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Effectiveness Of The Discovery Learning Model Used By Bulibum Media (Mathematical Culture Folding Book) On The Mathematical Representation Ability Of Students

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Abstract. *This study aims to analyze the effectiveness of the implementation of the Discovery Learning model assisted by BULIBUM (Mathematical Culture Folding Book) media in improving the mathematical representation ability of fifth-grade students at SDN Kalongan 02 on the perimeter of flat shapes. This study used a pre-experimental method with a One Group Pretest-Posttest Design. The study population consisted of all fifth-grade students at SDN Kalongan 02, while the sample was selected using a purposive sampling technique, resulting in 30 students from class VA. Data collection was carried out through an essay test instrument (consisting of pretest and posttest) along with non-test instruments including student response questionnaires, learning implementation observation sheets, and mathematical representation ability questionnaires. Data were analyzed parametrically using SPSS version 25.0, by including the Kolmogorov-Smirnov normality test, Paired Sample T-Test, and N-Gain Score analysis. The results of the Paired Sample T-Test produced a significance value of Sig. (2-tailed) = 0.000 < 0.05 and t_count = 18.513 > t_table = 2.045, indicating a significant difference between students' initial and final abilities, with the average score increasing significantly from 45.67 (pretest) to 89.00 (posttest). Furthermore, the N-Gain Score analysis yielded an average index of 0.7899 (High category) and an N-Gain percentage of 78.99% (Effective category). This success was further reinforced by a learning implementation level of 98.6% (Very Good), an average group worksheet score of 86.00% (Very Good), an indicator representation questionnaire score of 88.15%, and a positive student response rate of 87.36% (Very Good). In conclusion, the Discovery Learning model assisted by BULIBUM media is very effective in improving elementary school students' mathematical representation skills.*

Keywords: *Discovery Learning, BULIBUM, Mathematical Representation, Perimeter of Flat Shapes, Elementary School*

INTRODUCTION

Education is a fundamental tool that plays a very strategic role in fostering and developing the full potential of individuals to be able to face the increasingly complex demands and challenges of future life. At the elementary school level, mathematics plays a central role as a discipline that trains critical, logical, analytical, and systematic thinking skills. However, mathematics is often perceived as a difficult subject and is unpopular with most students. This is primarily due to

the characteristics of the object of study of mathematics, which is oriented towards abstract concepts, thus requiring an appropriate understanding bridge for optimal absorption. As stated by Fitriyani et al. (2019), the success of the mathematics learning process is not only measured by the extent to which students are able to memorize mathematical formulas, but also by the extent to which students are able to internalize concepts and apply them in the context of solving everyday life problems.

One of the fundamental competencies that plays a crucial role in successfully solving mathematical problems is the ability to represent mathematics. Mathematical representation is a form of expression of students' ideas, concepts, or thoughts that are used to describe and solve a mathematical problem they face (Sanjaya et al., 2018). With adequate mathematical representation skills, students are not only able to simplify complex problems but can also transform abstract problems into more detailed and concrete forms. In line with (Rahmadhani & Wiratomo, n.d.; Surel, 2019) view, mathematical representation skills are essential for students to understand and communicate mathematical ideas visually, symbolically, and verbally. The urgency of developing this ability is also reinforced by Minister of Education and Culture Regulation Number 21 of 2016, which emphasizes that communication and representation skills are an integral part of the basic competencies that must be mastered by students at the elementary education level. According to Villegas (Amieny & Firmansyah, 2021), mathematical representation abilities can be grouped into three main indicators, namely: (1) Verbal Representation, (2) Pictorial Representation, and (3) Symbolic Representation.

The exploration of the use of innovative learning models at SDN Kalongan 02 has previously been studied by Suhirno, Rizqi, and Aji (2025) who tested the effect of the Discovery Learning model assisted by interactive media Wordwall on the conceptual understanding ability of fourth grade students. The results of the quasi-experimental study proved that the Discovery Learning-based learning treatment was able to provide a significant positive influence of 89% on students' conceptual understanding, where the experimental class achieved an average of

77.86 which significantly exceeded the control class with an average of 70.68 (a difference of 7.18 points), and was supported by positive student responses reaching 87.5% (Very Good category) (Suhirno et al., 2025). These findings confirm the strong potential of the Discovery Learning model if integrated with relevant learning media in the SDN Kalongan 02 environment. However, the focus of previous studies was still limited to digital-based media (Wordwall) and oriented towards aspects of general conceptual understanding in fourth grade. In-depth research combining the Discovery Learning model with ethnomathematics-based three-dimensional concrete teaching aids (BULIBUM) specifically to intervene in fifth-grade students' mathematical representation skills at the school remains largely unexplored. This gap served as the primary basis for this research.

