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Abstract

This study aims to examine the needs of students in MTs Negeri 2 Ngawi, especially Class VII, for PBL-based science learning modules to improve HOTS. This development research method is R&D (Research and Development), which is adapted from the development of a 4-D model (Define, Design, Develop and Disseminate). However, this research is limited to the Define stage, which is carried out by analyzing learning procedures. The objects of this study were MTsN 2 Ngawi science teachers and class VII students who had studied temperature and heat material. Based on the questionnaire from students, it can be concluded that 90% of students believe in the need to develop teaching materials. While the questionnaire given to teachers found the result that learning in the classroom seemed to be monotonous so that it did not support the ability of students to think at a high level, it was necessary to have teaching materials or modules as support because the books provided by the government were inadequate. In conclusion from the results of the questionnaire of students and teachers, as well as the cognitive learning outcomes of students, it is necessary to develop modules related to Temperature and Heat. The development of problem-based learning modules (PBL) is a method for teachers to improve the learning process of students, especially in terms of fostering higher-order thinking skills (HOTS).

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INTRODUCTION

Education is one of the elements that a country must have to ensure its long-term survival by increasing its potential, quality, and human resources (Dewanti, 2019). Education is a form of realization of human cultural development that will occur continuously. This matter is by Law No. 20 of 2003 concerning the National Education System, which states that "national education functions to develop abilities and form a dignified national character and civilization to educate the nation's life, aiming to develop the potential of students to become human beings who have faith and piety in God, healthy, knowledgeable, capable and creative, independent, as well as being a democratic nobleman". Science education must be learned and mastered by junior high school students listed in the 2013 Curriculum because when students master the material they can apply it in daily life (Septiani, et al, 2019). Learning with the scientific process can improve the abilities of students in the future (Zuriyani, 2013). To improve human quality by expanding learning, namely by improving and developing teaching materials or modules.

Based on interviews conducted with science teachers at MTsN 2 Ngawi, Mrs. Warsiyem S.Pd. said that in her learning science is classified as a subject that is not in demand by students because there is so much material and questions with monotonous presentations. This is also supported based on the results of the questionnaire that was distributed to students and they all stated that science is one of the subjects that is avoided. Students want to provide learning materials, especially science with more interesting presentations. They strongly agree that they are given a learning media in the form of a science module as support in taking science learning.

Modules are divided into two categories, namely modules that are printed and digital modules (Dewi et al., 2017). Modules are used so that students can learn independently (self-instruction) because they contain teaching concepts that are easy to understand, as a result of making them active in the learning process (active learning). According to Fitri (2017), "modules can also be a learning resource for students because there are LKS and learning activities in them". The language of the module is also simple. Modules are arranged systematically as a result of which students can follow instructions and complete activities convincingly.

Modules are designed with a variety of interesting learning activities to encourage student participation in learning activities. PBL (Problem Based Learning) or the problem-based learning model is one of the learning models used in this study. The PBL learning model has several benefits, including 1) challenging the ability of learners to acquire new knowledge; 2) increasing student motivation and learning activities. 3) Assist learners with knowledge transfer to the real world, 4) Facilitate the development of knowledge and a sense of responsibility for learners 5) Develop critical thinking skills and the ability to adapt to new information, 6) Provide opportunities for learners to apply their knowledge in the real world, and 7) Foster learner interest. 8) Facilitating mastery of student problem-solving concepts (Priatna, 2019).

Researchers chose the PBL learning model to develop this module because the PBL learning model can improve the higher level of thinking ability (HOTS) of students (Luciana, 2016). Learners must have quality and strong human resources, and the ability to think at a high level to solve the problems faced (Khoiro, 2019). The urgency of the need to increase HOTS for learners was conveyed by Saido, G.M. et al (2015) based on the research they conducted. Uswatun (2019), found that "PBL (Problem Based Learning) affects the High Order Thinking Skills (HOTS) of students". This is supported by research conducted by Fahri et al. (2018) which shows that "the results of problem-solving skills using the PBL (Problem Based Learning) learning model are superior to students who apply the direct learning model in their learning". Sofyan and Komariah (2016) in their research obtained a response from lecturers that PBL learning is learning that is easy to plan and can support learning that is in line with a scientific approach per the application of the 2013 curriculum. According to research by Heri Retnawati (2016), "the use of problem-based learning tools is effective to improve HOTS, and problem-based learning is superior to in-person learning to improve HOTS".

HOTS (High Order Thinking Skill) or commonly referred to as higher order thinking ability is a type of thinking that requires a high-level cognitive hierarchy from Bloom's Taxonomy, including analyzing (C4), evaluating (C5), and creating (C6) (Anderson & Krathwohl, 2010). While the other three cognitive domains, namely remembering (C1), understanding (C2), and memorization (C3) are the stages of low-level intellectual thinking or LOTS (Low Order Thinking Skill) (Sani, 2015). Low thinking ability is not the need of the 21st century, one which requires high-level thinking skills (Osman et al., 2013), (Turiman et

al., 2012). Rofiah (2013), explained that "High Order Thinking Skill (HOTS) is a thought process that goes beyond memorization and fact reading". HOTS must also be carefully designed according to the student context and teaching materials (Nugroho, 2018).

Temperature and heat were selected as the subject matter for research and development of learning modules to improve HOTS. The selection of material is based on several factors, including the results of daily tests, the student's scores on temperature and heat materials are not satisfactory, and there are still many students who do not pass in understanding the material as a whole. When learning, most learners only remember the questions and examples given by the teacher. The science teacher of class VII stated that the students are not used to thinking at a higher level, because they can solve the problems that have been demonstrated by the teacher, but the difficulty when the context of the problem is changed to a more difficult level. When learning Temperature and Heat, learners are given questions that require a higher level of thinking ability (HOTS), but few of the learners answer correctly. Teachers only convey knowledge based on general teaching materials, without bringing up problem-solving related to science, especially in temperature and heat materials. Students do not all have teaching materials due to the limitations of schools that do not provide them, as a result of which students have to look for their books as their learning resources. This causes the books that learners have to differ from each other. In addition, the existing infrastructure in schools is not used optimally due to the limited time of the subjects that take place.

