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Developing pop-up book teaching materials on polyhedron to improve junior high school students' mathematical literacy

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Abstract
This research was motivated by the problems found at SMP N 1 Bantul, a junior high school in Bantul Regency, Yogyakarta, which were obtained by conducting interviews with mathematics teachers. We found that there were still many students who had not received good stimulation in cognitive development at the concrete stages so when entering the formal stages students have difficulty making reasoning into more complex problems where this reasoning will affect students' mathematical literacy skills. Besides, they also lack teaching materials especially in grade 7 due to using the new curriculum. One of which is the material of polyhedron which only explains concepts in general and does not explain further than the elements, content, and spatial components as well as the visualization of geometric shapes. This study aims to develop pop-up book teaching materials on polyhedron to improve the students' mathematical literacy skills. This development research used the analysis, design, development, implementation, and evaluation (ADDIE) model involving students of class VII-A in the testing. Before conducting testing in the classroom, the teaching materials, pretest, and posttest were validated by experts. The results are: (1) scores of material experts and media experts gave a valid result; (2) the students' and teachers' responses to teaching materials gave practical testimonies; and (3) there was an average increase from the pretest to posttest results at 25.49 points.

Keywords: mathematical literacy, polyhedron teaching material, pop-up book

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INTRODUCTION

Industrial Revolution 4.0 is a revolution that demands all countries change their mindsets and human resources for the better be marked with technology the more advanced And automatic life all humans will be affected by this revolution (Suwardana, 2018). Therefore, the Indonesian government prepared itself through existing education by creating various policies, including the existence of Curriculum 13. Then after that, it was revised into the Independent Curriculum and implemented the Movement Literacy National (Santika, 2021).

Through policy of Kampus Merdeka, the government expects two aspect indicator Which later improved by students in Indonesia, including an increase in the literacy of future students to not only can read but also can understand situations. Besides, students need to also be good in numeracy with the hope that students will be able to use and calculate number well (Marisa, 2021). The National Literacy Movement aims to: improve students' literacy skills and its implementation is one of them carried out in schools so that students have high

knowledge. One science that must be studied by the society to be able to prepare high quality human resources is mathematics.

Mathematics is the knowledge that teaches about numbers through the use of method logic, where the objective of the learning is to stimulate students' reasoning and practice skills students in forms related to mathematics (Rahmah, 2013). One of the mathematics purposes is to increase reasoning and in-depth understanding, namely by making efforts to improve students' mathematical literacy abilities. Mathematical literacy is the human ability to use mathematics in everyday life to solve problems (Kusumawardani, Wardono, & Kartono, 2018). This is a reference that mathematics and mathematical literacy are important components that must be learned. The components of mathematical literacy are communication, mathematization, representation, reasoning, strategic thinking, and the use of symbols and operations, as well as tools (Rodhi, 2021). This indicator must be met by students so that students can represent good mathematical literacy.

This is inversely proportional to the reality obtained from the results of introduction to the school field 2 at once observation during one month from 10 August 2022 – 10 September 2022 and interview with the 7th-grade mathematics teacher at SMP Negeri 1 Bantul. From the interview, there are still many students who have not received stimulation. The stimulation is good for the development of cognitive on stage concrete which is when students aged 6 - 12 years or on moment school base, so that on moment enter stage formal student difficulty For reason to problem more complex problems where this reasoning will influence ability literacy mathematical student; 2) material teach Which not enough complete especially in grade 7 mathematics learning; 3) on spatial building material side flat nor get up room side curved which should represent reasoning in the teaching materials used in this school only explaining the concept, in general, does not explain further than the elements, content, and the components of the spatial structure and visualization of the spatial structure are still insufficient so that students do not understand; 4) the questions given in the material The teaching is too complex even though there are still many students who don't get it stimulation development cognitive And reasoning in stage previously.

To fix some of the problems above, teaching materials need to be completed and the students' cognitive development and mathematical literacy need to be improved. Students so that later they can solve a variety of more complex problems. Therefore, we develop pop-up book teaching material for junior high school students to learn polyhedron.

RESEARCH METHOD

Study development This research uses model Analysis, Design, Development, Implementation, and Evaluation (ADDIE) with research subjects namely students in class VII – A of SMP Negeri 1 Bantul. before testing Try it in class, teaching materials and pretest-posttest questions must be validated first and go to material experts, media experts, and experts pretest-posttest. After being assessed validity, then proceed with testing the teaching materials in class small and class great for response students the related material taught which are already developed and do a pretest-posttest to know the improvement of abilities of students' mathematical literacy.

