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Development of Fun Multiplication Learning Media with Snakes and Ladders and Multiplication Cards to Improve Cognitive Abilities of Grade IV Elementary School Students

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Abstract

This research was motivated by the low cognitive ability of students in learning mathematics in multiplication. The purpose of this study was to develop a learning medium called "Fun Multiplication with Snakes and Ladders and Multiplication Cards" (PADUKA) and to test its feasibility, practicality, and effectiveness in improving the cognitive ability of fourth-grade elementary school students. This study used the Research and Development (R&D) method with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. The research subjects comprised 16 students in the experimental class and 22 in the control class. The data collection techniques used tests, questionnaires, and observations. The results showed that: (1) PADUKA media is declared feasible by media experts and subject matter experts; (2) PADUKA media is practically used in learning based on positive responses from teachers and students; (3) PADUKA media is effective in improving students' cognitive abilities with an N-Gain value of 0.65 (moderate category) and an effectiveness value of 91.1% (very high category). The paired t-test shows a significant difference between the pretest and posttest scores (p=0.000), and the independent samples t-test shows a significant difference between the experimental and control classes (p=0.005). Based on these results, it is recommended that PADUKA media be implemented more widely in mathematics learning in elementary schools.

1. INTRODUCTION

Mathematics is a subject that plays an important role in developing logical, analytical, systematic, critical, and creative thinking skills in learners. However, many students have difficulty understanding mathematical concepts, especially multiplication [1]. Innovative learning media, such as card-based games, can increase student motivation and understanding [2]. Research shows that games can enrich the learning experience and help students understand academic concepts in an engaging way [3].

Regulation of the Minister of Education and Culture Number 22 of 2016 concerning Standards for Primary and Secondary Education emphasizes the importance of using learning media that can facilitate students in achieving basic competencies [4]. Learning media have a strategic role in improving the quality of learning because they can bridge the gap between abstract concepts and students' concrete experiences [5]. As Piaget argued, children in primary school (7-11 years) are at the concrete operational stage, which requires direct experience with concrete objects to understand mathematical concepts [6].

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Based on initial observations, it was found that students' cognitive abilities in learning mathematics, especially in multiplication, are still low. This can be seen from the average pretest score of only 53.69. Uninteresting learning methods and the lack of interactive learning media often cause students difficulties in understanding the concept of multiplication. Monotonous learning that does not actively involve students leads to low motivation to learn and understand mathematical concepts.

Game-based learning media is a promising alternative for increasing students' interest and understanding in mathematics. Snake and ladder games and cards can be modified into fun, effective math learning media. The application of game-based educational media, such as Snake and Ladder, shows strong potential in creating an interactive and fun learning environment and encouraging students' creativity in understanding mathematical concepts. Research shows the effectiveness of snake and ladder media in improving students' understanding and math skills [7]. Through innovative and fun learning [8], PADUKA is expected to improve the cognitive abilities of fourth graders so that they are better prepared to face learning challenges in the future. The use of learning media motivates students and improves learning outcomes [5]. Interactive learning media has been proven effective in supporting the teaching and learning process [9], and can strengthen the understanding of the concepts taught [10].

Game-based learning (GBL) in primary education is very relevant to support children's cognitive development. Jean Piaget's theory of cognitive development emphasizes the importance of concrete experiences in learning, which is in line with the GBL approach that prioritizes active participation through games [11], [12]. Through games, children not only learn basic concepts but also develop critical thinking and problem-solving skills, important aspects of cognition [13], [14]. In addition, utilizing game elements to support social, emotional, and motor development, as well as increasing student engagement in learning [14], [15]. Thus, GBL is effective in improving academic understanding and an important tool in building children's character and social skills [16], [17].

Game-based learning effectively supports children's cognitive development and builds their social-emotional aspects [18]–[20]. When learning through play, children not only develop creativity and adaptability but are also able to overcome challenges and solve problems in a fun context [21], [22]. Furthermore, the application of game media in learning can attract children's interest, making them more motivated to learn [21], [22].