METHODS

This research is a component of development research (R&D/ Research and Development) as a result of the adaptation of the 4-D model (four-D models) proposed by Sivasailam Thiagarajan, Dirothy S Semmuel, and Melvyn I Semmuel (1974). This study examines how problem-based learning modules (PBL) improve student HOTS. This research is a define stage activity that establishes and explains the needs of development research. This study only analyzed the learning process of MTsN 2 Ngawi at the Define stage to find out and collect preliminary data from the study.

The define stage consists of 5 activities, namely: initial analysis, student analysis, concept analysis, task analysis, and specification of learning objectives. The initial analysis stage is used to collect information about learning carried out in the classroom so that problems are finally found in the classroom. The student analysis stage is used to find out the characteristics of the learners so that appropriate methods can be determined for learning. The concept analysis stage is used so that students can master the concepts that will be given in the concept map. The task analysis stage is carried out to determine the material and competencies that must be achieved in learning. The last stage is the specification of learning objectives, which is to determine the objectives of learning the material studied.

This series of define stages was carried out to a science teacher and 30 students of class VII MTsN 2 Ngawi, East Java who had studied temperature and heat material but still did not fully understand the material because of the material he considered difficult. This stage also analyzes the needs of teachers and students to find out what is needed in learning.

RESULTS AND DISCUSSION

The first stage of development carried out is the defining stage (Define). At this stage, the researcher conducts an analysis of development needs through literature studies or preliminary research. The results of the literature obtained a determination that the accuracy of the use of learning strategies has an impact on higher-order thinking ability (Mustapa, 2014).

This initial analysis stage was carried out using observations of the school where the research was carried out, based on observations made with science students and teachers, it was found that science was one of the lessons that were difficult for students to understand, besides that limited media and the use of reference books in learning was still limited.

The student analysis stage is carried out for class VII MTsN 2 Ngawi students by looking at the learning results so far by showing the scores of the exam results that have been carried out by previous students. At this stage, it was found that more students who have not been able to learn using problem-based models are proven by the grades shown by the teacher on the problem-solving criteria, but the students are still lacking. Therefore, researchers take a problem-based model or PBL,

Task analysis, this stage is carried out by researchers by adjusting KI (Core Competencies) and KD (Basic Competencies) by the 2013 curriculum as the basis for determining the content of the material. The material taken by the researcher is temperature and heat.

Concept analysis, at this stage a concept map is made that is used for later science learning to be more targeted when in the classroom.

The last stage is the specification of learning objectives, from all the series of analysis stages that have been carried out, it can be concluded that the purpose of this study is the development of a PBL-based science learning module on temperature and heat material for students of class VII MTsN 2 Ngawi.

Meanwhile, based on the results of the development needs analysis from the questionnaire given to 30 students, around 48% of students have not completed science learning on Temperature and Heat material, which is indicated by their daily test scores. This is due to the limited number of books and other learning resources that can improve students' higher-order thinking skills (HOTS) and learning that only emphasizes remembering and not HOTS. 90% of students are not interested in science lessons, because their learning has not been adequately supported and seems monotonous. Therefore, 100% of students believe in the need to develop additional teaching materials. This is in line with research conducted by Tyas Deviana (2018), which states that teachers need teaching materials that can meet the learning needs of individual learners and bathe but are adapted to the surrounding environment. The availability of package books in schools still raises problems for students, so teachers and students need teaching materials in the form of modules to support books at school, Riawan (2020).

Based on the results of the teacher needs analysis questionnaire, science learning has been running well, laboratory facilities are already in place, learning support books are available even though the number is limited as a result of hindering optimal classroom learning, and teachers have never made modules with temperature and heat materials. Only government-published Integrated IPA package books are used as guides. Classroom learning still seems to be teacher-centered and students' abilities limited such as remembering and memorizing, especially if there are daily tests, as a result of which students are less involved in learning activities. Learning has not implemented models that hone learners' high thinking skills (HOTS), such as problem-solving. In fact, according to Arsal (2017), learning involves several components including humans and the use of media or learning resources that can support the learning process so that the objectives of the learning process can be achieved.

Based on the results of the questionnaire of students and teachers, as well as the cognitive learning outcomes of students, it is necessary to develop modules related to Temperature and Heat. The development of problem-based learning modules (PBL) is a method for teachers to improve the learning process of their students, especially in terms of

fostering higher-order thinking skills (HOTS). This is supported by research from Merinda (2021) which states that the development of learning tools based on PBL (Problem Based Learning) is very feasible to be used to improve HOTS (Higher Order Thinking Skills). Research conducted by Widyarti, et al (2019), obtained the average score of higher-level thinking skills of students who were taught with a problem-based learning model was 75.89. 40.74% are in the category of excellent high-level thinking skills, 40.74% are in a good category and 18.51% are in the category of high-level thinking skills are sufficient.

CONCLUSION

Based on the results of the questionnaire analysis, it is necessary to develop a Temperature and Heat material module with a problem-based learning model (PBL) to improve the HOTS of students. It is recommended that this science development module be given to junior high school students because researchers limit the production of modules at this level.

SUGGESTION

For teachers, it is recommended to use modules and teaching materials that are following the material needed by students. Schools, it is expected to provide materials for learning needed by teachers. Students are expected to be more active and active in learning activities.

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