Interval: Indonesian Journal of Mathematical Education
Vol. 2, No. 1, June 2024, pp. 1~7
ISSN: 3021-7857, DOI: 10.37251/ijome.v2i1.978

Development of Student Worksheets Based on Calligraphy Art on the Subject of Circles

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Article Info

Article history:

Received May 5, 2024
Revised Jun 9, 2024
Accepted Jun 19, 2024
Online First Jun 22, 2024

Keywords:

Art
Calligraphy
Circles
Mathematics
Student Worksheets

ABSTRACT

Purpose of the study: The purpose of this research is to develop a student worksheet based on the art of calligraphy on the subject of class VIII circles at State Islamic Junior High School 1 Pringsewu. This research also aims to test the validity, practicality and effectiveness of the student worksheet developed.

Methodology: This research uses research and development methods (Research & Development). The research subjects were 29 class VIII students at State Islamic Junior High School 1 Pringsewu. Data will be analyzed using validation instrument data analysis techniques, student response questionnaires, and learning outcomes tests.

Main Findings: The main finding of this research is the development of calligraphy-based student worksheets on the subject of class VIII circles. This student worksheets includes components such as cover, table of contents, subtitles, competency standards, basic competencies, material, discussion, conclusions and practice questions. This student worksheets has gone through a process of validation and testing in learning.

Novelty/Originality of this study: Research regarding the development of student worksheets based on calligraphy art on circles revealed that the integration of art and mathematics can increase students' creativity and understanding of geometric concepts. The results of this research show that an interdisciplinary approach not only makes learning more interesting, but is also effective in strengthening students' analytical and aesthetic abilities.

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1. INTRODUCTION

Mathematics is a tool for developing ways of thinking because mathematics is a science that deals with or examines the forms or structures of everyday life [1]. Apart from that, mathematics is the result of human thoughts which are related to ideas, processes and reasoning. Mathematics is very necessary both for everyday life and in facing advances in science and technology, so mathematics lessons need to be taught to every student from an early age because Mathematics is also a scientific discipline that is studied at all levels of education, from kindergarten, elementary, middle and high school levels [2],[3]. Mathematics is very necessary both for everyday life and in facing advances in science and technology, so mathematics needs to be provided to every student since kindergarten [4] .

Considering the importance of mathematics in life, the Al-Quran has provided examples of mathematical aspects such as in the QS. Al. Isra verse 12 [5]. Meaning: "And We made the night and the day two signs, then We abolished the sign of the night and We made the sign of the day light, so that you may seek grace from your Lord, and so that you know the number of years and calculations. And We have explained everything clearly". (QS Al-Isra17:12) [6] .

This verse shows the importance of mathematics to be studied and applied in everyday life which is useful as a tool to solve problems that require numeracy skills [6]. In everyday life, we will certainly encounter various problems related to calculations. Starting from time, work, and money, everything requires calculation. Counting is the basis of several sciences used in everyday life, such as addition, subtraction, division or multiplication [7],[8]. Counting skills require thinking abilities [8]. For example, in a class lesson, a teacher delivers material and then gives math problems that require students to be skilled at calculating. In reality, it is impossible for students to finish answering the problem at the same time. Some students are fast, some are slow because they have different levels of thinking.

Considering the importance of mathematics as a field of science that plays a very important role in everyday life, learning will be felt more comfortably if it is linked to the context of everyday life [9]. Mathematics learning is more meaningful and realistic so that students can grasp the relationship between learning experiences at school and real life. In this way, the material studied will be firmly embedded in the student's memory. There is a lot of mathematical material that can be linked to the context of everyday life in understanding it, one of which is geometry material.

One of branch from knowledge mathematics is geometry [10],[11]. Knowledge Geometry literally means measuring the earth, namely the science that studies things learn about points, lines, planes and space objects and their properties, their sizes, and their relationship between one and another [12],[13]. Seen from his role, knowledge geometry very needed among We, especially in construction building, architecture, as well as art building. In Islam knowledge Geometry is very useful in making building art, especially for calligraphy, Islamic architecture (mosque buildings) as well architectures other. Geometry take role large enough in development artworks on civilization Islam [12],[14].