Applying the concept of constructivism, games function as interactive media that encourage children to actively learn and build knowledge through real experiences while strengthening social relationships [23], [24]. Overall, game-based learning media is not just entertainment but a tool that supports the holistic development of children, covering cognitive, motor, and socio-emotional aspects [25], [26].

Snakes and ladders games, in particular, have shown strong potential in creating an interactive and fun learning environment for mathematics. Combining this traditional game with educational content creates a unique learning tool that addresses specific learning difficulties in multiplication. PADUKA media is designed to target these challenges by integrating visual, tactile, and interactive elements that help students overcome the abstract nature of the concept of multiplication through concrete gaming experiences.

2. METHOD

This study uses the Research and Development (R&D) method with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. This model was chosen because it has systematic and comprehensive stages in developing learning media [27].

2.1. Research Procedure

The research procedure adopts the ADDIE model, which consists of five stages [28], that is:

a. Analysis: At this stage, the researcher conducts a needs analysis through observation and interviews with teachers and grade IV elementary school students to get a comprehensive picture of mathematics learning problems. The researcher identified the difficulties students faced in understanding the concept of multiplication and the factors that led to students' low cognitive abilities. These difficulties included misconceptions about multiplication as repeated addition, challenges in memorizing multiplication facts, and limited engagement with traditional teaching methods. The analysis revealed that students often struggled to connect concrete experiences with the abstract concept of multiplication. Curriculum analysis is carried out to ensure that the material developed in the PADUKA media is by the Basic Competencies and mathematics learning objectives in Grade IV.

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b. Design: Based on the analysis results, the researcher designed the PADUKA learning media by paying attention to pedagogical, psychological, and aesthetic aspects. The design stage begins with the formulation of learning objectives that are specific, measurable, and by the basic competencies of multiplication operations in class IV. The learning objectives were carefully aligned with cognitive development theory and focused on developing a procedural and conceptual understanding of multiplication. The PADUKA media concept is designed by integrating a snake and ladder game with multiplication cards to create a fun and meaningful learning experience.

c. Development: At the development stage, the researcher realized the design of PADUKA's media into a real product. The development process began with creating a 60x60 cm snake and ladder board consisting of 100 boxes with an attractive visual design. Multiplication cards are developed with varying difficulty levels, from simple multiplication to more complex multiplication, to accommodate students' diverse abilities. The development phase included prototyping, testing with a small group of students, and iterative refinement based on feedback. After PADUKA's media is completed, validation is carried out by media experts and material experts to assess the feasibility of the media.

d. Implementation: PADUKA media was implemented in mathematics learning in grade IV of elementary school using a quasi-experimental design with a control group design pattern. The experimental class, consisting of 16 students, used PADUKA media in multiplication learning, while the control class, consisting of 22 students, used conventional learning methods. The implementation process carefully followed established protocols to ensure research validity and reliable data collection. Teachers were trained to integrate the PADUKA media into their teaching practices effectively. The implementation begins with a pretest to measure students' initial abilities, followed by the learning process, and ends with administering a posttest.

e. Evaluation: Evaluation is carried out through two approaches: formative and summative. Formative evaluation is carried out continuously during the media development process. This included collecting feedback from teachers and students during the implementation phase and making necessary adjustments to optimize the learning experience. The summative evaluation was carried out after the implementation of media in learning to assess the effectiveness of PADUKA media in improving students' cognitive abilities.

2.2. Data Sources and Research Subjects

2.2.1. Data Source

a. Elementary school grade IV students From the involvement of students, the researcher obtained learning outcomes to measure cognitive ability. The small-scale test was carried out on 16 students of SD Negeri 2 Ngampel Kulon, and a large-scale test was carried out by all grade IV students of SD Negeri 2 Ngampel Kulon and SD Negeri 1 Sudipayung, totaling 38 children.

