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FEASIBILITY TEST OF *COOPERATIVE GI (GROUP INVESTIGATION)*-BASED STUDENT WORKSHEETS (LKPD) ON STATIC FLUID MATERIAL

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ABSTRACT
This development research aims to produce physics LKPD based on Cooperative GI on the subject matter of Static Fluid which is feasible to be applied in the physics learning process at school and determine the response of students after using the developed LKPD.The subjects in this study were students of class XI MIPA totaling 18 students. This type of research is a development research or Research and Development (R&D) using the 4D Model. The instruments used in this study consisted of a validation questionnaire for material experts and learning experts, a questionnaire for the assessment of physics teachers, and a questionnaire for students' responses to the physics LKPD based on cooperative learning. The data analysis technique used in this research is descriptive. From the results of data analysis obtained material expert validation of 82%, learning experts 81%, physics teacher assessment of 90% with each of these percentages included in the very good category. While in the broad trial the percentage of student responses with a sample of 15 people was 86.06% with very good criteria, so that based on the results of validation, physics teacher assessment and student responses it can be concluded that Cooperative-based physics LKPD on the subject matter of Static Fluid is feasible to use in the learning process.
Keywords: Development, LKPD, STEM, Elasticity and Hooke's Law

INTRODUCTION

According to Law No. 20 of 2003, education is a conscious and planned effort to create a learning atmosphere and learning process in order to develop the potential that exists in students. With education, students are expected to have a strong religious spirituality, control themselves, have a good personality, become intelligent human beings with noble character, and develop the skills that exist in themselves for the needs of society, nation and state.

Permendikbud No. 65 of 2013 concerning Process Standards for Primary and Secondary Education has signaled the need for a learning process combined with the principles of the scientific approach. Learning is one of the most important aspects of education. Learning activities in schools aim to improve students' process skills and social skills. According to Depdiknas (2008), to produce graduates who have the ability to meet the competency standards of graduates, it is necessary to develop learning for each competency systematically, integrated and complete.

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Physics is the most basic of all branches of science, including physics, generally seen as the organization of complex appearances detected by our senses. The purpose of learning physics is so that we can understand the basic parts of objects and interactions between objects, and also explain about natural phenomena.

Improving the quality of learning in improving student understanding requires applying interesting approaches, models and methods that make students actively think and generate student motivation in the learning process or receiving lessons. One of these approaches, models, and methods is the *cooperative* learning model of *group investigation* type and scientific approach. The group *investigation (GI)* learning method is one of the cooperative learning methods, where teachers and students work together to build learning. Students must be active in several aspects during the teaching and learning process, while the group functions as a means of interacting in forming a learning concept.

Based on observations, the teaching materials used in learning activities are not varied because they only use modules, while the facilities and infrastructure to support learning activities such as libraries already exist, but the laboratories owned by schools are less complete so they are rarely used. In addition, some teachers still use conventional methods (lectures) so that students have not received good learning skills, especially learning that leads students to think creatively. Information and Technology (IT) such as the internet at school is underutilized in physics learning so that a fun and memorable learning process for students cannot be created.

Based on the description and background above, it is necessary to develop research to examine the problem with the title: Feasibility Test of *Cooperative GI (Group Investigation)*-based Learner Worksheets (LKPD) on Static Fluid Material**.** In accordance with the background, problem identification and limitations of abilities, materials and time available, the limitations of the problems that researchers do are as follows: 1) *Cooperative-based* LKPD which will be developed in Physics learning is only for static fluid material. 2) *Cooperative-based* LKPD trials that will be developed are carried out by expert testing. 3) The instructional development that will be used is the *Four-D* (4-D) development model limited to the *define, design* and *development* stages.

Based on the problem limitation, the problem formulation in this study is stated as follows: 1) Does the *Cooperative GI-based* class XI Physics LKPD on static fluid material developed by researchers get feasibility based on feasibility criteria according to material experts and learning experts? 2) Does the *Cooperative* GI-based XI grade Physics LKPD on static fluid material developed by researchers get a good score based on assessment criteria according to teachers and students? The objectives of this study are: 1) Produce a *Cooperative* GI-based XI grade Physics LKPD on static fluid material developed by researchers to get feasibility based on feasibility criteria according to material experts and learning experts. 2) Produce a Cooperative *GI-based* XI grade Physics LKPD on static fluid material developed by researchers to get good grades based on assessment criteria according to teachers and students.