The study (Margareta et al., 2022) entitled "The Effect of the Discovery Learning Model on Students' Mathematical Representation and Concept Understanding" used a nonequivalent control group design. This study was conducted on eighth-grade students at SMP Negeri 10 Singkawang, focusing on number patterns. The results showed that the mathematical representation skills of students who used Discovery Learning improved and were superior to those who used direct instruction.

The similarities between this and that study are that both used the Discovery Learning model and measured students' mathematical representation skills. The differences lie in the depth, material, and learning media used. Margareta et al.'s study was conducted on junior high school students, focusing on number patterns and did not use Bulibum, while this study tested the effectiveness of Discovery Learning, assisted by the Mathematical Culture Folding Book (BULIBUM), on elementary school students' mathematical representation skills on the circumference of plane figures.

The differences between Margareta et al.'s (2022) study and this study lie in the educational level, material, and learning media. Previous research was conducted on eighth-grade junior high school students with number pattern material, while this research was conducted on elementary school students with the material on the perimeter of flat shapes. In addition, this study used the

Mathematical Culture Folding Book (Bulibum) media as a companion to the Discovery Learning model, while Margareta et al.'s research focused on the influence of the Discovery Learning model without testing the Bulibum media. The research update lies in the use of culture-based BULIBUM media to test the effectiveness of Discovery Learning on elementary school students' mathematical representation abilities on the perimeter of flat shapes material.

(Razi & Mirunnisa, 2019). The study entitled "Maple Software-Assisted Discovery Learning Model on Mathematical Representation Ability" examines the use of Maple-assisted Discovery Learning. The results reported in Juliani et al.'s article show that the model is used as an effort to facilitate mathematical representation. The research update lies in the use of BULIBUM media as an alternative to Maple media in supporting elementary school students' mathematical representation.

(Ula et al., 2019) Research on the Effectiveness of the Discovery Learning Model with Comics in Mathematics Learning. This study aimed to determine the effectiveness of the Discovery Learning model, using comics as a medium, for seventh-grade students at SMP Negeri 7 Surabaya. The results showed that the learning was effective in terms of student activity, teacher ability, learning outcomes, and positive student responses.

The similarities between this study and the author's research lie in the application of the Discovery Learning model with instructional media to support mathematics learning.

The differences lie in the type of media, educational level, and abilities studied. Previous research used comics for junior high school students, while the author's study used the Mathematics Culture Folding Book (BULIBUM), a pop-up book-like medium, to test the effectiveness of learning on fifth-grade elementary school students' mathematical representation skills in the topic of plane figures. The research innovation lies in the use of BULIBUM, a culturally-infused comic as an alternative medium to support elementary school students' mathematical representation.

The study (Anggraini et al., 2024) entitled "Evaluation of Augmented Reality Learning Media for Plane/Spatial Figures Using the Ethnomathematics Approach of the Lengkong Traditional House in Improving Students' Spatial Ability" discusses the effectiveness of culturally rooted interactive media in improving elementary school students' understanding of geometry.

The similarities between this study and the author's study lie in the use of cultural or ethnomathematic elements and the focus on geometry or plane figure material at the elementary school level. Both also aim for contextual learning that is close to students' daily lives.

The difference lies in the form of the media applied. That study used digital-based Augmented Reality (AR) technology and interactive technology. In contrast, this study used physical media in the form of a Mathematical Culture Folding Book (Bulibum) that students can hold and manipulate directly to represent plane figures. The research's innovation lies in the use of culturally-infused BULIBUM print media as an alternative to digital Augmented Reality media.