   The selection of students in the two schools is based on:

   (1) the number of students is not much different, (2) the results of the 2023 education report card (both schools must improve numeracy skills), (3) the school's accreditation is both in category B, (4) both use the Independent Curriculum in grade IV, (5) both schools are located in Ngampel District, Kendal Regency.

b. Teacher The role of teachers in this study is as a source of information on the needs of media and the practicality of using PADUKA learning media in the learning process of Mathematics multiplication material in grade IV of elementary school.
c. Validator The role of the validator is to test the feasibility of PADUKA learning media in learning Mathematics multiplication material in grade IV of elementary school.
d. Curriculum Document Curriculum Document as a source of Mathematics Learning Outcomes in phase B grade IV elementary school, sourced from the Decree of the Head of the Standards, Curriculum, and Assessment Agency of the Ministry of Education, Culture, Research, and Technology Number 032/H/Kr/2024.

2.2.2. Research Subject

The subjects in this study are grade IV students of SD Negeri 2 Ngampel Kulon (16 children) and SD Negeri 1 Sudipayung (22 children), Ngampel District, Kendal Regency.

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2.3. Data Analysis Techniques

The data analysis technique was carried out by quantitative descriptive analysis according to the development procedures carried out [29]. The data from the research results were obtained from the scoring of material experts from teachers, media experts from lecturers, and responses (teachers and students) of grade IV of elementary school. The effectiveness test is divided into two classes, namely, the experimental class and the control class.

2.3.1. PADUKA Learning Media Eligibility Test

The technique of analyzing the feasibility of PADUKA learning media is carried out by quantitative descriptive analysis. The data from the feasibility analysis of PADUKA's learning media was obtained directly using a response questionnaire conducted by media expert validators from lecturers and material expert validators from teachers. The steps for analyzing the feasibility data of PADUKA's learning media products developed are as follows: (a) Convert qualitative responses to quantitative with the provision of a score scale of 1-5, (b) Calculating the overall average score and every aspect, (c) Qualitatively interpreting the overall average score

2.3.2. Testing the Practicality of PADUKA's Learning Media

The technique of analyzing the practicality of PADUKA learning media is carried out by quantitative descriptive analysis. The data from the practicality analysis of PADUKA's learning media was obtained directly using a response questionnaire conducted by user validators (teachers and students). The practicality assessment included reproducibility coefficient (Kr) and scalability coefficient (Ks), with values above 0.80 indicating good practical usability of the media.

2.3.3. Test the Effectiveness of PADUKA's Learning Media

This research aims to develop products and test their effectiveness in improving students' cognitive abilities with quasi-experiment research methods and pre-test-post-test control group design. This study has two groups: an experimental group and a control group. The experimental group was given treatment in the form of providing PADUKA learning media, while the control group was not. The data obtained were tested using normality tests, homogeneity tests, N-Gain, and independent T-tests. The effectiveness assessment specifically measured improvements in students' cognitive abilities across different dimensions, including knowledge, comprehension, application, and analysis levels according to Bloom's taxonomy.

2.4. Instruments and Their Validity and Reliability

The data collection instruments used in this study included observation sheets, interview guides, practicality questionnaires, media and material validation sheets, and test sheets (pre-test and post-test). These instruments were developed based on the BSNP (National Education Standards Agency) criteria for scoring print media.

2.4.1. Observation and Interview Instruments

Observation sheets were used to analyze mathematics learning problems, specifically for grade IV multiplication material. Interview guides contained questions for teachers and students to gather information about learning needs and challenges.

2.4.2. Validation Instruments

The validation instruments for PADUKA media consisted of evaluation sheets for media experts and subject matter experts designed to assess the feasibility of the developed media. The validation aspects included design quality, instruction clarity, curriculum alignment, practicality of use, and attractiveness.