As for method And instrument collection data on the study This carried out by conducting observations, interviews, and distribution of questionnaires to students as well as tests using data analysis techniques, namely regarding the validity of teaching materials that use references from (Fuada, 2019) and references from (Irsalina, 2018).

Table 1. Scale Valid And Practical

Intervals	Criteria
$81\% \leq Va \leq 100\%$	Strongly Valid
$61\% \leq Va < 81\ \%$	Valid
$41\% \leq Va < 61\%$	Acceptable
$21\% \leq Va < 41\ \%$	Poor
$0\% \leq Va < 21\ \%$	Not Valid
Intervals	Criteria
$81\% \leq P \leq 100\%$	Very Practical
$61\% \leq P < 81\ \%$	Practical
$41\% \leq P < 61\%$	Acceptable
$21\% \leq P < 41\ \%$	Poor
$0\% \leq P < 21\ \%$	Not Practical

Apart from the validity and practicality of teaching materials, pretests are also carried out before the posttest to see the enhancement of mathematical literacy from the average whole pretest score and posttest student.

RESULTS AND DISCUSSION

For initial stage, the research starts with analyzing the need for learning. After that, we start collected literature and questions related to polyhedron which contain elements of mathematical literacy. So make design covers with use corel draws 2021. After that, the elements that have been collected related to teaching materials, starting from the foreword, list content, instruction use, profile student Pancasila, achievements learning and channel objective learning, map draft, introduction to polyhedron, build space in everyday life, cube material, beam, prism, pyramid, comparison size get up room side flat, summary, practice questions, discussion, glossary, bibliography, and profile writer. Stage furthermore that is stage printing and stringing from a design that will be formed into a pop-up book (See Figure 1).

The validation process for this teaching material was carried out by 3 experts, namely: material experts, media experts, and description experts. Results from media experts, experts' material, and expert descriptions show that the teaching materials and questions are very valid and can be tested with 2. Development material teach This gets results validation with results very valid from expert media as big as 95.88% And expert material as big as 93.09% so that material teach pop-up book can tested in class.

On evaluation, practicality obtained results that response Teacher And Student responses regarding this teaching material received very practical responses with the results of the practicality of pop-up book teaching materials on building materials This flat side received very practical assessment results

from teachers with results amounting to 100% and students amounting to 87.55% so that it can be utilized moment learning.

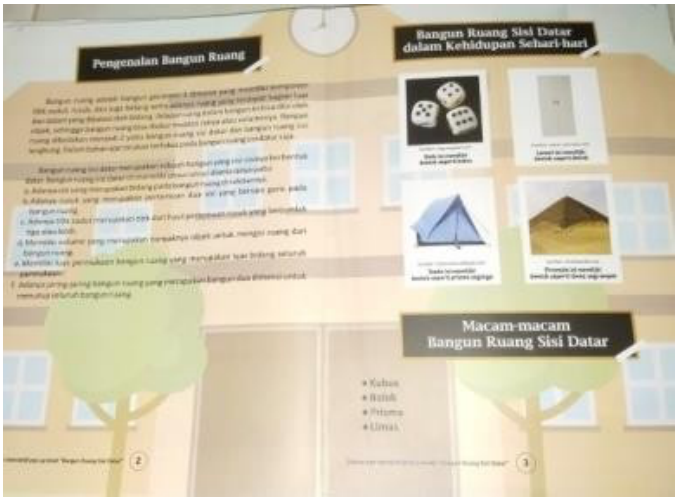

Figure 1. Pop-up book on polyhedron

As for the aspect of increasing mathematical literacy, there are 3 indicators used as assessment material in the pretest and posttest, namely indicators of reasoning and argument, strategy solution problem, and use of symbols. Students get 2 points if they can use indicators in a way appropriate. On the pretest, there are 3 problems consisting of 1 planar geometry and 2 solid geometry. While in the posttest, there are 4 geometric problems. On the assessment pretest average obtained by the student in a way whole as big as 60.74 and on the evaluation posttest average obtained by the student overall, namely 85.08. From the results of these two averages, there is an increase in score of 24.33.

CONCLUSION

The conclusions from developing the pop-up teaching materials book on polyhedron material, as follows: (1) scores of material experts and media experts gave a valid result; (2) the students' and teachers' responses to teaching materials gave practical testimonies; and (3) there was an average increase from the pretest to posttest results at 25.49 points.

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