



UHAMKA PRESS

p-ISSN: 2477-3859 e-ISSN: 2477-3581
JURNAL INOVASI PENDIDIKAN DASAR
The Journal of Innovation in Elementary Education
<http://jipd.uhamka.ac.id>



Volume 8 • Number 1 • November 2022 • 28 - 37

Feasibility of Number Necklace Game Based on Yogyakarta Local Wisdom for Elementary Schools

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Received: October 21, 2021

Accepted: September 21, 2023

Published: October 22, 2023

Abstract

Mathematics is still a scary thing for some students. This is because mathematics has an unpleasant stereotype, namely, learning that is boring and full of rules. This contrasts the characteristics of elementary school students, especially the lower classes, who still like to play. One of the math problems in grade 1 elementary school that are in the spotlight is students who cannot order numbers from smallest to largest and vice versa. This is caused by students who get bored quickly, resulting in decreased assignment accuracy. Therefore, this study aims to develop games in learning that can facilitate students to increase their interest in learning numbers. The game is complemented by concrete media based on local wisdom to increase student understanding according to the profile of Pancasila students in an independent curriculum. The method used in this study is the RnD (Research and Development) research method using the ADDIE model, which is carried out through five stages, namely analysis, design, development, implementation, and evaluation). Three data collection techniques are used in this study: validity obtained through validation by the validator, effectiveness obtained through the results of game trials on students, and practicality obtained from the assessment instrument by the validator. The results showed that the validity of the material was 83.3%, and the validity of the media was 97.8%. The game's effectiveness from the effects of field trials on students is 94.7% (matching evaluation) and 100% (sorting evaluation). The practicality of the media is obtained from the validator's assessment with a validity value of 90%.

Keywords: numbers, games, local wisdom, mathematics, elementary school

Abstrak

Matematika masih menjadi hal yang menakutkan bagi sebagian siswa. Hal ini dikarenakan matematika memiliki stereotype yang kurang menyenangkan yaitu pembelajaran yang membosankan dan penuh aturan. Hal ini bertolak belakang dengan karakteristik siswa sekolah dasar khususnya kelas bawah yang masih suka bermain. Salah satu soal matematika di kelas 1 SD yang menjadi sorotan adalah siswa yang tidak bisa mengurutkan bilangan dari yang terkecil ke terbesar dan sebaliknya. Hal ini disebabkan oleh siswa yang mudah bosan sehingga mengakibatkan menurunnya ketelitian dalam mengerjakan tugas. Oleh karena itu, penelitian ini bertujuan untuk mengembangkan permainan dalam pembelajaran yang dapat memfasilitasi siswa untuk meningkatkan minat belajar bilangan. Permainan dilengkapi dengan media konkrit berbasis kearifan lokal untuk meningkatkan tingkat pemahaman siswa sesuai dengan profil siswa pancasila dalam kurikulum mandiri. Metode yang digunakan dalam penelitian ini adalah metode penelitian RnD (Research and Development) dengan menggunakan model ADDIE yang dilakukan melalui lima tahapan yaitu analisis, desain, pengembangan, implementasi, dan evaluasi). Teknik pengumpulan data yang dilakukan dalam penelitian ini ada tiga yaitu validitas yang diperoleh melalui validasi oleh validator; keefektifan, diperoleh melalui hasil uji coba permainan pada siswa; kepraktisan, diperoleh dari instrumen penilaian oleh validator. Hasil penelitian menunjukkan validitas materi sebesar 83,3% dan validitas media sebesar 97,8%. Keefektifan permainan dari hasil uji coba lapangan pada siswa adalah 94,7% (evaluasi pencocokan) dan 100% (evaluasi penyortiran). Kepraktisan media diperoleh dari penilaian validator dengan nilai validitas 90%.

Kata kunci: bilangan, permainan, kearifan lokal, matematika, sekolah dasar

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INTRODUCTION

From the point of view of formal learning, the lowest level of formal education in Indonesia is elementary school. Learning at the primary school level must be accompanied using concrete objects so that learners better understand the material. This is in line with the opinion of J. Piaget (Ruseffendi, 2006) about the theory of child mental development. According to him, the maturity of children's thought processes is influenced by mental development factors. Piaget divided the stages of mental development of children into four, namely the sensory-motor stage, the pre-operative stage, the concrete operation stage, and the formal operation stage. If you pay attention to the average age of elementary school students at the initial level (grades 1 to 3) usually aged between 5 to 8 years, that age is entered in the preoperative stage.

