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GUIDED INQUIRY BASED STUDENTS' WORKSHEET TO GROW STUDENTS' CRITICAL THINKING AND COMMUNICATION SKILLS

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ABSTRACT

Weak learning process is one of the problems in education. Therefore, to create the ideal learning process, interactive teaching materials are needed to make student-centered learning.This study aims to describe and analyze teacher and student responses to the development of guided inquiry students worksheets, as well as see their effectiveness in growing critical thinking skills and student communication skills. The research method used is the Mix method with Research and Development type. The instrument used in the form of a feasibility questionnaire and tests of critical thinking skills and communication skills. Based on the research results obtained that the development of worksheets got very valid results from the validators, got very good responses from teachers and students and proven able to foster critical thinking and communication skills.

LEMBAR KERJA SISWA (LKS) BERBASIS INKUIRI TERBIMBING UNTUK MENUMBUHKAN KEMAMPUAN BERPIKIR KRITIS DAN KEMAMPUAN KOMUNIKASI SISWA

Kata Kunci:

Kemampuan berkomunikasi
Kemampuan berpikir kritis
Fluida statis
Inkuiri terbimbing
Lembar Kerja Siswa (LKS)

ABSTRAK

Lemahnya proses pembelajaranmenjadi salah satu permasalahan dalam pendidikan. Oleh karenanya, agar proses pembelajaran berjalan secara ideal, diperlukanbahan ajar interaktif yang dapat memusatkan kegiatan belajar mengajar kepada siswa. Penelitian ini bertujuan untuk mendeskripsikan dan menganalisis respon guru dan siswa terhadap pengembangan dan penggunaan lembar kerja siswa (LKS) inkuiri terbimbing dan melihat keefektifan LKS dalam menumbuhkan kemampuan berpikir kritis dan kemampuan berkomunikasi siswa. Metode penelitian yang digunakan adalah *mix method* dengan jenis penelitian *Research and Development*. Instrumen yang digunakan merupakan angket kelayakan dan tes kemampuan berpikir kritis dan kemampuan komunikasi. Berdasarkan hasil penelitian diperoleh bahwa pengembangan LKS mendapat hasil sangat valid dari penilaian validator ahli, mendapat respon sangat baik dari guru dan siswa serta teruji dapat menumbuhkan kemampuan berpikir kritis dan berkomunikasi.

1. INTRODUCTION

One weakness faced by education is a weak learning process. To overcome this problem, the teacher's role is needed as a director of teaching and learning activities. Teacher must prepare good teaching materials so that students not only gain knowledge but are also able to build knowledge [1]. So that student center learning can be realized. With the teaching material, the learning process will become more organized, so that the specified competency targets can be achieved, and students are able to foster various abilities such as critical thinking and communication [2]–[4].

The ability to think critically is very important to be developed because it will be useful in student life after school. But the present reality, the ability of high school students in critical thinking is still low [5], [6]. In general, the learning process in Indonesia does not encourage students to think critically. One of the causes of the low quality of students' thinking today is the assumption that students' thinking abilities will automatically develop after students studied all subject, and critical thinking will be taught at advanced education [7]–[9]. The learning process should force students to always think critically, in order to produce valuable and more enjoyable learning experiences [7]–[9]. The selection of appropriate methods in learning physics is very necessary to improve students' understanding of the material being taught, and also be able to foster critical thinking skills. So that it can improve student learning outcomes.

Based on the results of preliminary research identified that 80% of teachers stated that learning in schools had not been able to foster critical thinking skills in students. That is because in learning still tends to be centered on the teacher (teacher centered) and dominated by the lecture method. Communication skills can be used as indicators the improvement in the quality of student learning processes and involve the exchange of ideas, opinions and information with specific and objectives. 80% of student worksheets used by students are student worksheets from publishers, while only 20% of worksheets are developed by the teachers. These results indicate that there are still many teachers who have not developed their own worksheets for a variety of reasons, one of which is time constraints and practical issues.

Based on these problems, we need a learning model and worksheet that can make students think more critically. Especially worksheets that can increase student involvement in learning activities [7]. One of the factors that determine success in growing students' critical thinking skills is the ability to choose and use the right learning model [7].

The selection of learning models applied is expected to be able to develop and even improve students' critical thinking skills. One learning model that can shape critical thinking skills is inquiry [7],[10]. In inquiry learning, students not only act as recipients of learning through verbal explanation from the teachers, but also play a role to find the core of the subject by themselves [7].