Geometry played a large role in the development of works of art in Islamic civilization. Therefore, we can see the development of Islamic civilization Lots applications from draft geometry on field art Islam Wrong the only one art calligraphy. Art calligraphy is art writing Which beautiful Which growing in countries inheritance Islam culture Islam, calligraphy have styles (khot) that have distinctive forms include khat naskh, khufii, tsulust, diwani, farisi, riq'ah [15],[16]. In the art of calligraphy, geometric patterns such as circles can be used as calligraphic shapes and decorations which can produce distinctive beautiful decorations [17],[18]. In Islamic art, Islam has a rich heritage of combining geometric elements in architectural styles [19],[20]. It appears that the style of Islamic architecture is different from other architecture. Islamic architecture uses patterns in the form of lines, circles and other geometric patterns which are arranged to form a single unit which contains spiritual meaning and has a high level of aesthetic value or beauty [21],[22].

The field of Islamic art in Islamic architecture uses many patterns related to mathematics. Some students are less able to connect what they learn with how that knowledge will be used or utilized. One of the factors that influences students' difficulty in connecting the material studied with real life situations is that the mathematics learning and learning process that occurs has not been linked to real situations. Apart from that, the teaching materials used to present mathematics material are still limited due to the lack of development of teaching materials. In the learning process, currently there is a tendency that children will learn better if the environment is created naturally, that is, learning will be more meaningful if children experience for themselves what they are learning [6],[23]. Therefore, it is emphasized that the material taught is based on students' real world situations from material packaging, examples and problems related to students' daily lives or those in the environment around students.

Based on the results of observations at State Islamic Junior High School 1 Pringsewu, there are subjects related to Islamic religious art, namely khatilul Qur'an (calligraphy art). In this lesson, students are taught to write beautiful Arabic (calligraphy) using correct writing rules. Apart from that, students are taught how to create works with various patterns, such as contemporary calligraphy and calligraphy with circle patterns. Apart from that, based on the results of an interview with Mr Warsoyo, S.Pd as one of the mathematics teachers, he said that "The learning process at this school uses teaching materials in the form of printed books and student worksheet. The student worksheet has not been used yet There is Which hook exists form art calligraphy so that participant students are less able to connect mathematics learning related to mathematical geometry, especially the circle material that they study with the knowledge of calligraphy art that they also learn, and none of the teachers have developed student worksheet as teaching materials at the school.

Student worksheet is a learning tool that teachers can use to increase student involvement or activity in the teaching and learning process [24],[25]. In general, student worksheet contains practical instructions, experiments that can be carried out at home, material for discussion, and practice questions as well as all forms of instructions that are able to encourage students to be active in the learning process [26],[27]. There are many

ways that teachers can teach material that is memorable for students, from choosing teaching materials, learning models, teaching aids, learning media, and so on [28],[29].

GAP analysis from this research is research conducted by Zhang [30] who researches the art of calligraphy too. This research suggests that this integration provides benefits for beginning learners, engaging multiple senses simultaneously and improving their understanding of stroke order and character structure. In addition, these exercises serve to reposition calligraphy to its fundamental role in writing, thereby bringing students closer to the essence of the art of calligraphy and fostering a sense of accomplishment in their educational journey.

The novelty of this research is the research on the development of student worksheets based on calligraphic art on circle material, introducing an innovative approach to integrating artistic elements into mathematics learning, increasing student engagement and understanding. By conducting research on Circle Material Calligraphy Art-Based Student Worksheets, educators can explore new methods to enrich the curriculum, combining creativity with mathematical skills. Research regarding the development of calligraphy-based student worksheets on circle material is very important for creating more interesting and effective learning methods, which can help improve students' understanding of mathematical concepts. The urgency of this research lies in its ability to provide innovative solutions in mathematics learning, by utilizing the art of calligraphy to motivate students and enrich their learning experience.

The description above shows the need for research to develop learning tools, namely student worksheets. Therefore, researchers want to develop student worksheets based on the art of calligraphy. It is hoped that it will make it easier for teachers and students in teaching and learning activities, especially in circle material. So the researcher aims to develop student worksheets based on the art of calligraphy and determine the validity, practicality and effectiveness of the student worksheets that have been developed.

2. RESEARCH METHOD

2.1. Research Type

The type of research that will be carried out is research and development (R&D). Research and Development is a research method used to produce certain products, and test the effectiveness of these products [30]. The research aims to develop products and test the effectiveness of the products that have been produced. The product referred to in this research is an student worksheets based on the art of calligraphy on the subject of class VIII circles at State Islamic Junior High School 1 Pringsewu.

