and developmental learning experience for learners through various activities, such as recognizing objects, grouping, comparing, and sorting. This research is expected to produce guidance service media that is valid, practical, and suitable for use so that it can help teachers and counselors in facilitating the development of logical thinking skills of elementary school students.

II. RESEARCH METHODS

This research uses a Research and Development (R&D) approach to develop an interactive multimedia product based on *Game Logic Adventure* as a group guidance service medium that aims to improve the logical thinking skills of grade I elementary school students. The development process refers to the Four-D (4D) model proposed by Thiagarajan, which includes four stages, namely Define (define), Design (design), Develop (development), and Disseminate (disseminate).

In the Define stage, an analysis of the need was carried out to identify the characteristics of students' logical thinking skills, the problems faced in the implementation of group guidance services, and the need for the use of interactive multimedia in elementary schools. Information collection was carried out through observation of learning activities, interviews with teachers, literature studies, and the dissemination of needs analysis questionnaires. The results of the analysis are used as a basis for formulating development goals and determining the multimedia specifications to be developed.

The Design stage is focused on the preparation of a multimedia framework, user *interface* design, material selection, game *flow* arrangement, and the design of group guidance service activities that are tailored to the characteristics of concrete operational stages according to Piaget's theory of cognitive development. The multimedia developed integrates various elements, such as text, images, animations, audio, navigation buttons, and educational games that are interactive. Learning activities in multimedia include recognizing objects, identifying similarities and differences, grouping objects, arranging the order of objects, providing feedback, and presenting game results as a form of stimulation for students' logical thinking skills.

At the Develop stage, a multimedia prototype is made which is then evaluated through validity tests by experts and product practicality tests. Product validation involves media experts and subject matter experts who provide assessments using validated instruments that have been prepared. The results of the experts' assessment are used as a basis for revising and improving the product before implementation. After the revision process is completed, a practicality test is carried out through a user response questionnaire to determine the level of ease of use and suitability of multimedia in the implementation of group guidance services.

The Disseminate stage is carried out by introducing and implementing multimedia products that have been declared to meet the eligibility criteria as a medium for group guidance services in elementary schools.

The research instruments used include a needs analysis questionnaire, a media expert validation sheet, a material expert validation sheet, and a product practicality questionnaire. All instruments were compiled using the Likert scale to assess product quality based on aspects of content feasibility, media quality, presentation, ease of use, and practicality. The data obtained was analyzed using quantitative descriptive analysis techniques by converting the score of the assessment results into the form of percentages. Furthermore, the percentage value is interpreted based on the eligibility criteria that have been set to determine the level of validity and

practicality of multimedia as a medium for group guidance services in elementary schools.

III. RESULTS AND DISCUSSION

1. Needs Analysis

Needs analysis was carried out at the Define stage to identify students' needs for interactive multimedia in group guidance services aimed at developing logical thinking skills. The results of the questionnaire showed that elementary school grade I students responded very positively to the development of *interactive multimedia Game Logic Adventure*.

Table 1. Results of Student Needs Analysis

Indicator	Strongly Agree (%)	Agree (%)	Hesitation (%)
Interest in interactive learning media	90,00	10,00	0,00
Educational games make learning more fun	100,00	0,00	0,00
Activities that train logical thinking skills	73,33	26,67	0,00
Interactive group tutoring service	83,33	16,67	0,00
The need for multimedia <i>Game Logic Adventure</i>	50,00	46,67	3,33

Based on Table 1, it can be seen that students have a high level of interest in interactive learning media. All respondents stated that educational games are able to create a more enjoyable learning experience. In addition, almost all students stated that they needed interactive multimedia to support the implementation of group guidance services while improving logical thinking skills. These findings show that the multimedia developed is in accordance with the real needs of grade I elementary school students so that it becomes a strong basis in the product development process.

