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DEVELOPMENT OF THE LEARNING MATERIALS BASED ON GUIDED INQUIRY TO FACILITATE THE STUDENTS' EXPERIMENTAL SKILL IN ELASTICITY TOPIC

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Abstract

The research reported in this *skripsi* is intended to produce the feasible learning materials (syllabus, lesson plan, assessment sheet, student's worksheet and hand out) and to describe its feasibility. These learning materials were used to apply a learning process based on Guided Inquiry to facilitate the students' experimental skill in Elasticity topic. The feasibility of the learning materials was based on its validity, practicability and effectiveness. The learning materials were valid when it could differentiate the students according to their abilities, and it was practical when it was easy to be used by the teachers and students. These learning materials were effective when it made the students were able to do the experiment. These aspects were tested by ADDIE model. The first work of this model was to analyze the Core Competence, Base Competence, learning materials and experimental activity in SMAN 1 Krembung. The second work was to design the prototype of the learning materials. The third, this prototype was validated to produce the final version of the learning materials. The fourth, these learning materials were implemented to 32 numbers of students in the 10^{th} grade of Science 1 SMAN 1 Krembung. Finally, the learning materials feasibility was described. The result indicated that these learning materials were able to differentiate the 32 numbers of students' ability, so it was very valid. These learning materials were practical because 95 % of all the activities in these learning materials were easy to be used by the teachers and students, and almost all of students gave positive responses. The 32 numbers of students were able to do the experiment in Elasticity topic with score 0.3 – 0.7 (of 0 – 1 scale). This score compared with the skill before the students used these learning materials. Consequently, 21 of 32 numbers of students passed the performance assessment with score between 79.2 and 92.7, this score is above the minimum score (78.0). According to the above results, the learning materials based on Guided Inquiry were feasible to facilitate the students' experimental skill in Elasticity topic.

Key words: learning materials, Guided Inquiry, Students' experimental skill and Elasticity.

INTRODUCTION

Physics is a part of natural science, which its learning requires the students to do the scientific process first then get the scientific product (Siahaan & Suyana, 2010). Therefore, to get the scientific products, students are expected to do the scientific process first. One of the scientific processes which needed by the students is the experimental activity because 50 % of all the activities in psychomotor aspect is the experimental activity (Depdiknas, 2016).

One if the physics topic at high school level is about the Elasticity topic. The Base Competence in this topic is doing the experiment about the characteristic of Elasticity topic, and presenting the experiment results also its benefit in daily (Base Competence in psychomotor aspect). According to this Base Competence, the students are expected to be able to do the experiment in Elasticity topic and to present their experimental result. Consequently, the students' experimental skill facilitation, exactly the real laboratory experiment, is really needed to achieve this Base Competence.

The students' experimental skill was adapted by integrated science process skill which consists of identifying variable, formulating hypotheses, defining variables operationally, collecting data, interpreting data and drawing conclusions (Kruea-In et al., 2015). Science process skills not only focus on students' psychomotor skill but also intellectual skill and affective skill (Sheeba, 2013). Hence, the facilitation of the students' experimental skill are expected to facilitate the students' intellectual skill and affective skill.

Guided Inquiry is an investigation-based learning model where the teacher gives the problems and guided to help the students doing the investigation and solve this problem (Sani & Handayani, 2015). Guided Inquiry model consist of 7 step, there are: (1) identify the problem and do the observation; (2) ask questions; (3) plan the investigation; (4) collect the data or information by investigation; (5) analyze the data; (6) draw the conclusion, and (7) communicate the result (Nurdyansyah & Fahyuni, 2016). However, not all the teachers can used the Guided Inquiry model becase there's no a learning materials that support the application of this model. The

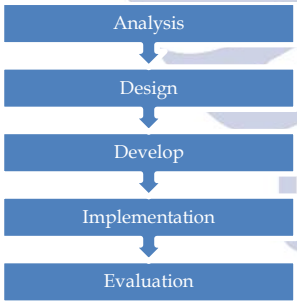
learning materials are a set of tools that used by the teachers as a guideline to produce the learning process according to their expectation (Prasetyo, 2013). Therefore, the feasible learning materials based on Guided Inquiry are needed by the teachers as a tool to apply a Guided Inquiry-based learning process.

The result of research conducted by Ainur Rohmah (2015) and Tomy Alif Wijayanto (2016) indicated that the students' experimental skill (adapted by science process skill) can be facilitated in the learning process based on Guided Inquiry. Moreover, the reasearch conducted by Martina Hodosyova (2014) indicated that the implementation of integrated science process skill to the students has vary enhancement result. The worst enhancement has score 33 % with the indicator formulating hypotheses and the best one has score 65 % with the indicator drawing the conclusion.