Mathematics is one of the subjects in the education curriculum in Indonesia that needs to be taught both in formal learning and informal learning. Mathematics taught at the school level, namely elementary school, junior high school, and general high school is called school mathematics (Rahmah, 2018). Mathematics is seen as one of those subjects that is considered difficult as well as scary. Even in elementary school, most students do not like mathematics because mathematics has many formulas that must be memorized so it is difficult to understand. This happens because of misconceptions in teaching mathematics to students. As well as interviews with grade 1 teachers of SD Pedagogia Labschool FIPP UNY, show that there is material that is quite confusing and a challenge for students, namely "sorting numbers from largest to smallest" Children are still not careful and upside down in sorting them. So, a new method is needed to teach number material to students using a fun way.

Creating an atmosphere of learning mathematics at the initial level of elementary school requires mature thought about achieving learning objectives, creating a pleasant learning atmosphere, and using concrete media as a tool for student understanding. The combination of the four is supported by the learning method proposed by J.P Dienes (Ruseffendi, 2006), namely the game method. The game method in learning mathematics can increase learning motivation by spurring a sense of challenge among students. Learning mathematics becomes fun, and cheerfully without feeling forced but can improve student competence which leads to increased achievement or learning outcomes. The right game method is expected to provide visualization of the counting process, delight children when used, do not burden brain memory to improve counting skills and completeness of learning mathematics.

Hearing the word game, then what we have in mind is something fun, exciting, prizes, and other positive words that describe the game. Rohmah, N. (2016) in his journal explains that "... Play is a basic activity of children carried out alone, with educators, family, friends and parents where these activities are carried out voluntarily, fun, and without coercion, with play children will be able to understand the rules, work together, and socialize". According to Kasbudiah (2014), the concept of play is carried out to help children's development in learning objectives. So, teaching the concept of material with games will make students understand the material while having fun.

The concept of the game is integrated into the material of sorting numbers with the medium of number necklaces. Dwirahayu (2016) revealed that a number necklace is a game using card media that contains certain numbers made like necklace hangers. This game can be used to train students' understanding of the sequence of numbers, both the order from the smallest to the largest or vice versa. Furthermore, Rosnita (2012) explained that the function of number necklaces is to improve children's cognitive abilities in recognizing number symbols.

The development of a guidebook for number necklace games based on local wisdom is related to the development of Pancasila student profiles in learning. Santosa revealed that in the independent curriculum, teachers are expected to be able to implement the 'Pancasila

Student Profile' so that it can be integrated into the learning process (Santoso, 2023). Kurniawaty (2022) explained that student profiles are one of the programs that aim to shape and develop the character of Pancasila students in students. The Decree of the Head of the Education Standard, Curriculum, and Assessment agency of the Ministry of Education and Culture and Technology Number 033/H/KR/2022 that at the end of phase A, students show understanding and have number sense on numbers up to 100, they can read, write, determine place values, compare, sort, and perform composition and decomposition numbers. Based on this, it is known that there is a subject matter or element as essential material that teachers can develop in each subject, one of which is number material. Numbers are abstract material, containing symbolic elements in the form of number symbols (Haryuni, 2013). Numbers can be natural numbers, integers, numerics, and so on. In grade 1 mathematics lessons, number material is limited, namely numbers from numbers 1 to 10 and the sequence of these numbers. The student profile integrated into this game is a global celebrity.

METHODS (HEADING 1)

This research uses the R&D (Research and Development) method. According to Gay, Mills, and Airasian (2009: 18), Research and Development (R&D) is a research method conducted to produce a product and test its effectiveness to obtain new products that are more effective in supporting learning in schools. According to Ali Maksum (2012: 79) the design of R&D research products is classified as hardware or software with the meaning of interactive learning processes, guidance, and others. This research was conducted by developing a "Number Necklace Game Based on Local Wisdom in Learning Mathematics Number Material for Grade 1 Elementary School in Yogyakarta". The planning process uses the ADDIE model. According to Sugiyono (2016), ADDIE's research method consists of five stages, namely analysis, design, development, implementation, and evaluation. Soesilo explained that the ADDIE development model has several advantages, namely being more organized, simple, and often used in developing learning products effectively and validated by experts (Soesilo: 2020). In line with Angko and Mustaji in Kurnia (2019) who said that the ADDIE model can adapt well to several conditions, is flexible, and is structured for the development of instructional interventions and revision in its stages (Kurnia: 2019). According to Nieveen (2010) states that a learning tool is said to be good if it meets the following aspects: (1) Validity, (2) Practically, and (3) Effectiveness.