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METHODS

This type of research is development research or *Research and Development (R&D)* with the aim of developing physics LKPD on Static Fluid material based on *Cooperative GI (Group Investigation).* Research and development as a process to develop and validate products that will be used in education and learning. This LKPD development research was conducted based on a needs analysis that refers to the 2013 curriculum.

This research design refers to the 4D model (*Define, Design, Development and Dissemination*) as follows:

1. ***Define* Stage**

The define stage is the initial stage to establish and define the learning requirements. This stage is useful for determining and defining the needs in the learning process and collecting various information related to the product to be developed.

2. ***Design* stage**

This design stage aims to determine the design of teaching materials in the form of LKPDs to be developed.

3. **Development stage (*Develop*)**

On teaching materials that have been planned. The steps taken at the development stage include this development stage, the researcher has produced a product in the form of LKPD as one of the teaching materials.

The data collection instrument in this research development is a product assessment instrument that has been developed by researchers. In this study, researchers used data collection instruments in the form of questionnaires or questionnaires. The instruments used in this study are: (1) LKPD assessment questionnaire and student analysis; (2) Teacher validation questionnaire of LKPD. (3) Questionnaire of lecturer assessment of LKPD.

The data sought for the level of feasibility and good value are (1) LKPD assessment questionnaire and student analysis; (2) LKPD expert team validation questionnaire. (3) Questionnaire of lecturer assessment of LKPD.

RESULT & DISCUSSION

Cognitive ability is the ability needed to answer the questions of the Learner Worksheet (LKPD). This LKPD model is often used even though it only applies concepts. As far as the author's observation, there is no LKPD used by teachers in learning that contains assessment in the form of scientific activities. Usually LKPD is made in the form of manual activities, for example practicum. The author views this as ineffective. For this reason, a model or framework of LKPD is needed that can involve all aspects of knowledge, skills, and attitudes of students.

Based on the results of the literature review (Guilford, 1988; Reif, 1995; McDermott, 2010; Santyasa, 2003; Etkina, 2005; Popper, 2005; Wenning, 2006; Brewe, et al. 2009;

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Abrahams & Milar, 2008; Danielson, 2011; Nivalainen, et al. 2013; Putra, 2013) obtained information on the characteristics of the cooperative learning-based Learner Worksheet device containing a framework consisting of (1) Identity contains a Title with specific characteristics, concise, clear and eye-catching (2) general information in the form of pictures and or narrative descriptions; (3) productive questions consisting of, inquiry questions, analysis and discussion questions, conclusion questions and concept application questions.

The productive question in question is the formulation of questions in the LKPD that can only be resolved after investigation / observation. The formulation of questions is presented in accordance with the sequence of scientific activities. The form of scientific activities carried out, is a stage and also an indicator of science process skills with reference to Chiappetta's book, 2010.

A. Expert and Practitioner Validation Results

Description of LKPD Content	Science Process Skill Indicators
A. Title	
Static Fluid	Provided/can be made by learners
B. General Information	
Look at the picture below, if the density of the object is greater than the density of the fluid, the object will sink. If the density of the object is equal to the density of the fluid, the object will float. If the density of the object is less than the density of the fluid, the object will float. ***(presenting pictures, sinking objects, floating objects, floating objects)***	• *Observing, classifying*
C. Productive Questions	
1. An object of mass is placed in a tube filled with water at a height such that the water level increases. What is the density of the object? 2. If an object is immersed in a well at a certain depth from the water surface of the well. What is the total pressure experienced by the object? 3. A u-shaped pipe having different cross-sectional areas of its legs is used to lift a load. What is the maximum load it can lift?	• *Experimenting* • *Using numbers*
D. Analysis Question	
1. Why are large pieces of wood easily lifted in water? 2. Why can a gas balloon rise to the top? 3. Why do eggs float in salt water while they sink in pure water? 4. Why can small insects move on water and not drown? 5. Why do chickens find it difficult to walk on soft ground while ducks find it relatively easy? 6. What are the conditions for floating, floating, and	- *hypothesizing, analyzing* - *analyzing* - *hypothesizing, analyzing* - *hypothesizing, analyzing*