2.2. Research Subjects

The research subjects for developing student worksheets based on calligraphy art were class VIII students at State Islamic Junior High School 1 Pringsewu. The subjects of this research consisted of 29 class VIII students with the characteristics of evenly distributed mathematics learning abilities. The school was chosen as a research location because it had implemented K-13 and in the learning process the teacher had not yet developed the student worksheets optimally.

2.3. Data AnalysisTechnique

The data analysis technique in this research is to evaluate various aspects of the student worksheets being developed. First, to measure the validity of the student worksheets, a validation instrument data analysis technique using a Likert scale was used. Furthermore, to evaluate the practicality of the student worksheets, data analysis techniques were used based on student response questionnaires using a Likert scale. Finally, to measure the effectiveness of the student worksheets, data analysis was carried out based on a learning outcomes test consisting of 10 questions with the same weight. Learning outcomes test scores use a scale of 1-10. This allows teachers to provide a more detailed assessment of students' answers.

2.4. Research Procedure

The procedure in this research contains several steps. The first step is a needs analysis, which involves observing the conditions of mathematics learning and teaching materials at State Islamic Junior High School 1 Pringsewu, as well as identifying existing problems. Next, the second step is data collection, where learning tools such as syllabus, lesson plans and teaching materials used in learning are collected. After that, the third step is product design, where the initial product student worksheets based on calligraphy art for the topic of circles is created. This design includes components such as the student worksheets cover, table of contents, subtitles, competency standards, basic competencies, materials, discussions, conclusions and practice questions. This product is prepared in Indonesian.

The fourth step is design validation, where the initial product that has been created is consulted with a team of experts. Material experts, language experts and media experts provide input regarding the construction, didactics, technical aspects, size, skin design and content design of the student worksheets. After that, the fifth

step is design revision, where the student worksheets is improved based on input from previous validation activities. The sixth step is product testing, where the revised student worksheets is tested in learning activities. This trial involved class VIII students at State Islamic Junior High School 1 Pringsewu. Trials were carried out to test the practicality and effectiveness of the student worksheets, by collecting student responses through questionnaires and conducting learning outcomes tests.

Finally, the seventh step is product revision, where the results of the trial are used as input for making improvements and improvements to the calligraphy art-based student worksheets. If the student worksheets meets the practical and effective criteria, then the student worksheets is considered complete and ready to be used as a final product. However, if improvements still need to be made, then the test results will be the basis for making further improvements to produce an optimal final product.

3. RESULTS AND DISCUSSION

The result of the development carried out by this researcher was to produce a worksheet based on calligraphy art on the subject of circle class VIII at State Islamic Junior High School 1 Pringsewu which was valid, practical and effective. In developing student worksheets based on calligraphy art, the author used the research and development (R&D) method. The development model used in this research, namely the Borg nand Gall model in Sugiyono, includes: 1) Potential and Problems, 2) Gathering Information, 3) Product Design, 4) Design Validation, 5) Design Revision, 6) Product Trial, 7) Product Revision, 8) Usage Trial, 9) Product Revision, 10) Mass Production. In this study, the steps were limited to seven steps. The steps in developing student worksheets based on calligraphy art developed by researchers are as follows:

The potential for this development lies in the use of calligraphy art in class VIII circle worksheet at State Islamic Junior High School 1 Pringsewu, an Islamic religious school that implements the 2013 Curriculum. In learning khatilul Qur'an, students study various forms of calligraphy patterns, including circle calligraphy. However, learning at this school is still limited to printed books and student worksheets without integrating the art of calligraphy. As a result, students have difficulty connecting mathematics, especially circles, with the art of calligraphy. Teachers also have not developed student worksheets that combines these two aspects. Therefore, it is necessary to develop student worksheets based on calligraphy art so that students can link and apply knowledge of mathematical geometry in circle material with the knowledge of calligraphy art that they are learning.

After identifying potentials and problems, the next step is to collect important information in developing calligraphy art-based worksheet for circle material. In this process, researchers collect teaching materials from several printed books as sources for the product. Researchers do not change the content of existing material, but combine information from various sources and design it to meet didactic, construction and technical requirements.