According to the explanation above, a research entitled "Development of The Learning Materials Based on Guided Inquiry to Facilitate The Students' Experimental Skill in Elasticity Topic" is done. This research is intended to produce the feasible learning materials (syllabus, lesson plan, assessment sheet, student's worksheet and hand out) and to describe its feasibility.

METHOD

This research was a development research that used ADDIE model. The ADDIE model consists of 5 phases like the picture 1 below.



Picture 1 ADDIE's phase (Danks, 2011)

The learning materials were validated by the experts then was implemented to the 32 numbers of students of 10th grade of Science in SMAN 1 Krembung used one group pretest-posttest design.

The feasibility of these learning materials was described by its validity, practicality and effectiveness. The implementation was to prove the validity of these learning materials and to measure the practicality and effectiveness of these learning materials. The validity of these learning materials based on the experts' assessment, and its ability to differentiate either the students whom passed the minimum score or the students whom not passed. The practicality was based on how the learning materials were easy to be used by the teacher and students. The effectiveness was based on these learning materials ability to facilitate the students' experimental skill, it was indicated as effective when could improve the students' experimental skill (tested by N-gain) and made the students passed the minimum score.

RESULT AND DISCUSSION

The learning materials' validity

Before the learning materials were validated, it was corrected by the experts first. Then, the final version of the learning materials was validated. The learning materials validity indicated by the experts' assessment presented in Table 1.

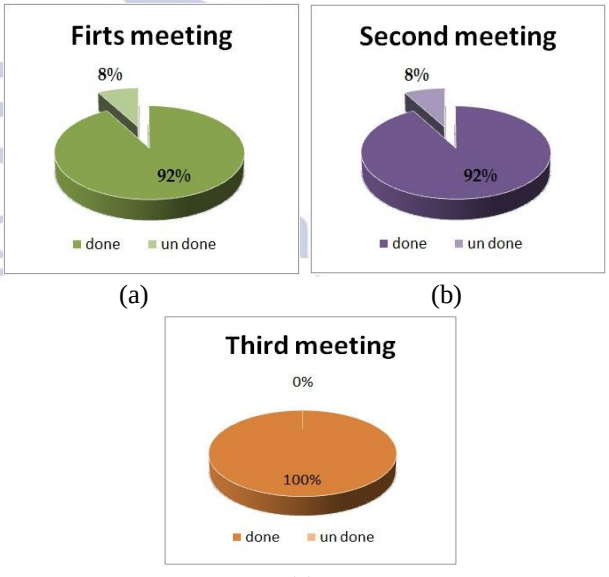
Table 1 The learning material components' validity

No.	Learning materials component	Category
1	Syllabus	Very valid
2	Lesson plan	Very valid
3	Assessment sheet	Very valid
4	Students' worksheet	Very valid
5	Hand out	Very valid

Based on the Table 1, each component of the learning materials was indicated as very valid. Consequently, the learning materials were very valid too. This result was convinced by the ability of these learning materials to differentiate the students according to their abilities after implemented to 32 numbers of students.

The learning materials' practicality

The learning materials' practicality was based on the practicality score assessed by observers and the students' questionnaire result. The practicality score presented in Picture 2.



Picture 2 The practicality score (a) at the first meeting, (b) at the second meeting and (c) at the third meeting

Based on the Picture 2 (a) and (b), the practicality scores at the first meeting and the second meeting were 92 %. These scores meant that the 92% of all the activities in the learning materials was easy to be done by the teacher and students. Moreover, based on Picture 2 (c), the practicality score at the third meeting was 100 %. This score meant that all of the activities in these learning materials were easy to be done by the teachers and students. The average of all the practicality scores were 95 %, these meant that the learning materials were easy to be used by the students and teacher.

The high score of the learning materials' practicality was strengthened by the students' questionnaire result presented in Table 2.