These results are in line with Piaget's theory of cognitive development, which states that children at the concrete operational stage learn more effectively through real experiences and activities that are visual and concrete. Therefore, the multimedia developed is designed with various activities, such as recognizing objects, comparing, grouping, and sorting objects according to the developmental characteristics of students at elementary school age.

2. Product Development

Based on the results of the needs analysis, interactive multimedia was developed using the Four-D (4D) model. The resulting product consists of a cover page, main menu, instructions for use, material on logical thinking skills, four levels of the game arranged in stages, *feedback*, and a display of the final score.

The game activities are designed in stages to train students to recognize objects, compare similarities and differences, group objects based on certain characteristics, and arrange objects in a logical order. This multimedia integrates text, illustrations, animations, audio, and interactive navigation into an *educational adventure game*. The design encourages students to actively participate during group tutoring services while stimulating logical thinking skills through a concrete and fun learning experience.

3. Product Validation

a. Media Expert Validation

Multimedia prototypes are evaluated by a media expert to determine the feasibility of the product based on aspects of interface appearance, visual quality, readability, ease of use, and media appeal.

Table 2. Media Expert Validation Results

Assessment Aspects	Percentage (%)	Category
Interface design	80,00	Highly Worth It
Visual quality	73,33	Worthy
Color and readability	80,00	Highly Worth It
Ease of use	66,66	Worthy
Daya tarik media	66,66	Worthy
Average	73,33	Worthy

The validation results showed that multimedia obtained an average score of 73.33%, which is included in the feasible category. The results show that multimedia has met the minimum requirements as a learning medium that can be used in group tutoring services in elementary schools. However, media experts provide several suggestions for improvement, especially in terms of visual appeal and ease of use to make the product more optimal.

These findings are in line with various previous studies that stated that interface quality and the level of multimedia interactivity are important factors in increasing learning motivation and student engagement during the learning process.

b. Subject Matter Expert Validation

The learning materials contained in multimedia are then evaluated by material experts to determine the suitability of the content with the purpose of developing logical thinking skills in elementary school students.

Table 3. Material Expert Validation Results

Assessment Aspects	Percentage (%)	Category
Suitability of the content of the material	80,00	Highly Worth It
Visual suitability	80,00	Highly Worth It
Conformity with the characteristics of the learner	80,00	Highly Worth It
Clarity of material	80,00	Highly Worth It
Educational benefits	80,00	Highly Worth It
Average	80,00	Highly Worth It

The results of the validation of the material experts showed that the product obtained an average score of 80.00% with the very feasible category. This shows that the material presented is in accordance with the characteristics of grade I elementary school students and supports the achievement of the goals of group guidance services in developing logical thinking skills. The learning activities that are prepared are considered relevant to the characteristics of students who are at the concrete

operational stage according to Piaget's theory of cognitive development.

The results of this study support the findings of previous research which stated that multimedia designed according to the characteristics of students' development is able to improve concept understanding, learning quality, and effectiveness of the learning process.

4. Product Practicality

After going through the validation stage by experts, multimedia was then tested on 10 elementary school grade I students in group guidance service activities to find out the level of practicality of the product.

Table 4. Product Practicality Test Results

Indicator	Percentage (%)	Category
Students' Interest	98,66	Very Practical
Ease of use	97,33	Very Practical
Ease of understanding material	94,66	Very Practical
Participation during mentoring services	92,66	Very Practical
Product benefits	92,00	Very Practical
Average	95,06	Very Practical

The results of the practicality test showed that multimedia obtained an average score of 95.06%, which is included in the category of very practical. During the implementation of the group guidance service, students showed active participation, were able to solve each game challenge well, and responded very positively to the use of multimedia. These findings show that the developed product not only meets the feasibility aspect, but is also easy to use, attractive, and able to increase learner involvement in the group guidance service process.

