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DEVELOPING OF STUDENT WORKSHEETS BASED ON INQUIRY IN TEMPERATURE AND HEAT MATERIAL IN CLASS XI ACADEMIC YEAR 2020/2021

Tiovani Ariesta Pasaribu dan Muhammad Kadri
Department Of Physics Education Faculty Of Mathematic and Science State University Of Medan
ariestapasaribu16@gmail.com, kdrmhmmd8@gmail.com
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ABSTRACT

This study aims to develop inquiry learning-based physics worksheets on the material of temperature and heat. The subjects in this study were students of 11 grade sciences Nasrani Private School 3 Medan totaling 20 students. The research method is Research and Development (R&D) using 4D (Define, Design, Develop and Disseminate) development model by S.Thiagarajan and Semmel (1994). The instruments used consisted of a material expert validation questionnaire, learning experts, a teacher assessment questionnaire in the field of study, and a student response questionnaire. The data analysis technique used is descriptive. The results of data analysis obtained validation of material experts by 85%, learning experts by 65%, teacher assessments by 87%. The response of students in a limited trial with a sample of 5 people was 74% included in the good criteria. Meanwhile, in the wide trial, the percentage of student responses with a sample of 20 people was 91.5% with very good criteria for learning process.

Keywords: *development, student worksheets, inquiry learning, heat and temperature.*

INTRODUCTION

Physics learning is learning that links scientific theory and scientific experiments that support this theory. One of the teaching materials needed is the Student Worksheet. The use of worksheets in classroom learning has not been effective because worksheets are only used at certain times. One of them is when asking the teacher to ask students to solve the questions that have been available in the worksheet, and to do it in groups. As a result, students who have lower abilities to work on questions and choose to wait for answers from other friends. Students also stated that sometimes they did not understand the material being studied but did not want to ask questions because they were lazy.

Worksheets that are usually used during classroom learning are also not made by the teacher because the teacher does not have enough time to make worksheets. The worksheets in circulation only contain the title of the material, a summary of the material, and practice questions. The worksheet does not display the investigation activities that will be carried out by students but instead directly addresses the problem.

Even though currently teachers are required to teach more creatively and less boringly. To create this, teachers must be good at innovating in the use of learning models that suit the needs of students, and be able to use

learning resources and teaching materials well so that students can understand the material well.

Development research methods are research methods used to produce certain products, and test the effectiveness of these products.

This research purpose were: 1) to know the feasibility level of 11th-grade Inquiry-based Physics worksheet on Calor and Movement material developed. 2) to know the responses of teachers and students to the Inquiry-based Class XI Physics Worksheet on the temperature and heat material developed.

RESEARCH METHODS

This type of research is research and development (R&D) with the aim of developing worksheets for physics students on inquiry-based temperature and heat material. Research and development as a process for developing and validating products that will be used in education and learning.

The 4D development model consists of 4 main stages, there are: Define, Design, Development, and Disseminate. Define stage is to define and design good requirements. Design, the purpose of this stage is to design teaching materials in the form of prototypes. Development, this stage is the stage for producing a development product. Disseminate this process is the final stage of development.

The populations of this study were Senior High School Nasrani 3 Medan and the objects research were students of sciences 11th-grade. There are 20 students. The research instrument in this development research is a product assessment instrument that has been developed by researchers. In this study, researchers used data collection instruments in the form of a questionnaire or questionnaire.

The instruments used in this study were: (1) teacher interviews in the field of physical studies and initial questionnaires for students as a preliminary analysis and student analysis; (2) questionnaire for assessing student worksheets and student analysis; (3) Questionnaire validation of the expert team. Student worksheets. (4) Questionnaire for Testing Student Worksheets.

The data obtained in this study are quantitative and qualitative data. Quantitative data in the form of scores of answers to assessment questionnaires from validators to products developed by researchers, namely inquiry-based student worksheets on temperature and heat material, while qualitative data in the form of responses and suggestions given by validators, teachers, and students about student worksheets developed namely sheets Inquiry-based students work on temperature and heat material.

The data analysis in this research is descriptive, where the data analysis technique is divided into two parts, namely:

a. Analysis for the results of the expert validation questionnaire
b. Analysis of the results of teacher and student or student questionnaires.

RESULT AND DISCUSSION

a. Research Results

The results of this study describe the results of the development of student worksheets on the subject matter of temperature and heat according to the needs of the physics learning experience in high school/MA. Developed and the results of responses by teachers and students. The process of developing Student Worksheets for Temperature and Heat material based on Inquiry Learning as physics teaching material for high school is carried out in stages according to the development model, namely the definition, planning, and development stages.