The validity test is carried out to test the validation of material and media to experts with an assessment instrument in the form of a questionnaire using a Linkert scale with five (5) answer scores. On a scale of 1-5, a guideline score of 5 is very good, a score of 4 is good, a score of 3 is sufficient, a score of 2 is less, and a score of 1 is very little. Meanwhile, practicality tests were given to class teachers with questionnaire data collection techniques and linkert scales. The effectiveness aspect is carried out by conducting field trials for students by distributing evaluation sheets. The data obtained is dialysis by converting the form of data into percentages with the formula:

$$Percent = \frac{\sum \text{score per item}}{\text{max score}} \times 100\%$$

FINDINGS AND DISCUSSION

In developing the "Yogyakarta Local Wisdom-Based Number Necklace Game for Elementary Schools", the results of the development procedure carried out by researchers are as follows:

Analysis

Student characteristics through interviews with grade 1 teachers and observations in the classroom show that learning with concrete game media makes students better understand mathematics lessons, especially number sorting material. In the Concrete Operational stage (7-12 years), children are mature enough to use logical thinking or operations, however, without physical objects in front of them, children in the concrete operational stage still have great difficulty in solving logic tasks (Juwantara, 2019).

From curriculum analysis, it was obtained that the curriculum used in grade 1 of SD Pedagogia Labschool FIPP UNY was independent. From this curriculum, Learning Outcomes have been established for making number necklace game media based on local wisdom in learning mathematics number material.

Design

This stage is done by determining the *software* that will be used in making number necklace media and guidebooks. The manufacturing process utilizes Canva *software* to design the design to be used. There are two number necklaces developed, namely a number necklace with a picture of a number symbol accompanied by a name and a number necklace containing a picture of an object of local wisdom in Yogyakarta. In both media, each object is different in number with a range of 1-10 on each necklace. The media is equipped with a guidebook containing the identity of the game, background, rules, and implementation of the game, as well as attachments to support the game media.

Analysis

The analysis of student conditions, and student characteristics through interviews with grade 1 teachers and observations in the classroom shows that learning with concrete game media makes students better understand mathematics lessons, especially number sorting material. In the Concrete Operational stage (7-12 years), children are mature enough to use logical thinking or operations, however, without physical objects in front of them, children in the concrete operational stage still have great difficulty in solving logic tasks (Juwantara, 2019). Next, an analysis of curriculum needs, curriculum analysis, it was obtained that the curriculum used in grade 1 of SD Pedagogia Labschool FIPP UNY was independent. From this curriculum, Learning Outcomes have been established for making number necklace game media based on local wisdom in learning mathematics number material.

Develop

This stage is the stage of product development. Products that have been designed are developed into physical products. Next, a validity test is carried out to test the feasibility of the product. Validation is carried out by material experts and media experts against guidebooks and media that have been designed. The assessment instrument is a validation instrument consisting of two types of instruments. The first validation includes material validation with indicators from Setyawan (2023), namely the accuracy of the material which is assessed from the suitability of the material with KD, the accuracy of the material, the feasibility of presenting the use of language and writing, and information in practice questions. The second validation is media validation with indicators from Widyaningrum, and Astri (2018), namely color composition, image proportion, and the feasibility of presenting language, writing, and illustration quality. The results of validity values are classified using categories according to Sari Nilam and Yusuf Munir (2018) in the table below:

Table 1. Percentage Validate Category

Percentage	Category
0%-20%	Invalid
21%-40%	Less valid
41%-60%	Quite valid
61%-80%	Valid
81%-100%	Highly valid

The validator is given 17 questions to answer. The validator validation results for material validation can be seen below:

Table 2. Results of material validation by the Material Validator

Assessment Aspect	Total Aspect Score	Average Aspect	Percentage	Category
Accuracy of the material	25	4.2	83.3%	Very valid
Use of language and writing	9	4.5	90%	Very valid
Illustration quality	8	4	80%	Very valid
Quality of information and practice/game questions	28	4	80%	Very valid
Average		4.2	83.3%	Very valid

Based on the results obtained in the analysis of Table 2, the average percentage of validity for material validation is 83.3%. Which indicates that product development falls into the "very valid" category.

The validator is given 20 questions to answer. The results for media validation can be seen below:

Table 3. Media validation results by Media Validators

Assessment Aspect	Total Aspect Score	Average Aspect	Percentage	Category
Media engineering	34	4.6	97.1%	Very valid
Visual communication	64	4.9	98.5%	Very valid
Average		4.9	97.8%	Very valid

Meanwhile, the results of the analysis in Table 3 show that the average percentage of validity for media validation is 97.8% with the category "very valid". Based on the results of the validity test, the development of this product was declared feasible to be used as a support for the number necklace game in mathematics learning for elementary schools.