2.4.3. Practicality Test Instruments

The practicality test instruments evaluated the ease of use, clarity of game rules, student involvement in learning, and media attractiveness. These were administered to teachers and students to gather comprehensive feedback on the practical aspects of using PADUKA in real classroom settings.

2.4.4. Effectiveness Test Instruments

The effectiveness test instruments consisted of pre-test and post-test questions that assessed students' cognitive abilities in multiplication. The test questions were categorized into three levels: LOTS (Lower Order Thinking Skills), MOTS (Middle Order Thinking Skills), and HOTS (Higher Order Thinking Skills). The validity and reliability of these instruments were rigorously tested to ensure they accurately measured the intended cognitive abilities.

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All instruments underwent validity and reliability testing. Content validity was assessed using the Content Validity Ratio (CVR) method with expert judgment. At the same time, reliability was measured using appropriate statistical methods, including inter-rater reliability tests and Kuder-Richardson formula 20 (KR-20) for test items. Additionally, test items were analyzed for difficulty level, discrimination power, and distractor effectiveness to ensure high-quality assessment tools.

3. RESULTS AND DISCUSSION

3.1. Development of PADUKA Learning Media

PADUKA's learning media is developed through the ADDIE stage. The results of each stage are as follows:

1. Analysis Results: It was found that students had difficulty understanding and mastering the concept of multiplication, so interesting and interactive learning media were needed.
2. Design Result: Media PADUKA was designed with the concept of a snake and ladder game integrated with multiplication cards. The media comprises a 60x60 cm snake and ladder board with 100 squares, multiplication cards, dice, pawns, and a user manual.

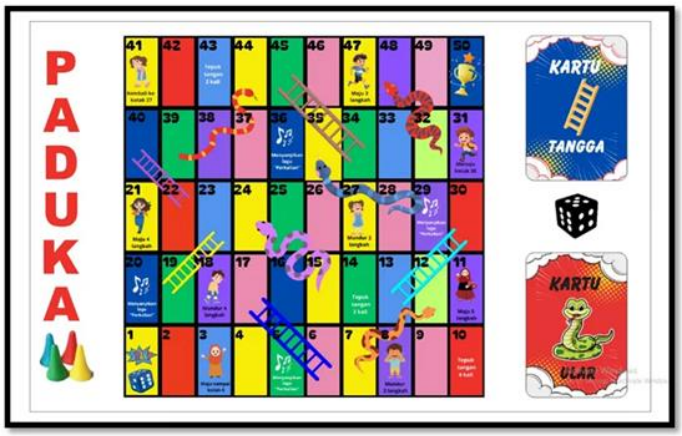

Figure 1. PADUKA Game Board Design

3. Development Results: The PADUKA media that has been developed is validated by media experts and material experts. The validation results show that PADUKA media is suitable for mathematics learning.

Figure 2. PADUKA Multiplication Card Design

3.2. PADUKA Learning Media Qualification

The feasibility of PADUKA's media is assessed based on validation from media experts and material experts. The aspects assessed include visual appearance, technical aspects, and material aspects. The validation results showed that PADUKA media met the eligibility criteria for use in grade IV mathematics learning in elementary school.

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Table 1. Media Expert Validation Results

Assessment Aspects	Average Score	Category
Visual Display	4,45	Highly Viable
Technical	4,30	Highly Viable
Material Quality	4,25	Highly Viable
Overall Average	4,35	Highly Viable

Table 2. Results of Subject Matter Expert Validation

Assessment Aspects	Average Score	Category
Material Suitability	4,35	Very Feasible
Material Depth	4,20	Feasible
Learning Aspects	4,30	Very Feasible
Overall Average	4,28	Very Feasible

Based on the assessment of media experts, PADUKA media obtained an average score of 4.35, which is included in the "Very Eligible" category. Meanwhile, the assessment from subject matter experts resulted in an average score of 4.28, which is also included in the "Very Eligible" category. This shows that PADUKA media has met the eligibility standards regarding media design and suitability with learning materials.

