Work and Energy by Guided Inquiry Worksheet: Analysis of Critical Thinking Skill in Madrasah

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Abstract. The worksheet is a part of learning that is very necessary for shaping the characteristics of students who are able to think in every problem solve. The purpose of this study is to develop a student worksheet based on a guided inquiry to obtain a worksheet that is suitable for use in physics learning. This research method using ADDIE (Analysis, Design, Development, Implementation, Evaluation) with data type of qualitative and quantitative data, that is description or narration obtained from worksheet validation, critic and suggestion from validator and learner to revise product And worksheet analysis done by the learner during learning process and quantitative data in the form of worksheet feasibility test result, student's response and test result of critical thinking skill of learner through pretest and posttest. This study is in SMAN 1Subang. The initial sketch of the worksheet design contains guided inquiry guidance that guides the critical thinking skills of learners. Validation of media experts, structures and languages provides positive feedback with revisions of the inquiry stage and minor image enhancement, then small-scale and large-scale tests that ultimately give results that the worksheet is feasible to use based on n-Gain large-scale test results that are on flat the average of 0.54 is in the middle level and the student response is 65.28 which is very good category. Its mean that the development of guided inquiry worksheet can improve student’s critical thinking skill in Madrasah.

1. Introduction

The learning process in the classroom is an act of communication between teachers with learners, and learners with other learners. In the process of communication is necessary in order to process the communication media to take place effectively. The standard States that the process of learning media learning is the process of learning tools to convey the subject matter. One of the media to deliver learning materials namely textbooks[1].Textbooks become the main namely learning resources in the form of a book the teacher and student books.

Implementation of Curriculum teacher's Book mentions that 2013 is the guidelines for teachers in implementing the learning. According to Suharto, the book covers the preparation, implementation, and assessment as well as the use of guidelines for student book [2]. The next book is the book of student learning resources for students who come with a concept map, introduction, parts want good student activities and experiments.

Every school has different facilities and infrastructure. Anyone have a laboratory, some are not. The model used usually follows the material to be supplied so that different material sometimes different models used. therefore necessary activity sheet learners (students' worksheet) as a learner activity sheets/substitute sheets the activity of learners. students' worksheet developed by the teacher in accordance with the state of the schools, both the means and the infrastructure, as well as the learning
model used by teachers, demands high-level thinking skills who want to build early on learners. High order thinking skills (HOTS) one of them, namely the ability of thinking that teaches students to think critically.

According to Gibbs critical thinking ability is indispensable in the learning process as it pertains to how students think critically and apply for the issue of studied science [3]. There are students who can answer correctly but the reason that connects with the physics concept is still wrong; on the second indicator basic skills learners still low IE cannot consider the procedure an event correctly, then physics does not make the concept of physics as the basis when conveying the allegations and commentary; on the third indicator of learners is still very low in inference an argument. Yet the concept of congruency physics when learners create and determine the outcome of consideration based on the facts or events; on the fourth indicator learners is very low in giving explanations more of a Physics concept [4]. So that learner can still not when defining and explaining the concept of Physics from events that occurred. Aziz malayeri said that learners still confusion in using the logic of strategy when choosing suitable criteria in considering possible solutions for an alternative problem solving [5].

the existence of needs regarding the development of the activity sheet students' worksheet as learners is an activity/behavior that occurred during the teaching and learning activities taking place. students' worksheet created not just a collection of matter and a matter of course but the steps of activities that support the learning process of learners [6], these steps are useful to build up knowledge of the learners. these steps can also be learning the syntax of a model. further requirements regarding critical thinking skills learners, critical thinking skills can be enhanced when the learning process takes place. researchers use students' worksheet based on a model (as a rare-stride) to enhance critical thinking skills learners. inquiry model i.e. social interactions. Because according to Danielle, a model inquiry is designed to engage learners in the learning inquiry. Inquiry teaching model is centered on teaching learners. In this lesson students more active learning [7]. Kemudan & Mudjiono revealed that the main goal of inquiry is to develop model intellectual skills, critical thinking, and able to solve problems scientifically [8]. The real world requires high-order thinking skills that can be built early on in learners. Thinking high level or high order thinking skill (HOTS) one of them is the ability to think that teaches learners to think critically. According to Rahayu and Pamelasari said the ability to think critically is necessary for the learning process because it relates to how learners think and solve problems critically about the concept of Science learning [9]. Critical thinking ability is one aspect of skills that need to be trained to learners to be able to compete in the world level.