Based on the results of the preliminary study and field observations conducted at SDN Kalongan 02, a factual picture was obtained that the mathematical representation ability of fifth grade students was still relatively low. This condition was reflected in the results of the preliminary study test which showed that the average overall score of new students reached 53.75, where class V obtained an average of 55.8 and class VB obtained an average of 51.7. This achievement was still far below the Minimum Completion Criteria (KKM) set by the school, which was 70. In detail, the analysis of achievement in each indicator of mathematical representation ability showed suboptimal results in both sample classes. In the verbal representation indicator, class VA students recorded an average score of 57.0 and class VB 54.0, resulting in a combined average of 55.5. In the pictorial representation indicator, class VA obtained an average score of 59.0 and class VB 58.0, with a combined average reaching 58.5. Meanwhile, the symbolic representation indicator was the lowest achievement, where class VA only obtained an average score of 52.0 and class VB 45.0, resulting in a combined average of 48.5.

This problem is reinforced by the results of a preliminary study questionnaire, which recorded a representational ability percentage of 55% for class VA students and 46.5% for class VB students (with a combined average of 50.75%). This low achievement is due to several key factors, including the dominance of conventional, teacher-centered learning models and the minimal use of interactive, real-world learning media. As a result, students experience significant difficulties translating text-based story problems into pictorial representations or constructing mathematical formulas symbolically.

To address this issue, a learning innovation is needed that combines discovery-based learning models with interactive, concrete media. The approach implemented in this study is the Discovery Learning model, supported by BULIBUM (Mathematics Culture Folding Book). According to Syah (2017), the Discovery Learning model is a learning strategy that guides students to organize and understand mathematical concepts, relationships, and structures through a series of independent mental processes of discovery. The operational syntax of this model consists of six main phases: (1) Stimulation, (2) Problem Statement, (3) Data Collection, (4) Data Processing, (5) Verification, and (6) Generalization.

To optimize these discovery stages, the BULIBUM (Foldable Book of Mathematical Culture) media is presented. BULIBUM is designed as a three-dimensional pop-up book that combines the material of the circumference of plane figures with elements of Indonesian culture, such as miniature temples, traditional masks, and Ceplak Batik patterns. Through this combination of ethnomathematics, abstract concepts of plane figures can be transformed into concrete objects that are interesting and easy for students to understand.

The low mathematical representation ability of fifth-grade students at SDN Kalongan 02 in reality does not only stem from the abstract characteristics of geometry material, but is also caused by the learning process that has not been able to facilitate the transition needs of students' thinking from the concrete to the abstract stage. Based on initial data from the preliminary study, the low mastery of students on the verbal representation indicator (average 48.5) and images (average 55.5) reflects the limitations in presenting learning media that are relevant and close

to the students' daily world. Learning that tends to be procedural without the use of interactive teaching aids makes it difficult for students to contract mathematical ideas into various forms of representation. Therefore, an instructional approach is needed that is able to bridge the geometric concept of the perimeter of flat shapes so that it can be understood visually, logically, and communicatively.

One strategy that has great potential to overcome these problems is the integration of the Discovery Learning model supported by ethnomathematics-based media, namely BULIBUM (Mathematics Culture Folding Book). The Discovery Learning model requires students to actively discover mathematical concepts themselves through a series of systematic stages, starting from stimulation, problem statement, data collection, data processing, verification, to generalization. Through this syntax, students do not simply receive formulas passively, but build understanding through a process of independent proof. The role of this learning model becomes even more optimal when paired with BULIBUM media which carries a three-dimensional form (pop-up book). The embedding of elements of Indonesian culture such as Batik Ceplak patterns, miniature temples, and traditional masks in this media not only serves as a visual attraction, but also functions as an ethnomathematics context that grounded abstract mathematical concepts into real objects that are familiar to students.

This study aims to expand and deepen the involvement of the Discovery Learning model by combining it with three-dimensional physical demonstration media based on ethnomathematics (BULIBUM), which is specifically focused on intervening and improving the mathematical representation skills of fifth-grade students.

Based on the background description above, this study aims to:

1. To determine whether there is a difference in the mathematical representation abilities of fifth-grade students before and after using the Discovery Learning learning model assisted by BULIBUM (Foldable Book of Mathematical Culture) media.
2. To determine the effectiveness of the Discovery Learning learning model assisted by BULIBUM (Foldable Book of Mathematical Culture) media on the

mathematical representation abilities of fifth-grade students at SDN KALONGAN 02.