Based on the observation of the questionnaire and teacher interviews, problems were found were students are usually given worksheets that only contain evaluation questions of the learning material without being accompanied by experimental worksheets, so students do not know how to experiment to find answers from problems in learning; Student worksheets provided from the school are not the result of the development of the school teacher, but student worksheets obtained from publishers that have provided the learning

model used in the learning process are not integrated with the student worksheets used: and the display of student worksheets is also not interesting. Even though in reality, the development of students' abilities in the learning process is so fast, so it is time for students to find their own answers to a problem through experiments and teamwork so that students can more easily understand the concepts of temperature and heat material being taught. In the analysis stage, students aim to examine student characteristics as objects of using the developed student worksheets. In general, high school students have started to think critically, especially those who are smart. The student characteristics analyzed were student competence, attitudes, language, and students' tool skills.

Define stage is the initial stage in compiling student worksheets to define and define learning requirements. At this stage, the researcher identified the essential problems faced by students and teachers in learning through interviews and observations at Senior High School Nasrani Private School 3 Medan. Based on questionnaires distributed to students and interviews with teachers, researcher found essential problems that need attention in learning.

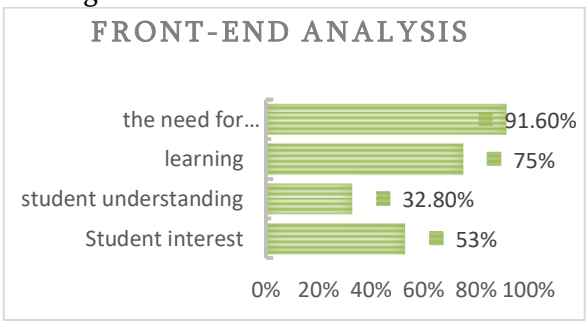

Figure 1. Diagram of front-end analysis results for students.

Based on these data, it is known that there is a gap between students' interests and understanding of the material temperature and heat. High enough student interest should be able to have a positive influence on students to more easily understand the temperature and heat material, but the fact that the researchers encountered was not because students' understanding of the temperature and heat material was still in the low category. If viewed from the student learning experience, it can be seen that the student learning experience is still low, this is because the student worksheets provided by the teacher do not contain work steps that can be used by students as instructions in solving heat and temperature problems, so that they can see that the student's need for the development of student worksheets is very high.

Design stage, the researcher chooses the material that is in accordance with the syllabus used at Nasrani Private School 3 Medan. The material presented and developed in the student worksheets based on Inquiry Learning in class XI material for temperature and heat. The next step is to collect material from various accurate sources to enrich the information in the book. The material contained in the temperature and heat student worksheets consists of definitions of temperature and heat, changes in substance form.

Research instruments compiled and designed by researchers and thesis supervisors to obtain information that can be used as a basis for determining the feasibility of products and material expert lecturers and learning experts as well as teacher and student responses. The composition of the instruments that have been designed and validated is as follows: (1)The assessment sheet by material experts consists of 20 questions. (2)An assessment sheet by learning experts consisting of 20 questions. (3)Teacher responses in the field of study consisted of 20 questions. (4)Student Response Questionnaire consisting of 20 questions.

At this stage all input from the supervisory lecturer review has been corrected and ready to be validated to material expert lecturers and learning expert lecturers starting from the cover display, and some incorrect writing and image layout.

Figure 2. Cover display before repair

Figure 3. Cover display after repairing

Development stage, at this stage the researcher has produced a product that has been planned to be developed. The things that are done at this stage of development include: assessment by material expert lecturers, assessment by learning expert lecturers and responses from teachers and students.

Based on the results of the material expert's assessment, the student worksheets that have been developed by the researcher are expressed as a percentage, so the content feasibility gets a percentage of 81.80%, presentation feasibility gets 88%, graphics 100% and 80% readability. Then the average presentation is 85%. If it is matched with the eligibility criteria table, this achievement score is included in the very feasible criteria. It can be concluded that the students' worksheets that have been developed are stated in physics learning at 11 grade at Nasrani Prvate School 3 Medan, which can be continued at the teacher and student feasibility trial stage.

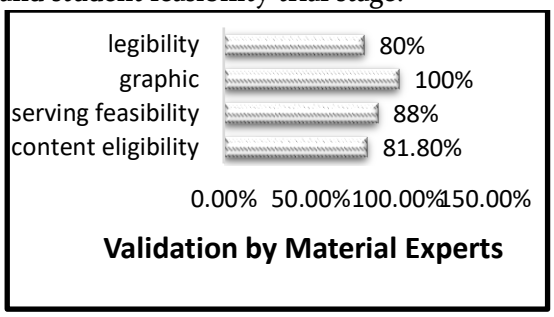

Figure 4. Results diagram of eligibility level worksheets of students by material experts.

Based on the results of the learning expert's assessment, the student worksheets that have been developed by the researcher are expressed as a percentage, the feasibility of the content gets a percentage of 73.33%, the feasibility of inquiry-based presentation learning gets 77%, 80% graphics and 85% readability. Then the average presentation is 74%. If it is matched with the eligibility criteria table, this achievement score is included in the very feasible criteria. It can be concluded that the students' worksheets that have been developed are stated in physics learning in grade 11th of sciences class on senior high school Nasrani 3 Medan, which can be continued at the teacher and student feasibility trial stage.