2. Research Method
This research is a development research using research and development method according to Gustafson and Branch that consist of several steps, namely analysis, design, development, implementation, and evaluation [10]. the instrument used is the students' worksheet validation sheet along with the scoring sheets given to the materials expert media experts, and the physicist educator or teacher, and the questionnaire of the learners' responses given when both small and large-scale test. The location of this study is a development study carried out in MAN 1 Subang Regency.

The type of data taken in this research is qualitative and quantitative data. Qualitative data are descriptively obtained from students' worksheet validation, criticism, suggestions, or inputs from validators and students to revise students' worksheet products and analysis done by students during the learning process. quantitative data in the form of results of students' worksheet small-scale feasibility test, the result of critical thinking skills test of students as many as 12 questions are adjusted to an indicator of critical thinking skills on a large scale, and student responses. Data on improving critical thinking skills are obtained through pretest and posttest. In the process of implementation of learning in this large-scale research using the pre-experiment method with design one group pretest-posttest. This large-scale implemented sample of class X MIPA 2 totaling 40 students.
3. Result and Discussion

3.1. Analysis Stage
The analysis stage is the stage where the researcher analyzes what needs to be developed, analyzes the curriculum, and the field circumstances. The analysis can be started from policy analysis from the government (education and culture ministries), or facts and surveys from the field (schools, news and etc). needs analysis found that the existing students' worksheet only contains the material and the problems alone so there needs to be developed so that existing students' worksheet can load the activities of learners in the learning process.

Furthermore, in curriculum analysis, it is determined that students' worksheet made will be applied to business material and energy. and last (field condition analysis), students' worksheet will be tested on a small scale and the large scale that is in man 1 Subang, after knowing what will be developed, the researchers conducted literature studies, either from journals, articles, books or from research reports on the development of students’ worksheet, critical thinking skills, and guided inquiry model.

3.2. Design Stage
This design stage produces students’ worksheet design which will be developed, students’ worksheet test instrument is in the form of the test sheet, validation sheet, student response questionnaire, and also test sheet of critical thinking skill of learners. The drawings generally correspond to the guided inquiry stages of the worksheet are shown in Fig. 1.

![Figure 1 Guided Inquiry Worksheet](image)

Figure 1 shows that students' worksheet design contains guided inquiry that guides the critical thinking skills of learners. the framework is then created from the students' worksheet itself, and in one students' worksheet include a cover or start page; page of competence to be achieved; orientation stage; stage of formulating the problem; phase answer hypothesis; stage of collecting data; phase test hypothesis; and the last stage formulate the conclusions.

Validation results also obtained some inputs for students' worksheet improvement. The media expert states that there should be a reference to the content and the value of each observation table so as to have no difficulty in comparing with the research material; the material expert expressed his input in the form
of some misconceptions and lack of graphical analysis; physics teacher states the input is a less proportional image size.

3.3. Development Stage

The development stage is the qualitative stage of validation. Students' worksheet validation is done by 2 expert lecturers and one teacher of the study area. The validation results of the three validators are presented in Table 1.

| Rated aspect          | Average | Nilai | Criterion   |
|-----------------------|---------|-------|-------------|
| Eligibility of content| 4.3     | 85.71 | Very good   |
| Language              | 4.1     | 81.33 | Very good   |
| Presentation          | 4.5     | 90.00 | Very good   |
| Graph                 | 4.5     | 90.00 | Very good   |

Table 1: Small-scale validation results.

The small scale is carried out with the subject of research that is four people learners who are the best students in his appointment. Implementation of the learning is done in the laboratory, so easy when using laboratory equipment. In addition, groups can train learners to discuss and accept suggestions or inputs of others (appreciate the opinions of others). Analysis of the worksheet on a small scale is presented in table 2.

Table 2: The average value of critical thinking skill per sub concept.

| Sub Concept                  | Average | Interpretation |
|------------------------------|---------|----------------|
| Work                         | 82.53   | Very good      |
| Potential and Kinetic Energy | 81.79   | Very good      |
| Mechanic Energy              | 86.50   | Very good      |

Table 2 shown the form of the work of learners in the form LKPD that has been filled and questionnaire response for input on students' worksheet. Analysis of students' worksheet results is categorized into the range of values that is with average get the criteria "very good" in all sub-material. This is also in line with research conducted by juniar which shows that student worksheets based on guided inquiry are possible to use [11].