RESEARCH METHOD

Operationally, this pre-experimental research design began with a pre-test (O_1) to measure students' initial mathematical representation abilities before the treatment. Next, the experimental group, consisting of Grade 6 students, was given treatment (X), which involved learning about the circumference of plane figures using the Discovery Learning model with the aid of BULIBUM media. After the entire treatment series was completed, a post-test (O_2) was administered to measure students' mathematical representation abilities.

The population in this study included all fifth-grade students at Kalongan 02 Public Elementary School. Sampling was conducted using purposive sampling, a technique for determining samples with specific considerations. The primary consideration for selecting this sample was based on discussions and input from class teachers, as well as analysis of preliminary study test data, which indicated that fifth-grade students required special attention due to their low achievement in mathematical representation indicators. Based on these criteria, the sample size was 30 fifth-grade students.

The data collection process in this study involved test and non-test instruments, detailed as follows:

1. Test Instrument: A six-item essay test administered in the pretest and posttest. This test was carefully designed to measure three main indicators of mathematical representation ability: pictorial representation, symbolic representation, and verbal representation.
2. Non-Test Instrument:
    a) Student Response Questionnaire: Consisting of 20 positive and negative statements designed using a Likert scale to measure students' satisfaction, acceptance, and motivation with the learning treatment.

b) Learning Implementation Observation Sheet: Consisting of 19 assessment criteria to systematically observe the level of teacher compliance and appropriateness of the Discovery Learning syntax in the teaching module.
c) Mathematical Representation Indicator Questionnaire: Consisting of 20 statements to measure students' perceptions and independent reflections regarding their representation abilities.
d) Documentation: Collection of supporting data including group student worksheets (LKPD), photographs of the learning process, and a summary of student answer sheets.

Before the test instrument was used in research data collection, its validity was first tested through content validity (expert judgment) by two mathematics lecturers and one supervising teacher. Next, an empirical tryout of the instrument was conducted on 30 students outside the sample group. The empirical test results revealed 11 valid items, with correlation coefficients ranging from 0.392 to 0.761 ($> r = 0.361$). Furthermore, the instrument's reliability was tested using Cronbach's Alpha, yielding a coefficient of 0.821, indicating that the test instrument met the Very High reliability criteria and was suitable for use.

All quantitative data obtained were comprehensively processed and analyzed using SPSS version 25.0 statistical software. The data analysis stages included:

1. Prerequisite Analysis Test (Normality Test): This was conducted to verify whether the pretest and posttest score data came from a normally distributed population. Testing was conducted using the Kolmogorov-Smirnov method with a significance level of $\alpha = 0.05$. The decision criterion was that if the Sig. value > 0.05, the data were declared normally distributed, allowing the analysis to proceed to parametric statistics.
2. Hypothesis Testing (Paired Samples T-Test): Used to test whether there is a significant difference in the average scores between the pretest and posttest results in a sample group. Hypothesis H_0 is rejected and H_1 is accepted if the Sig. value (2-tailed) is < 0.05 or the calculated $t_{value} > t_{table}$.

3. N-Gain Score Test: Conducted to measure the effectiveness of improving students' mathematical representation skills after the treatment is implemented. The N-Gain index is calculated using a formula developed by Hake: the difference between the posttest score and the pretest score divided by the difference between the ideal maximum score and the pretest score. The level of effectiveness is categorized based on the N-Gain percentage (N-Gain = N-Gain Score 100%), with the following criteria: percentage > 76% is in the Effective category, 56–75% is Quite Effective, 40–55% is Less Effective, and < 40% is Ineffective.

To ensure the validity and accuracy of the data obtained, the implementation of this research was designed through structured and systematic procedural stages. The stages began with a pretest to measure students' initial mathematical representation abilities on the perimeter of flat shapes before being given treatment. Next, the learning intervention was carried out in three meetings using the Discovery Learning model which was intensively integrated with BULIBUM media. In each treatment, student activities were oriented towards ethnomathematics-based problem solving by utilizing the three-dimensional folding (pop-up) features on BULIBUM media to explore the concept of flat shapes independently or in groups. The entire learning flow was guided using Student Worksheets (LKPD) which were specifically designed to guide students in mastering the three indicators of mathematical representation, namely pictorial, symbolic, and verbal representation. At the end of the treatment series, a posttest was given with a weight and difficulty level equivalent to the pretest to measure the level of improvement and the effectiveness of the intervention that had been implemented.