The steps in guided inquiry learning include orientation, formulating problems, compiling hypotheses, collecting data, testing hypotheses, and formulating conclusions. These steps can be applied to media or teaching materials such as worksheets to arouse students'curiosity and optimize students' abilities [10]. The knowledge and skills acquired by students should be the result of finding, not from memorization. This can be realized through inquiry steps: (a) formulating the problem; (b) formulating a hypothesis; (c) collecting data through observation; (d) analyze and present data; and (e) conclude and communicate [10].

Guided inquiry-based practical learning can attract students' interest and motivation to learn. Students can understand the concept of reaction rates better through experience and daily life phenomenon, so that, it can be more meaningful for students [7]. Based on

the problems and literature review, the researcher developed a guided Inquiry based worksheet on static fluid lessons as a means to foster critical thinking skills and the communication skills of high school students.

2. METHOD

The type of research used is Research and Development (R&D) with the Borg and Gall development model which is oriented to developing and validating products used in education [7].This study used a mixed method, which is a research approach that combines or links quantitative and qualitative research methods. The study was conducted at bandar 9 high school in Lampung, the research subjects were students of class XI IPA(Natural Sciences) and physics teachers.

The steps in the Borg and Gall development model consist of ten steps: 1) *Research and information collectin*g, 2) *planning*, 3) *develop preliminary form a product*, 4) *preliminary field testing*, 5) *main product revision*, 6) *main field testing*, 7) *operational product revision*, 8) *operational field testing*, 9) *final product revision*, 10) *dissemination and implementation*).The sampling technique was purposive sampling, which is a random sampling system using a lottery or random number table.

The instruments used in this study were tests and non-tests, non-test instruments in the form of a questionnaire [7]–[9]. The test is used to collect data about the ability of research subjects [7]–[9].In the experimental class using guided inquiry student worksheets and in the control class using conventional student worksheets. Data collection through pretest-posttest, using tests of critical thinking skills and student communication skills questionnaire [7]–[9]. The test given to measure the ability to think critically is a test of static fluid material [7]. Data collection using questionnaires, observation and interviews [7].

3. RESULT AND DISCUSSION

This research produced a guided inquiry-based student worksheet. The initial design of the product included a cover that was made as attractive as possible, illustrated the contents of the student worksheet and displayed the identity of the student worksheet, and to foster critical thinking skills and student learning communication.

3.1 Validation Result

Before being tested on students, the product is validated by material and design experts to determine the product's suitability. From the results of this expert evaluation, the level of validity of the worksheet is calculated, and can be seen in Table 1.

Table 1. Results of Guided Inquiry-based Student Worksheet Media Validation

Assessment Aspects	Percentage
Display	72%
Content	75%
Students' worksheet criteria	76%
Average	74%

The following is a graph of the percentage of results of design/media validation.

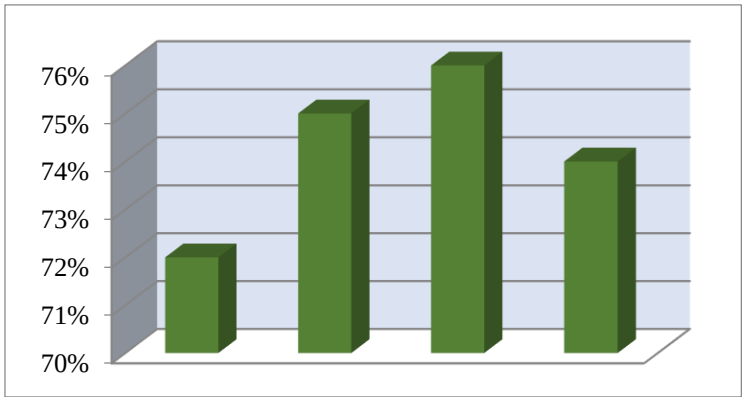

Figure 1. Percentage Graphs of Guided Inquiry Design/media Validation Results

The results of the validation on the guided inquiry from design validator are obtaining a percentage of 72% on the performance aspects of the worksheet, 75% on the content aspects of the worksheet, 76% on the aspects of the worksheet criteria, so that according to the design validator's assessment and suggestions the average overall percentage of all aspects are valid for use with a percentage of 74%. Furthermore, the data validator results can be seen in table 2.

Table 2 Material Expert Validation Results Guided Inquiry-based Student Worksheet

Assessment Aspects	Percentage
Content Quality	74%
Accuracy	83%
Components of Guided Inquiry	80%
Illustrations (pictures, tables, concept maps)	80%
Evaluation	70%
Average	77%

The following is a graph of the percentage of material validation results.