Implementation

The trial phase was carried out in grade 1 of an elementary school in Yogyakarta City with respondents totaling 19 students and class teachers. Data collection is carried out with responses to student learning outcomes as an aspect of effectiveness and teacher questionnaires as aspects of practicality. Data collection of student learning outcomes response is carried out by providing learning outcome evaluation sheets to students based

on the material taught in the number necklace game, which is sorting numbers 1-10. There are 10 evaluation questions with the command to match the number symbol with the right number and 2 questions to sort numbers from the smallest to the largest number and vice versa. The teacher's response questionnaire was given by giving a questionnaire to the teacher containing several questions related to the number necklace game.

Table 4. Student Evaluation Result

Score interval	Matchmaking	Shorting
0%-39%	18 people (94.7%)	19 people (100%)
40%-59%	-	-
60%-74%	1 people (5.3%)	-
75%-89%	-	-
90%-100%	-	-

In interpreting the results of the effectiveness validation value, classification is carried out using categories according to [Jerol E Kemp, in Hobri \(2009\)](#) with the table below:

Table 5. Categorizing Effectiveness Validation

Percentage range of student mastery level	Category
0%-39%	Very low
40%-59%	Low
60%-74%	Keep
75%-89%	Tall
90%-100%	Very high

Based on the results above, the completeness of learning using media is that 80% of students who take part in learning can achieve a minimum level of material mastery of the medium, or at least 80% of students who take part in learning reach a score of 75 (maximum score is 100), [Yumasari \(2010\)](#). Based on the trials that have been conducted, students have achieved mastery of the material because 94.7% of students with matching evaluations and 100% of students with sequencing evaluations have achieved scores above 75, it can be said that this multimedia-based learning media has been effective based on the results of field trials.

The practical aspect is carried out by conducting media validation for class teachers by providing questionnaires. According to [Nurhikmah \(2022\)](#), indicators for this validation are the appearance, presentation of content, and benefits. The results of the teacher's answers are categorized according to [Jerol E Kemp, in Hobri \(2009\)](#) with the table below:

Table 6. Practicality Validation Category

Percentage	Category
0%-20%	Impractical
21%-40%	Less practical
41%-60%	Quite practical
61%-80%	Practical
81%-100%	Very practical

The teacher class as validators are given 20 questions to answer. The results for practical validation can be seen below:

Table 7. Questionnaire Answer Sheet Given to Class Teacher

Assessment Aspect	Total Aspect Score	Average Aspect	Percentage	Category
Skill Aspect	38	4.2	84%	Very practical
Content Aspect	9	4.5	90%	Very practical
Presentation Aspect	14	4.7	94%	Very practical
Benefit Aspect	28	4.7	90%	Very practical
Aspect of Use				
Average		4.5	90%	Very practical

Based on the practicality test table above, data were obtained that the skill aspect obtained an average of 4.2 with the very practical category, the content presentation aspect obtained an average of 4.5 with the very practical category, the benefit aspect obtained an average of 4.7 with the very practical category, and the use aspect obtained an average of 4.7 with the practical category. The overall average of the practicality validation aspect is 4.5 with a percentage of 90% and the category is so practical that the game can be developed using without revision.

Evaluation

The last stage is *evaluation*. After validating and testing the product, the next stage is the evaluation of the product that has been developed. In this stage, there is an evaluation as a follow-up to product improvements derived from the previous stage. This evaluation is determined from the validation results of media experts, material experts, teachers, and students. Based on the description of the validity test, practicality test, and effectiveness test, it can be concluded that guidebook development products and number necklace media can be developed as media or learning tools in the teaching-learning process without making final improvements.

CONCLUSION

Based on the results of research conducted by researchers developing number necklace game media based on local wisdom in learning mathematics number material with the ADDIE development model (Analyze, Development, Design, Implementation, Evaluation) have met valid criteria. This can be described as follows:

1. The number necklace game in the material of sorting numbers 1-10 for grade 1 elementary school can facilitate students to increase interest in learning number material. This game is equipped with concrete media based on local wisdom to increase the level of student understanding by the profile of Pancasila students in the independent curriculum.
2. This research produces a number necklace game media based on local wisdom in learning mathematics, number material meets valid criteria. Material validity is 83.3% and media validity is 97.8%.
3. The practicality of the media is obtained from the assessment of validators with a validity value of 90%.
4. Based on all stages of ADDIE carried out, it can be seen that the number necklace game based on local wisdom in learning mathematics the number material developed is effective and suitable for use in the mathematics learning process. The effectiveness of the game from the results of field trials on students was 94.7% (matchmaking evaluation) and 100% (sequencing evaluation).

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