The measurement of the test instrument's success is also supported by precise mapping of the item specifications. Of the 6 essay questions used in the pre-test and post-test, each indicator of mathematical representation ability is represented proportionally by 2 items. Non-test questionnaire testing in the form of a student response questionnaire and a representation indicator questionnaire is also applied with a strict assessment scale to minimize response bias. In addition,

comparative data analysis between pre-test and post-test results is strictly correlated through a Paired Samples T-Test and N-Gain Score calculation at a significance level of $\alpha = 0.05$. This comprehensive methodological approach is applied so that all changes in student abilities, both quantitatively through test scores and qualitatively through observation sheets and response questionnaires, can be measured objectively, validly, and scientifically accountable.

RESULT AND DISCUSSION

Prerequisite Test Analysis (Normality Test)

The normality test is a prerequisite step in quantitative data analysis and is crucial for determining the type of statistics to be used in hypothesis testing, whether parametric or non-parametric. This test aims to prove that the sample pretest and posttest score data are normally distributed. The normality test was conducted using SPSS version 25.0 using the One-Sample Kolmogorov-Smirnov Test at a significance level of $\alpha = 0.05$.

Based on the results of the normality test using the Kolmogorov-Smirnov test on the VA class sample (N = 30), the test statistic for the pretest data was 0.123 with a significance value (Sig.) of 0.200. Meanwhile, for the posttest data on mathematical representation ability, the test statistic was 0.147 with a significance value (Sig.) of 0.098. Since the significance value of both data groups is consistently greater than the critical limit of 0.05 (Sig. > 0.05), it can be concluded that the pretest and posttest score data of class VA students' mathematical representation ability are normally distributed. The parametric assumptions have been met, so that the hypothesis testing of the average difference can be continued validly using the Paired Samples T-Test.

Differences in Mathematical Representation Ability (Paired Samples T-Test)

A descriptive analysis of the pretest results of class VA students (N = 30) showed an average score of 45.67 with a standard deviation of 11.427 and a standard error of 2.086. After being treated using the Discovery Learning model

with the BULIBUM media, the average student score on the posttest significantly increased to 89.00 with a standard deviation of 7.474 and a standard error of 1.364. This descriptive analysis indicates an increase in the average student score of 43.33 points.

Furthermore, inferential testing using the Paired Samples T-Test yielded a mean paired difference of -43.333 with a standard deviation of 12.820 and a standard error of 2.340. The 95% Confidence Interval of the Difference range moves from the lower limit of -48.120 to the upper limit of -38.546. The results of this statistical test obtained a t_count value of -18.513 (or absolute value of t_count = 18.513) at degrees of freedom df = 29, and a significance value of Sig. (2-tailed) = 0.000. Because the significance value is significantly smaller than 0.05 (0.000 < 0.05) and the t_count value > t_table (18.513 > 2.045), then H_0 is rejected and H_1 is accepted. This proves that there is a very significant difference in students' mathematical representation abilities before and after the implementation of the Discovery Learning model assisted by BULIBUM media.

Learning Effectiveness (N-Gain Score Test)

To determine the effectiveness of the Discovery Learning model, supported by BULIBUM media, in improving students' mathematical representation skills, an N-Gain Score (Normalized Gain) analysis was conducted. This analysis measures the difference between pretest and posttest scores relative to the ideal maximum score achievable by students.

Based on the results of the N-Gain data analysis on 30 class VA students, the N-Gain Score decimal index achieved a minimum value of 0.40, a maximum value of 1.11, and an average (mean) N-Gain index of 0.7899 with a standard deviation of 0.1554. Based on Hake's normalized gain criteria, this average value of 0.7899 falls within the range g > 0.7, indicating that the overall level of improvement in students' mathematical representation skills is classified as high.