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sinking objects? 7. Is your hypothesis right or wrong?	- *conclutions* - *analyzing* *-hypothesizing*
E. Summarizing Question	
1. What factors affect pressure? 2. What is the mathematical formulation of pressure?	*Conclutions*
F. Concept Application Question	
Provide problems on the application of the concept of liquid pressure in various containers!	Trying out, communicating and applying ideas or concepts

The validation process of LKPD was carried out by giving the manuscript to each of two (2) experts and two practitioners. From these activities, the results obtained that the expert and practitioner assessments of the devices produced were in the very valid category (average value of 3.70). In addition, the author received some improvements and suggestions from the validators, namely the need for additional pictures in the LKPD. Thus, the resulting device has been developed based on supporting theories so that it is worth testing. As an example, the following is given a table describing the physics LKPD for the topic of GI-based static fluid material:

B. Practicality Test Results

LKPD based on the *Cooperative model of* Fluid material was then tested through a questionnaire test to lecturers, teachers and 17 Physics Bilingual 2017 students. The research subjects are Physics Education Study Program students who program the Physics Teaching and Learning Models course. Based on data analysis, the results obtained are 86.06% and all aspects in the device meet the readability aspects, and interest in LKPD.

C. Special Findings

The results of the analysis of the LKPD contents in the productive question section, especially in the formulation of problems and hypotheses, obtained information that most of them only formulate questions, not in the category of good problem formulation, this happens because students have never been accustomed to formulating problems to be investigated. Contents related to analysis questions, especially in graph analysis, students generally experience problems, especially in interpreting / reading graphs. This can be caused by students not being accustomed to, or even never processing data through. This is supported by Feynman's (1998) opinion that learners must have in-depth experience to analyze experimental results such as making graphs, or providing an overview of the relationship between variables.

The results of the analysis of the LKPD filling related to discussion and conclusion questions show that students still need special guidance in filling out the LKPD, this is because students do not understand the framework and objectives and do not have basic concepts operationally related to the logic of discovering a

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physics concept. They only measure, analyze according to the instructions but to find concepts from the experimental results, they are not accustomed / practiced or have never been at all. So it is necessary for the teacher to be proactive in providing information. Again, this can happen because students are not used to and new to activities like this. These results are supported by the explanation of Wenning (2006) which reveals that the use of scientific discovery logic such as understanding basic concepts operationally, must be interpreted by students to develop data collection techniques, as part of physics practicum activities. The same thing is also stated by Breweet al. (2009) who revealed that the scientific method, which is usually used by students in interpreting practicum results, often becomes a significant difficulty due to lack of accuracy in identifying a number of physical variables. However, there were some students who achieved very good performance results, especially in the application of concepts. This can happen because the activities they carry out lead them to the achievement of concept understanding. This statement is in line with the view of Santyasa (2003) who explained that understanding of physics concepts through practicum can occur when they are able to carry out the scientific process as knowledge of error analysis and data interpretation. The same finding was also stated by Popper (2005) who revealed that students will be able to make observations and interpret the theory optimally if they are aware of the problem. Thus it can be said that the readiness of students in analyzing the relationship between physical concepts that can be practiced has been well undertaken. Other analysis results show that students are still mistaken in preparing experimental designs, this shows that the existing LKPDs have begun to train them in designing experiments/practicums even though some are still wrong, so scientific activities still need to be trained continuously. The stage of experimental activities towards higher-order thinking according to Wenning (2006) as a pattern of learning in the physics laboratory that has been described in teaching materials, has also not been fully followed by students. Other observation results, especially the activities of students have not been maximally implemented at the group discussion stage, and discussions between groups. This indicates that they have the potential to analyze based on their own reasoning and not refer to the results of scientific observation and analysis. This is in line with Danielsson's (2011) view that physics practicum activities will have an impact on the students' discourse model based on practicum implementation and analysis, based on their own reasoning and experience of basic physics concepts in their activities.

CONCLUSION

1. LKPD based on the *Cooperative model of* fluid material can be concluded to be feasible to use in the learning process based on the validation results of lecturers, teachers and students, this LKPD is included in the very good criteria.
2. Student response to the assessment test through a questionnaire involving 17 respondents obtained a presentation of 86.06%, including very good criteria.

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