Overall, the results of the study show that *Game Logic Adventure* 's interactive multimedia meets the needs of users, has a good level of feasibility based on the assessment of media experts and subject matter experts, and is very practical to use in group guidance services. The integration of educational game elements with interactive multimedia provides a more meaningful learning experience and is in accordance with the characteristics of the cognitive development of grade I elementary school students. Thus, this multimedia has the potential to be an innovative media that can help teachers and counselors in facilitating the development of students' logical thinking skills more effectively.

The results of the study show that the *Logic Adventure multimedia Game* developed successfully answers the need for interactive guidance service media and is able to support the development of logical thinking skills in grade I elementary school students. The high level of interest of students shown at the needs analysis stage is in line with the results of the practicality test which obtained the category of **very practical**. The findings indicate that the multimedia developed is able to combine educational materials with

interesting *game mechanics* so as to create a fun and meaningful learning experience for students.

This multimedia is designed based on Piaget's theory of cognitive development, especially at the concrete operational stage, by integrating various activities, such as recognizing objects, comparing, grouping, and sorting objects. These activities provide a real and meaningful learning experience that allows students to build logical thinking skills through direct interaction with visual materials and concrete objects. The results of this study reinforce Piaget's view that the development of logical thinking skills in children takes place optimally if the learning process is adjusted to the stage of cognitive development and involves concrete experiences.

Compared to previous studies, this study makes a different contribution. Previous research has generally developed interactive multimedia to support the learning process in the classroom, while this study integrates interactive multimedia, *educational adventure games*, and group tutoring services into a single product specifically designed to improve the logical thinking skills of elementary school grade I students. This integration is the main novelty of this research while expanding the use of multimedia, not only as a learning medium, but also as a medium in guidance and counseling services in elementary schools.

Overall, the results of the study show that *Game Logic Adventure*'s multimedia meets the criteria of feasibility based on the results of expert validation and is very practical based on the results of user trials. Therefore, this multimedia has the potential to be an effective alternative media to support the implementation of group guidance services in elementary schools in developing students' logical thinking skills. However, this study still has limitations because the product evaluation is only carried out through expert validation and practicality tests on a limited scale involving ten students. Therefore, further research is recommended to test the effectiveness of this multimedia through the design of experimental research with a larger sample size so that it can provide stronger empirical evidence regarding its effect on improving the logical thinking skills of elementary school students.

IV. CONCLUSION

This research succeeded in developing an interactive multimedia product based on *Game Logic Adventure* as a group guidance service medium to improve the logical thinking skills of grade I elementary school students. Multimedia is developed using the Four-D (4D) research and development model which includes the Define (define), Design (design), Develop (development), and Disseminate (dissemination) stages. The development process begins with a needs analysis that shows a high need for game-based interactive guidance media that is in accordance with the characteristics of students' cognitive development. The final product integrates educational materials with a variety of interactive activities, such as recognizing objects, grouping, comparing, and sorting objects, which are designed based on the characteristics of concrete operational stages according to Piaget's theory of cognitive development. The results of validation by media experts and material experts showed that the multimedia developed met the

feasible criteria, while the results of the practicality test showed that the product was in the category of very practical and received a very positive response from students during the implementation of group guidance services. The findings show that the *Game Logic Adventure* multimedia is suitable for use as a guidance service medium that is able to support the development of logical thinking skills through an interesting, interactive, and appropriate learning experience for students.

This research contributes to the development of the field of guidance and counseling through the introduction of *Game Logic Adventure* multimedia as an innovative media specifically designed to support the implementation of group guidance services in elementary schools, not just as a learning medium in the classroom. The integration of educational games with guidance activities offers an alternative approach in developing students' cognitive abilities while increasing their motivation to learn and active participation during activities. However, this research is still limited to the product development and feasibility evaluation stage with a relatively small number of research subjects. Therefore, further research is recommended to test the effectiveness of this multimedia through experimental research with a larger sample size as well as at various different levels or educational contexts. Thus, stronger empirical evidence will be obtained regarding the influence of *Game Logic Adventure* multimedia on the improvement of logical thinking skills and other cognitive competencies in students.

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