After gathering information, the next step is product design. In developing calligraphy art-based student worksheets for class VIII circle topics at State Islamic Junior High School 1 Pringsewu, several steps were taken in preparing the student worksheets design. These steps include adjusting core competencies, basic competencies, and syllabus based on Curriculum 13, linking the circular form of calligraphy art with circular material, using A4 paper, Times New Roman letters, and 1.5 spacing.

The results of developing the student worksheets design include several elements, including:

a. Student worksheets Cover: The cover page is designed with the title, image, name of the author and identity of the student worksheets owner. The image on the cover is adapted to circle material and calligraphy art. This cover design aims to attract students' interest in studying the student worksheets.
b. List of contents
c. Student worksheets Sub Title
d. Supporting Information
e. Material
f. Student Activities
g. Conclusion
h. Exercises

Design validation was carried out by material experts to assess the suitability of teaching materials in the form of calligraphy-based student worksheets at the initial revision stage. The results of this initial validation include assessments from material experts regarding the didactic, construction, technical and quality aspects of the student worksheets material. For material expert I, a total score of 82 was obtained with an average of 4.1. In material expert II, a total score of 79 was obtained with an average of 3.95. Meanwhile, for material expert III, a total score of 81 was obtained with an average of 4.05. From the validation results, the average obtained from all validators was 4.03 with the category valid or suitable for testing.

Results by linguists for feasibility teaching materials in the form of student worksheets based the art of calligraphy in the initial revision stage. As for the results initial validation Which obtained from expert assessment Language Which cover aspect legibility obtain amount score 41 with average 4.1 with category valid/worthy tried out. Validation results by media experts for the suitability of teaching materials in the form of calligraphy-based student worksheets in the initial revision stage. The initial validation results obtained from the assessment of media expert I which included aspects of student worksheets size, student worksheets skin design and student worksheets content design obtained a total score of 79 with an average of 3.95 in the valid/feasible to be tested category, while media expert II obtained a total score 76 with an average of 3.8, resulting in an average score for all media expert validators of 3.88 in the valid category.

After validating the design by material experts, language experts and media experts, the next step is to revise the design. The assessment guidelines obtained from the validators are used as a reference in making improvements. The suggestions and input provided by the validators are then tabulated and implemented to improve the quality of the learning tools that have been developed. Design revisions were carried out with the aim that this learning tool could be implemented effectively. In this process, special attention is paid to aspects that need improvement, such as material content, clarity of language, layout, and use of appropriate media. This revision aims to ensure that the resulting learning tools meet quality standards and can provide optimal benefits for students.

After being revised based on validator suggestions, the product was tested at State Islamic Junior High School 1 Pringsewu with 29 class VIII students. At the first meeting, students are given a revised student worksheets, explaining its contents and instructions for use, and working on practice questions. Researchers also provided a questionnaire on student responses to the student worksheets. At the second meeting, students were given a learning outcomes test consisting of 10 descriptive questions. The trial results showed that the student worksheets based on the art of calligraphy was practical (average questionnaire score 4.19) and effective (class average 77.59, percentage of completion 79.31%). This product has gone through adequate validation, revision and testing, and is considered practical and effective in learning.

After a trial was carried out to evaluate the practicality and effectiveness of calligraphy art-based student worksheets on the subject of class VIII circles at State Islamic Junior High School 1 Pringsewu, this product was declared practical and effective without requiring further improvements. Therefore, the student worksheets can be used as teaching material for class VIII students in learning circle material. The development of this product has several advantages, including providing new knowledge insights to students, especially in terms of mathematical material by linking circles with forms of calligraphy art. However, there are drawbacks to this student worksheets, namely that it is not suitable for use by schools that have a low level of understanding of the patterns and forms of calligraphy art.

Development of worksheet based on calligraphy art on the topic of research and development circles has two objectives. The first objective in this development is to develop student worksheets based on calligraphy art on the subject of class VIII circles at State Islamic Junior High School 1 Pringsewu. The second objective in this development is to find out that the student worksheets based on calligraphy art on the subject of class VIII circles at State Islamic Junior High School 1 Pringsewu is valid, practical and effective. This student worksheets is prepared based on core competencies, basic competencies and achievement indicators in class VIII circle material. This student worksheets contains a circle of calligraphy art related to circle material, mathematician figures, words of wisdom to motivate students taken from various sources.