Meanwhile, reviewed from the percentage of effectiveness (N-Gain Percentage), the minimum value obtained was 42.86%, the maximum value was 100.00%, and the average reached 78.99% with a standard deviation of 15.54%. Referring to the interpretation category of N-Gain effectiveness (ineffective: <40%;

less effective: 40–55%; quite effective: 56–75%; effective: >76%), the average percentage obtained was 78.99% which exceeded the threshold of 76% indicating that the implementation of the Discovery Learning model assisted by BULIBUM media was included in the effective qualification. This effectiveness is also strengthened by the achievement of supporting indicators in class VA, including an average observation of learning implementation of 98.6% (very good), an increase in the average collaborative LKPD score from the first to the third meeting of 80.00, 85.00, and 93.00 with a cumulative average of 86.00 (very good), an average achievement of mathematical representation indicators of 88.15% (covering image, symbol, and verbal aspects), and a positive student response questionnaire to learning of 87.36% (very good). The overall improvement in all these benchmarks proves that class VA students have made real progress in understanding, processing, and transforming mathematical ideas from concrete forms of local culture into structured images, symbols, and verbal explanations.

Supporting Data for Learning Quality

The success of this research was also supported by the high achievement of all learning process variables:

1. Teacher Learning Implementation: Observers' observations during three meetings recorded an implementation percentage of 98.6%, which is categorized as Very Good.
2. Group Student Worksheet Achievement: The group student worksheet scores, which included problem-solving on the Ceplak Batik motif, increased sequentially: Meeting I (80%), Meeting II (85%), and Meeting III (93), with a cumulative average of 86.00% (Very Good).
3. Mathematical Representation Indicator Achievement: A summary of the indicator questionnaire showed an average achievement of 88.15%, with the following distribution: Pictorial Representation Indicator (91.11%), Symbolic Representation Indicator (87.78%), and Verbal Representation Indicator (85.56%).
4. Student Response Questionnaire: Students' assessment of the comfort and ease of learning using this treatment reached 87.36% (Very Good).

The empirical findings in this study clearly demonstrate that the implementation of the Discovery Learning model, supported by BULIBUM media, significantly contributed to improving students' mathematical representation skills. The increase in students' average score from 45.67 to 89.00, along with an N-Gain percentage of 78.99%, confirms that the combination of independent discovery syntax and the use of concrete teaching aids can create an effective learning climate.

This finding is in line with and supports the research conducted by Waruwu & Rizqi (2026) regarding the effectiveness of the Discovery Learning model assisted by Parekan media on fraction material for class II SDN Karangjati 01. In Waruwu & Rizqi's research (2026), the application of Discovery Learning assisted by concrete teaching aids was proven to be significant (Sig. = 0.000 < 0.05) in increasing students' average score from 44.33 to 83.61 with an N-Gain index of 0.6948 (moderate category) (Waruwu & Rizqi, 2026). The comparison of these two findings strengthens the empirical evidence that Discovery Learning syntax is always effective when combined with concrete manipulative media. Both the Pamerah media used to instill an understanding of the basic concept of fractions in lower grades (Waruwu & Rizqi, 2026), and the BULIBUM media designed based on ethnomathematics to hone complex mathematical representation skills in upper grades, both have proven successful in providing real contributions in facilitating the transformation of students' thinking from concrete to abstract.

Substantively, this success is inseparable from the Discovery Learning syntax flow, which facilitates students' construction of their own understanding. In the Stimulation and Problem Statement stages, the presence of BULIBUM media in three-dimensional (pop-up) forms successfully captured students' attention and curiosity. The integration of ethnomathematic elements—such as Ceplak Batik motifs, temples, and

masks—helped students connect abstract geometric objects with real-world forms familiar in everyday life.

In the Data Collection and Data Processing stages, students actively interacted and manipulated BULIBUM media to calculate the side lengths and perimeters of plane figures. This activity directly impacted the strengthening of the Pictorial Representation indicator, which achieved the highest achievement of 91.11%. With the guidance of group worksheets, students were guided to the Symbolic Representation stage (87.78%), where they were able to transform visual understanding into mathematical formulas (K = s + s + s or K = 4 X s). In the Verification and Generalization stage, students draw final conclusions and present them in front of the class, which directly trains Verbal Representation (85.56%).