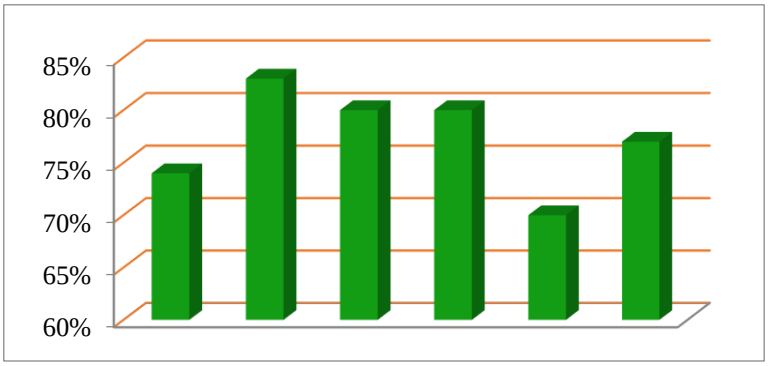

Figure 2. Percentage Graph of The Results of The Guided Inquiry-based Student Worksheet Material

Based on the results of the validation from the material validator obtained a percentage of 74% in the aspect of content quality, 83% in the aspect of accuracy, 80% in the aspects of the guided inquiry component, 80% in the aspect of illustration, and 70% in the aspect of evaluation. So, the average percentage is 77% with a decent category. Furthermore, the data of the design validation can be seen in table 3.

Table 3 Validation Results of Props Design

Aspect	Percentage
Aesthetics	83%
Safety	100%
Efficiency	88%
Storage Box	94%
Life Time	98%
Average	92%

This is the percentage graph of validation results:

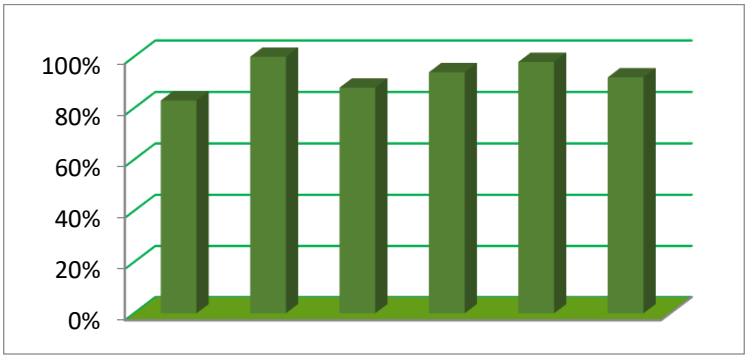

Figure 3. Percentage Graph of Validation Results

Based on the results of the validation by the design validator, a percentage of 83% was obtained in the aesthetic aspect, 100% in the safety aspect, 88% in the aspect of the efficient use of the equipment, 94% in the aspect of storage box, and 98% in the life time aspect. So, the average percentage of design assessment is very feasible to use with a percentage of 98%.

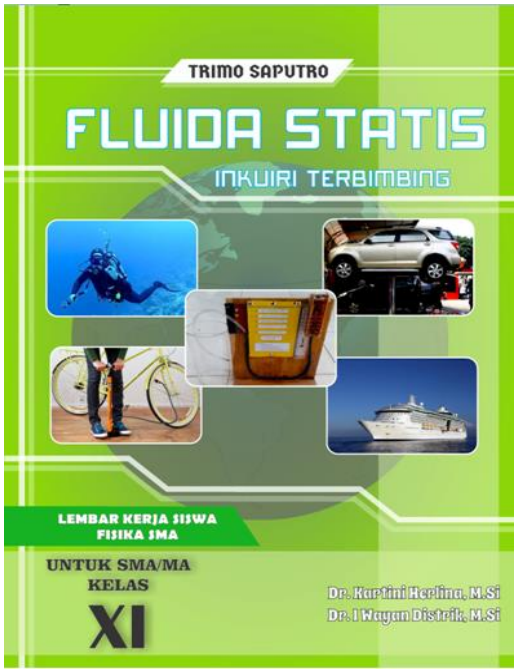

Figure 4. Display of Guided Inquiry-based Student Worksheets

Figure 5. Hydrostatic Pressure Experiment Props

3.2 Trial Results

The results of trials conducted by experts (physics teacher) showed an excellent interpretation of the results with a percentage of 87%, and the aspects measured were the appearance of student worksheets, usage, instructions, suitability of images, suitability of concepts, language, and content delivery. So based on these results, this guided inquiry-based student worksheet can be used with a very good feasibility level.

Table 4. Test Results by Experts

Aspect	Percentage
Display	87%
Usage	89%
Insturctions	93%
Suitability of the image	90%
Suitability of the image	87%
Language	80%
Content delivery	87%
Average	87%

The results of small group trials with 10 respondents were 87% with very good criteria. The results show that the guided inquiry-based student worksheet was very well received by students to be used as independent learning material.