Meanwhile, research into the development of student worksheets based on calligraphy art on the subject of class VIII circles at State Islamic Junior High School 1 Pringsewu uses the Research and Development (R&D) development method. In this development, to produce the developed student worksheets product, the researcher used 7 steps using the Borg and Gall model in Sugiyono, namely: 1) Potential and Problems in this research, the problem is that learning has not linked the art of calligraphy to the subject of circles, whereas the potential research is carried out at State Islamic Junior High School 1 Pringsewu because there is already learning about the art of calligraphy and using curriculum 13 in circle material. 2) Collect information as a reference source in this research. 3) Product Design, 4) Validation Product design includes validation tests carried out by material experts, language experts and media experts. 5) Design revisions are carried out if there are input and suggestions for improvement to produce a product that is valid and ready to be tested. 6) Product trials were carried out at State Islamic Junior High School 1 Pringsewu with a total of 29 students. 7) Revision of products if there was no/lack of practicality and effectiveness of the student worksheets according to suggestions student responses and student learning outcomes tests. The reason researchers limit themselves to only seven research and development steps is because of the researchers' limitations.

The validation results in stage I were carried out by material experts, media experts and language experts. The assessment results for material experts reached an average of 4.03, the results for media experts reached an average of 3.88 and the language assessment 4.1, resulting in an average score of 4.00 from all experts and obtaining a valid category. In stage I validation, suggestions for improvement were given to produce a better product, so the researcher revised the product being developed. After carrying out revisions, the

researcher carried out phase II validation. The results of the stage II assessment for material experts reached an average of 4.18. The results of the assessment for media experts reached an average of 4.5 and the language assessment reached 5, resulting in an average score of 4.56 from all experts and obtaining a very valid category.

The research conducted was tested on class VIII students at student worksheets with a total of 29 students. In the practicality test of a product, an average score of 4.19 was obtained based on the average student response questionnaire and in the effectiveness trial, a class average of 77.59 was obtained and the percentage of completion of the student learning outcomes test was 79.31, namely based on the learning outcomes test. Based on the statement above, it can be concluded that the student worksheets based on calligraphy art on the subject of circle class VIII at State Islamic Junior High School 1 Pringsewu which was developed meets the criteria of being very valid, practical and effective.

Research regarding the development of calligraphy-based student worksheets on circle material has several limitations that need to be considered. First, students' levels of understanding of the art of calligraphy may vary, so the effectiveness of worksheets may be uneven among students with different backgrounds. Second, the availability of resources and tools needed for learning calligraphy, such as special pens and calligraphy paper, may be limited in some schools. Third, integrating the art of calligraphy into mathematical material such as circles requires an innovative teaching approach and sufficient time to ensure students can understand both aspects in depth. In addition, evaluating the success of these calligraphy-based worksheets requires a holistic assessment method, which not only assesses students' mathematical abilities but also artistic skills, which may add complexity to the assessment process.

4. CONCLUSION

Based on the results of the research and discussion that have been described, it can be concluded that in this research a worksheet for students based on the art of calligraphy in circle subjects has been developed using the Borg & Gall method, a research and development method consisting of 7 stages. These stages include potential and problem analysis, information gathering, product design, design validation, product revision, product testing, and product revision. Judging from the aspect of validity, the students' worksheet based on calligraphy art on the topic of class VIII circles was declared valid based on the assessment of material experts, media experts and language experts. The average score of all validators is 4.56 in the very valid category. Viewed from the practical aspect, student worksheets based on the art of calligraphy in class VIII circle subjects were declared practical based on student responses in the questionnaire. The average student response score was 4.19 in the practical category. Judging from the results of student learning tests after using student worksheets, student worksheets based on the art of calligraphy in class VIII circle subjects were declared effective in the learning process. The average student learning test score was 77.59, and the percentage of student learning achievement test completion reached 79.31 in the good category. Recommendations for further research are to develop a holistic assessment method that is able to assess mathematics and art skills simultaneously, so that it can measure the effectiveness of calligraphy-based student worksheets more accurately. In addition, further research should also include broader trials involving various levels of education and student backgrounds to identify factors that influence the successful implementation of this worksheet.

ACKNOWLEDGEMENTS

We would like to express our deepest gratitude to all parties who have contributed to this research, especially the participants and fellow researchers who have worked hard. Without your support and cooperation, this achievement would not have been possible.

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