3.3. Practicality of PADUKA's Learning Media

The practicality of PADUKA media is evaluated based on the response of teachers and students after using the media in learning. The evaluation results show that PADUKA media is practical for learning mathematics. Teachers and students responded positively to the ease of use, clarity of instructions, and usefulness of PADUKA media.

Table 3. Results of Practical Tests by Teachers

Assessment Aspects	Reproducibility Coefficient (Kr)	Scalability Coefficient (Ks)	Criteria
Ease of Use	0,90	0,84	Practical
Clarity of Instructions	0,95	0,88	Practical
Benefits	0,92	0,85	Practical
Average	0,92	0,85	Practical

Table 4. Results of Practicality Test by Students

Assessment Aspects	Reproducibility Coefficient (Kr)	Scalability Coefficient (Ks)	Criteria
Interest	0,94	0,87	Practical
Ease of Use	0,88	0,82	Practical
Understanding of the Material	0,90	0,84	Practical
Average	0,91	0,84	Practical

Practicality data analysis uses the reproducibility coefficient (Kr) and the scalability coefficient (Ks). The analysis results show a Kr value of 0.92 and a Ks value of 0.85 from teacher assessments and a Kr value of 0.91 and a Ks value of 0.84 from student assessments, which means that PADUKA media meets the practicality criteria. Teachers assessed that PADUKA media is easy to use in learning and can increase students' active participation. In contrast, students stated that PADUKA media makes learning multiplication fun and easy to understand.

3.4. The Effectiveness of PADUKA's Learning Media

The effectiveness of PADUKA media in improving students' cognitive abilities was analyzed through several tests:

3.4.1. Normality Test Results

Table 5. Data Normality Test Results

Variable	N	Shapiro-Wilk Statistic	Sig. (p-value)	Conclusion
Pre-test	16	0.916	0.149	Normal (p > 0,05)
Post-test	16	0.933	0.296	Normal (p > 0,05)

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The normality test was performed using Shapiro-Wilk. The test results showed that the significance value for the pretest was 0.149, and the posttest was 0.296. The data is normally distributed since the significance value is greater than 0.05.

3.4.2. Homogeneity Test Results

Table 6. Homogeneity Test Results

Group	Amount of Data	Post-test average	Varians (S^2)
Experimentation	16	82.25	120.83
Control	22	70.08	178.61

The homogeneity test was carried out using the F test. The test results showed that the calculated F (1.48) < the table F (2.31), so it can be concluded that the variance of the data is homogeneous.

3.4.3. Paired t Test Results (Paired t-test)

Table 7. Paired t-Test Results

Statistics	Value
t-Statistik	9,77
df (derajat bebas)	15
Sig. (2-tailed)	0,000

Paired t-tests were conducted to test the difference in pretest and posttest scores in the experimental class. The test results showed a t-statistic value of 9.77 with a significance of 0.000 ($p < 0.05$). This indicates a significant difference between the pretest and posttest scores, with the posttest mean score (81.13) being higher than the pretest mean score (53.69).

3.4.4. Independent Sample t-test

Table 8. Summary of Data for Both Groups

Groups	N	Average Post-test	Standard Deviation
Experimental Class	16	82,25	10,99
Control Class	22	70,08	13,36

Table 9. Independent t-test results

Statistics	Value
t calculate	2,972
df	38
p-value	0,005

An independent t-test was conducted to compare the learning outcomes of the experimental and control classes. The test results showed a t-score of 2.972 with a significance of 0.005 ($p < 0.05$). This indicates a significant difference between students' learning outcomes in the experimental class (M = 82.25) and the control class (M = 70.08).

3.4.5. N-Gain Calculation Results

N-Gain Calculation Results

Class	Number of students	Average N-Gain	Categories
Experimentation	16	0,65	Medium
Control	22	0,36	Low

The N-Gain calculation measures the improvement in students' cognitive abilities. The results show that the average N-Gain of the experimental class is 0.65 (moderate category), while the average N-Gain of the control class is 0.36 (low category). This indicates that the improvement in student learning outcomes in the experimental class is higher than in the control class [15].