Table 5. Small Group Trial Results

Aspect	Percentase
Display	83%
Usage	87%
Instructions	90%
Suitability of image	84%
Suitability of Concept	76%
Language	85%
Content delivery	91%
Average	85%

The results of student responses revealed that students needed student worksheets, containing interesting images, exam exercises to improve critical thinking and communication, content summary, instructions, practical simulations, and easy to use without any time limit. The results of student responses can be seen in Table 6:

Table 6. Field Trial Results

No	Statements	%	Category
1	The display of student worksheets is interesting and practical	84%	Very Good
2	The display of student worksheets matches the age and mindset of students		Very Good
3	There are steps in the experiment / visual observation that are interesting and easy to use		Very Good
4	I am more interested in using printed books in explaining physics to students	83%	Very Good
5	The use of guided inquiry-based student worksheet makes it easy for me to deliver physics lessons in the static fluid chapter		Very Good
6	Guided inquiry-based student worksheet is more difficult to use to make students more active in class.		Very Good
7	Guidelines for using guided inquiry-based student worksheet are difficult to understand	78%	Good
8	Images are suitable with the material and make it easy for me to convey the material	84%	Very Good
9	Guided inquiry-based student worksheet that are incompatible with props and are difficult to understand		Very Good
10	The props make learning more interesting and easier for students to understand		Very Good
11	Discussion and presentation activities do not increase students' enthusiasm in learning physics		Very Good
12	The concept of guided inquiry corresponds to static fluid and is effective in improving critical thinking skills and communication	85%	Very Good
13	The language used in describing the theory is difficult to understand	79%	Good
14	The language used is good		Good
15	The theory presented does not match the indicators on the static fluid material	81%	Very Good
16	The theory presented is clear and in accordance with Core Competencies and Basic Competencies		Very Good
17	Theory and phenomena in guided inquiry-based student worksheet is difficult to understand		Very Good
18	Examples of problems in daily life and explanations about static fluidin the worksheet make it easy to explain the lesson to students		Very Good

Table 6 explains that in the field trial, students gave very good responses related to the results of the development of guided inquiry-based student worksheets. They found that guided inquiry-based student worksheets were interesting and easy to use and were appropriate for their age and their mindset. That is because the guided inquiry-based student worksheet is a guide that can facilitate students in understanding the concepts of the lesson.

The guided inquiry-based student worksheet consists of: title, basic competencies, learning objectives, formulating problems, hypotheses, tools and materials, experimental steps, observation tables, data analysis, and conclusions. After the product is validated, the suggestion and comment data are then taken into consideration and the basis for making improvements. Improvement of student worksheet components aims to reduce the fundamental errors of the product. In general, the results of validation for Student Worksheets are categorized as good, which means that the student worksheet developed are feasible to use. Furthermore, the product is tested on students, the trials carried out are shown in tables 5 and 6. The table shows that the average response of students to the trial is very good to be used in learning.

The guided inquiry-based student worksheet that has been developed provides alternative learning strategies that are innovative, constructive, and student-centered, focusing on the achievement of competencies. The components in the worksheet are expected to create an atmosphere of learning that is interactive, inspiring, fun, challenging, motivates students to actively participate, and provides sufficient space for initiative, creativity, and independence in accordance with their talents, interests, physical and psychological development. The student worksheet that is developed also becomes a quality curriculum document, because it has passed the validation and trial stages, so that it is appropriate for students to use.

Based on the results of previous studies one of the things that need to be considered in conducting learning is teaching material, teaching material that will support learning process to be better [12]–[14]. Quality teaching materials will help learning become more efficient and provide quality results, because teaching materials are the main source of gaining knowledge. Teaching materials have been developed and applied in previous studies to improve learning outcomes[15]–[19]. In this study, researchers analyzed physics teaching materials in the form of guided inquiry-based student worksheet that had passed the validation stage by experts, and trials on teachers and students. The final result obtained is a guided inquiry-based student worksheet with decent quality and very well used as an independent learning material especially in physics in high school. In addition, through the development of guided inquiry-based student worksheets, we also know the effectiveness of guided inquiry worksheets that can foster critical thinking skills and student communication skills.

4. CONCLUSSION

Based on the results of the assessment by the design validator, the material validator and the design validator of the props, the trials to the physics teacher, small group trials and field trials to students, it can be concluded that the guided inquiry-based student worksheet meets the requirements with very decent quality and very good to be used as learning material and can foster critical thinking skills and communication skills. Based on the research, the following things are suggested: Conducting trials in several schools to get maximum results, developing guided inquiry-based student worksheet on other physics theory and continuing development until the dissemination stage.

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