The input given to small-scale activities is when the data collection stage is a lot of ways one of them can with practice, observation, reading discourse and others. when we hear, see, discuss, and do, we will gain knowledge and skill. So not only remember, but more than understand. The picture is quite proportional and when it is bundled, the image does not need to be enlarged.

3.4. Implementation Stage

The feasibility of students' worksheet, in addition to using the value of improving critical thinking skills, as well as by analyzing answers from students' worksheet filled by students. This data is obtained from the students' worksheet in each meeting. For the business concept sub-subject, the potential energy and average kinetic sub-matter and the mechanical energy sub-material are presented in table 3 below:

Table 3: Mean value of critical thinking skills per sub-concept for a large-scale trial.

| Sub Concept                  | Average | Interpretation |
|------------------------------|---------|----------------|
| Work                         | 80.70   | Very good      |
| Potential and Kinetic Energy | 86.02   | Very good      |
| Mechanic Energy              | 83.91   | Very good      |

Table 3 shows the results obtained by the students show the average value for each subconcept is very good, this is in line with the results of research from some researchers who stated that the worksheet based guided inquiry can improve students' critical thinking skills for the better [12, 13]. N-Gain for aspect critical thinking skills are presented in table 4.
Table 4 The average value of critical thinking skills per the aspect of critical thinking skills.

| Aspect                  | N-Gain | Category |
|-------------------------|--------|----------|
| Elementary classification| 0.53   | Middle   |
| Basic support           | 0.53   | Middle   |
| Inference               | 0.53   | Middle   |
| Advance clarification   | 0.56   | Middle   |
| Strategy and tactic     | 0.56   | Middle   |
| Average                 | 0.54   | Middle   |

Based on Table 4 it can be seen the cumulative N-Gain results show an improvement in students' thinking skills. It means the guided inquiry-based worksheet can improve students' critical thinking skills with happy increase category. In accordance with what is proposed by some research which states that with guided inquiry strategy can improve students' critical thinking skills. Many research shows that guided inquiry model can decrease student difficulties [14, 15]. Student response to students' worksheet quality assessment is presented in Table 5 below.

Table 5 Percentage of student responses to students' worksheet on a large-scale trial

| Aspect                  | Percentage | Interpretation |
|-------------------------|------------|----------------|
| Presentation            | 79.03      | Very good      |
| Language                | 74.65      | Very good      |
| Content of Physics      | 81.37      | Very good      |
| Aspect Critical Thinking| 83.20      | Very good      |

Table 5 shows students’ responses to students’ worksheet guided inquiry after they looked at and used from every aspect students' worksheet got an excellent interpretation. This illustrates that guided inquiry-based students' worksheet is highly feasible for use in learning.

3.5. Evaluation Stage
The final evaluation result after a large scale or needs is found on a small scale and unmet large scale of the resulting students' worksheet, criticisms, suggestions, and comments obtained both on students' worksheet and on learning. First, it is possible because the explanation of the image is only in the prologue only, so when doing students' worksheet they ask again and when ordered to read the prolog then they understand and realize it, the improvement is the addition of description in the second picture, because students' worksheet used based syntax a model and applied to three sub-materials, so it will produce the same content. Third, students are not used, so when learning or filling students' worksheet there is a fast and some are slow. Equitable grouping is likely to be one of the causes. Because the division of the group is left to them, and possibly uneven.

Feedback provided by students to improve students' worksheet quality. In general, this guided inquiry-based students' worksheet can be used and continuously developed by teachers to develop students' critical thinking skills whose learning is tailored to the characteristics of students and the curriculum. This is as stated by Ramnarain which states that the preparation of teaching materials by teachers can improve teachers' teaching skills and students' ability in understanding the concepts of learning materials [16].

4. Conclusion
The result of guided inquiry students' worksheet development research shows that students' worksheet is feasible to be used in learning material physics of business and energy and ability to improve students' critical thinking skill which has been honed through the learning process. The students' worksheet presented is more interesting by using many colorful pictures and stimulating students with the presentation of problems in everyday life.
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