These findings align with research by Rahmawati & Mulyani (2021) and Lin & Zhang (2022), which confirmed that the use of the Discovery Learning model combined with manipulative teaching aids can significantly improve visual and symbolic representation skills. Furthermore, the integration of local cultural contexts through BULIBUM supports Smith & Patel's (2023) theory regarding the importance of ethnomathematics in building meaningful learning, as reflected in the high positive student response rate of 87.36%.

Overall, the integration between Discovery Learning syntax and the use of BULIBUM media has been proven to provide complementary instructional impacts in improving students' mathematical representation skills. Learning is no longer centered on memorizing procedures alone, but rather on forming meaningful understanding through the exploration of concrete, culture-based objects that are systematically transitioned into the form of images, symbols, and verbal explanations. The implications of this study indicate that the use of ethnomathematics manipulative media can be

an effective alternative solution for elementary school teachers to overcome students' low mathematical representation skills in geometry material.

The significant improvement in these three indicators of mathematical representation is inseparable from the role of the BULIBUM media design, which is structured to facilitate students' cognitive abstraction process gradually. The presence of visual elements with a local cultural background—such as the Ceplak Batik pattern, miniature temples, and traditional masks—does not merely function as an initial visual stimulus that attracts attention, but acts as a cognitive bridge that makes it easier for students to transform visual information in the form of images (pictorial) into more abstract mathematical formulations in the form of symbols and verbal representations. Through active involvement in the Discovery Learning syntax, students are required to organize and process data directly from the three-dimensional manipulative media. This makes the concept of the perimeter of a plane figure no longer perceived as a set of rigid memorized formulas, but is internalized as a form of logical relationship built through independent discovery experiences.

Furthermore, the integration of ethnomathematics-based media and discovery-based learning flows has proven effective in reconstructing student interaction patterns in the classroom from passive to interactive. Group discussions that develop during the data processing and verification processes provide ample space for students to communicate their mathematical ideas verbally and in writing with greater confidence. This alignment not only impacts theoretical mastery of the material but also proves that a contextual approach based on local culture can improve the quality of the mathematics learning process in elementary schools, making it more meaningful, relevant, and having a real impact on students' thinking skills.

Although these findings are in line with various previous studies on the effectiveness of the Discovery Learning model assisted by concrete

media, this study has novelty and provides specific theoretical and practical contributions. In contrast to previous studies that generally focus on secondary school levels (such as junior high/senior high school) or use digital media, electronic worksheets (software), and conventional media without local cultural content, this study offers innovation in the form of integrating Nusantara culture-based ethnomathematics through three-dimensional physical media (pop-up books) called BULIBUM (Mathematical Culture Folding Book) which is specifically designed for elementary school students in grade V. The use of local cultural elements—such as the Ceplak Batik motif, temple shapes, and traditional masks—does not only function as ordinary visual aids, but also as a cognitive bridge that contextualizes abstract geometric concepts (the perimeter of flat shapes) into the reality of students' daily lives. Therefore, this study enriches the literature on mathematics education by proving that the combination of Discovery Learning syntax and manipulative media rooted in local culture is able to provide a new dimension in building meaningful conceptual understanding (meaningful learning) and sharpening mathematical representation skills comprehensively at the elementary school level.

CONCLUSION

Based on the statistical data analysis and discussion of the research results, the following conclusions can be drawn to answer the research problem formulation. There is a significant difference in the mathematical representation skills of grade 5 students at SDN Kalongan 02 before and after implementing the Discovery Learning model with the BULIBUM media. This is evident from the Paired Samples T-Test, which yielded a Sig. (2-tailed) value of $0.000 < 0.05$ and a calculated t-value of $18.513 >$ t-table $= 2.045$, accompanied by an increase in the average score from 45.67 (pretest) to 89.00 (posttest).

The implementation of the Discovery Learning model with the BULIBUM media has proven effective in improving students' mathematical representation

skills. This is demonstrated by the average N-Gain Score of 0.7899 (High category) and the N-Gain percentage of 78.99% (Effective category). This performance is supported by the implementation of learning of 98.6%, the average LKPD of 86.00%, the percentage of achievement of representation indicators of 88.15%, and the student questionnaire response of 87.36%.

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