3.4.6. Effectiveness Calculation Results

Table 11. Data for Effectiveness Calculation

Data	Value
Me (Average post-test of experimental class)	82,25
Mk (Average post-test of control class)	70,08
SDk (Standard deviation of the control class)	13,36

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The effectiveness of PADUKA media is calculated using the Control Group Design formula with a result of 91.1%, which is categorized as very high. This shows that using PADUKA media effectively improves learners' cognitive abilities.

3.4.7. Conclusion of Statistical Analysis

Table 12. Statistical Analysis Conclusion

Statistical Test	**Results**	**Conclusion**
Homogeneity Test	Calculated F = 1.48 < Table F = 2.31	Homogeneous data variance
Normality Test	p > 0,05	Normally distributed data
T-test (Difference Test)	t calculate = 2.972; p = 0.005	There is a significant difference between the groups

3.5. Discussion

The development of PADUKA learning media is based on the need for interesting and interactive mathematics learning media to improve students' cognitive abilities in multiplication. PADUKA media combines the concept of a snake and ladder game with multiplication cards designed for learning mathematics.

PADUKA media provides a concrete learning experience through manipulating physical objects, a semi-concrete experience through the visualization of a snake, and a ladder board through solving multiplication problems. Effective integration of interactive media can significantly increase student engagement and understanding [30], facilitating a more beneficial learning environment. [30]–[32].

The results showed that the use of PADUKA media successfully improved students' understanding of the concept of multiplication. There was a significant difference between the experimental and control classes' learning outcomes, proving that PADUKA media was more effective than conventional learning. Interactive learning media in an educational environment has a real positive effect on learning ability and student engagement levels [33], [34]. In particular, learning media designed for multiplication improves understanding, encourages student interaction, and improves critical thinking skills [34], [35].

Analysis of the independent t-test results shows a significant difference between the learning outcomes of students in the experimental class (M = 82.25) and the control class (M = 70.08) with a value of p = 0.005 (p <0.05). This proves that the use of PADUKA media has a positive impact on students' cognitive abilities. The significant difference in the average post-test score between the experimental and control classes shows that PADUKA media effectively improves understanding of the concept of multiplication in fourth graders. The effectiveness of interactive learning media in improving essential skills, which are very important for mastering basic arithmetic operations such as multiplication [36].

In addition, the N-Gain value of the experimental class is 0.65 (moderate category), which is higher than the control class of 0.36 (low category), indicating that the improvement in the cognitive ability of students using PADUKA media is higher. The effectiveness of PADUKA media, which reaches 91.1% (very high category), shows that this learning medium is very effective in improving students' cognitive abilities in multiplication. The high level of effectiveness can be explained by several factors, including (1) the design of media that is attractive and suitable for the characteristics of students, (2) the integration of game elements that make learning fun, (3) the presence of social interaction during the game that facilitates scaffolding, and (4) a concrete and contextual learning approach.

3.5.1 The Contribution of the PADUKA Component to Cognitive Development

A deeper analysis of how each component of PADUKA media contributes to improving cognitive abilities reveals the specific mechanisms of learning improvement. The visual-spatial arrangement of the Snake and Ladder Game Board helps students develop spatial reasoning and sequential thinking. As students move their pieces according to the dice roll, they practice counting, directional movement, and pattern recognition—all basic math skills that support understanding multiplication. The randomness of the dice roll also introduces an element of chance that maintains engagement while indirectly teaching the concept of probability.

Multiplication Cards serve several cognitive functions. First, they provide hands-on practice with multiplication facts, reinforcing memory through repetition. Second, the varying difficulty levels allow for differentiated learning that aligns with each student's zone of proximal development. Third, the visual presentation of multiplication problems in card format helps students transition from concrete to more abstract representations of mathematical concepts.