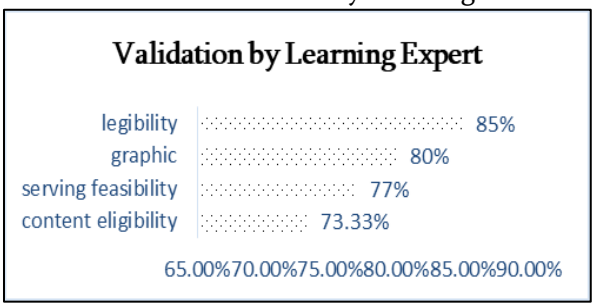

Figure 5. Result diagram of feasibility level worksheets of students by learning experts.

After making revisions and the product is declared valid by material experts and learning experts, then the product is given to the teacher to respond to the product. The teachers response serves to obtain information that will be used to improve the quality of the temperature and heat student worksheets that have been developed. Where the teacher who became the respondents are 3 people. Based on the results of the assessment of the teacher in the field of study, the student worksheets that have been developed by the researcher are expressed as a percentage, so the students' worksheets get a percentage of 80%, content eligibility gets 77%, presentation feasibility is 93%, graphics are 92% and readability is 90%.

Then the average presentation is 86%. If it is matched with the eligibility criteria table, this achievement score is included in the very feasible criteria. The purpose of giving student worksheets to the teacher is to adapt to student development because the development of students in the class is better known by the teacher who teaches in the class.

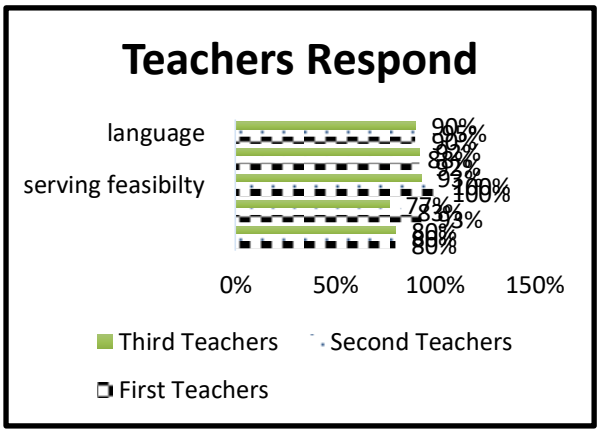

Figure 4.11. Diagram of the teacher response results.

b. Final Product Discussion

Researchers used the Research and Development (R&D) development methodology. In this study, it only reached the development stage, namely the large group test. The student worksheet developed by the researcher consists of three parts, namely: the introduction, content, and closing pages. The introductory page section consists of a cover, a foreword and a table of contents, the second part (content) consists of Temperature and Heat material, learning steps according to inquiry learning and questions, and the third part in the form of independent questions and bibliography. In the assessment process, inquiry learning-based students' worksheets on the material of temperature and heat received an assessment in the very good category from the material expert lecturer, namely 85% by making some improvements. Things that are fixed according to the material expert are in the form of writing, adding sample questions, and practice questions to strengthen students in understanding the material before starting practicum.

The assessment from the learning expert lecturer also provides an assessment with a decent category with a score of 65%. The process of revising the worksheets of temperature and heat students based on inquiry learning by learning experts provides improvements, namely improvements in typing.

The teacher's response to the inquiry learning-based student worksheets on the temperature and heat material of the 20 indicators provides an assessment that is included in the "very good" category with a percentage of 86%. Thus the product developed is suitable for use in learning physics at Nasrani Private School 3 Medan.

CONCLUSIONS AND SUGGESTIONS

Based on the results of the research and discussion that has been described, the conclusions in this study are as follows: An Inquiry Worksheet has been developed with the material of Temperature and Heat. The development of Inquiry Learning-based worksheets, with the materials of Temperature, and Heat, has gone through the stages of define, design, and development. It can be concluded that the worksheets are feasible to be used in the learning process. Based on the results of material expert validation with an average percentage of 85% with very feasible criteria, and learning expert validation with an average percentage of 65% and included in the criteria for use.

The feasibility level of student worksheets based on inquiry with the material Temperature and Heat based on the teacher's response as many as 3 people is with an average percentage of 86%, 87%, and 89% with the following criteria: "Superior". The level of feasibility of student worksheets is based on student responses in small groups of 5 students, with an average percentage of 74% with the "Advanced" category. Student responses to student worksheets in large groups were 20 students, with an average percentage of 91.5% with the "Superior" category. This shows that the developed student worksheets are feasible to be used as one of the supporting media in the learning process.

The authors propose several suggestions in overcoming problems found in the field: Researchers expect research results in the form of student worksheets Inquiry-based students on Temperature and Heat material can be used in the learning process at school so that the quality of student worksheets as a whole becomes more useful.

In conducting research on developing worksheets in the future, researchers should increase the number of student respondents, so

that they can see a wider comparison in developing worksheet inquiry-based on temperature and heat materials. Because this student worksheet is intended for students, so researchers are able to cover more of the needs of students in the learning process.

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