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The Rules of the Game and Social Interaction support the development of executive function skills such as following directions, taking turns, and thinking strategically. The social interaction component encourages verbal and mathematical thinking as students explain their movements and calculations, deepening conceptual understanding through articulation and peer feedback.

Each component works synergistically to create a comprehensive learning experience that addresses various aspects of cognitive development related to multiplication skills. Combining these elements provides multiple pathways to understanding, accommodates different learning styles, and reinforces concepts through various modalities (visual, tactile, auditory, and social).

3.5.2 Study Limitations

Despite the positive results, some limitations must be acknowledged when interpreting the findings of this study. The relatively small sample size (16 students in the experimental class and 22 in the control class) may limit the generalization of the results to a larger population. Future research should consider larger and more diverse samples. The intervention period is limited to a specific time frame, which may not capture long-term retention effects. A longitudinal study would provide insight into the sustainability of learning gains.

The positive results may be partly attributed to the novelty of the PADUKA media, which may temporarily increase student motivation and engagement. Extended use over time will help determine whether the effects last beyond the initial excitement. While efforts were made to control for teacher variables, differences in teaching styles and implementation approaches may have influenced the results. Future studies should include tighter controls for these factors. This study focused on multiplication skills and did not explore potential transfer effects to other mathematical concepts or subject areas. These limitations provide direction for future research while contextualizing current findings within the appropriate scope.

3.5.3 Implications for Classroom Practice and Curriculum Development

The findings of this study have several important implications for educational practice and curriculum development. The success of the PADUKA media shows that curriculum developers and education policymakers should systematically consider incorporating game-based learning approaches into mathematics curricula, especially for abstract concepts that students traditionally find challenging. Teachers must receive training to implement game-based learning strategies effectively and understand the theoretical foundations that make this approach effective. This includes guidance for facilitating productive discussions during gameplay and connecting game experiences to formal math concepts.

The varying difficulty levels in PADUKA media demonstrate the value of incorporating different learning materials into classroom resources, enabling teachers to address diverse learning needs in a single activity. Traditional assessment methods may not fully capture the learning during game-based activities. Schools should consider developing complementary assessment approaches that evaluate process skills, collaborative problem-solving, and conceptual understanding in addition to procedural fluency.

The cost-effectiveness of PADUKA media (relatively cheap to produce compared to digital technology) shows that schools with limited resources can still implement high-quality and engaging learning experiences through carefully designed physical materials. Successful PADUKA media design principles can be adapted for other subject areas and age groups, creating a cohesive learning experience across the curriculum. By addressing these implications, educators can utilize these research findings to improve mathematics instruction more broadly and support the development of students' essential cognitive skills through engaging and effective learning experiences.

4. CONCLUSION

Based on the results of the research and discussion, it can be concluded that the development of the learning media Fun Multiplication with Snakes and Ladders and Multiplication Cards (PADUKA) has been successfully carried out through the ADDIE stages by producing learning media that are in accordance with the needs and characteristics of fourth-grade elementary school students. The PADUKA learning media has met the eligibility criteria based on the assessment of media experts and subject matter experts. The eligibility of this media is reviewed from the aspects of visual appearance, technical aspects, and suitability with the mathematics learning materials for fourth-grade elementary school. The practicality evaluation shows that PADUKA media is practical for mathematics learning. This practicality can be seen in the positive responses of teachers and students to the ease of use, clarity of instructions, and usefulness of the media in the learning process. The results showed that PADUKA media is effective in improving the

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cognitive abilities of fourth-grade elementary school students in multiplication. This effectiveness can be seen from the significant improvement in the learning outcomes of students who used PADUKA media compared to students who used conventional learning. The improvement in students' cognitive abilities through the use of PADUKA media proves that learning mathematics in the form of a game can be an effective alternative to overcome students' difficulties in understanding abstract mathematical concepts.

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