Table 2 The students' questionnaire result

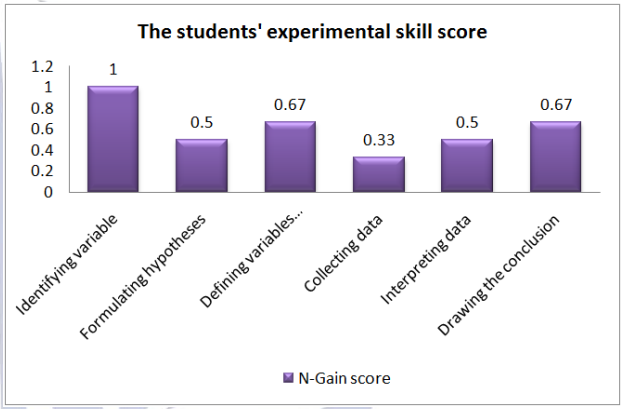
No	Statements	Percentage of positive responses
1	The learning materials based on Guided Inquiry in Elasticity topic was interesting and enjoyable.	96,88%
2	The Elasticity hand out based on Guided Inquiry helps you in the learning process.	100,0%
3	The sentences in this hand out are easy to understand.	71,88%
4	The topic in this hand out is easy to understand.	71,88%
5	The topic arrangement in this hand out is systematic.	84,38%
6	The Elasticity worksheet based on Guided Inquiry helps you to do the experiment.	100,0%
7	This worksheet provided a space to answer the questions.	87,50%
8	The questions in this worksheet are easy to understand.	71,88%
9	This worksheet facilitates your experimental skill.	96,88%
10	The questions in the assessment sheet are easy to be answered.	53,13%
11	The questions in the assessment sheet are relevant with the learning process.	93,75%

Based on the Table 2, almost all of the students gave positive responses to the learning process and these learning materials (limited to assessment sheet, students' worksheet and hand out). However, at the statement "The questions in the assessment sheet are easy to be answered." less than 61 % students give positive responses, so it categorized as enough (Arikunto & Jabar, 2007). This score was because the students were not able enough to answer the questions about the students' experimental skill. This fact was reasonable because the learning process to facilitate the students' experimental skill was limited for 3 meetings. Whereas, the learning process to facilitate the students' experimental skill should be learned continuously, so the students will be really able to do the experiment by themselves and answer the questions about the students' experimental skill (Sheeba, 2013).

Having the above results, the learning materials that develop indicated as practical because 95 % of all the activities in these learning materials were easy to be done and almost all of the students gave positive responses.

The learning materials' effectiveness

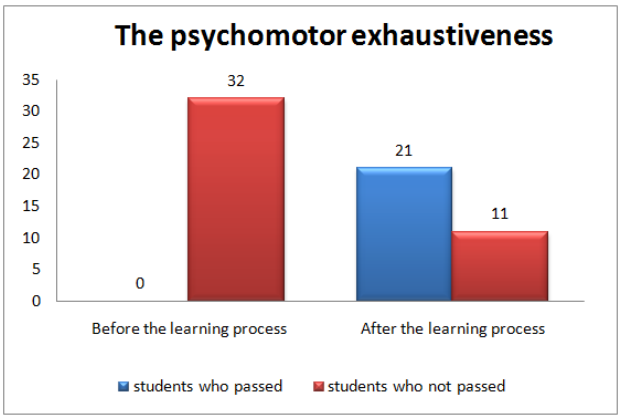
The learning materials' effectiveness was based on the N-gain score and the numbers of the students whom passed the minimum score. The N-gain score defined the enhancement of the students' experimental skill as compared with the skill before used these learning materials (Hake, 1999). The N-gain score presented in the Picture 3.



Picture 3 The students' experimental skill score

Based on the students' experimental skill score, the lowest score was collecting data because students are usual collecting the data in the experiment activities before. Because they were able to collect the data even in the first meeting, so the enhancement got the low score. The highest score was identifying variable because students never got this aspect before. In addition, identifying variable was not the aspect which difficult to understand. The other aspects got score between 0.5 and 0.7. This middle enhanced because these aspects needed some students' abilities such as the self learning's ability, self management's ability and the ability to make an opinion (Nurdyansyah & Fahyuni, 2016), but the students not have this abilities. These abilities should be learned to the students continuously.

The enhancement of the students' experimental skill affected the students' psychomotor score, this score presented in Picture 4.



Picture 4 The students' psychomotor exhaustiveness

The students' psychomotor exhaustiveness shown that before the learning materials were implemented, there's no student that passed the minimum score (78.0), but after the learning materials were implemented the 21 students got score between 79.2 and 92.7, this meant that 21 students passed the minimum score in psychomotor aspect and the others (11 students) still didn't passed the minimum score. The 11 students who didn't passed because of some factors. The first, according to the students' experimental skill which got score 0.3 – 0.7, this score was categorized as the middle level. It meant that the students still needed the learning process to facilitate the students' experimental skill, and this skill should be learned continuously (Sheeba, 2013). The students' experimental skill also needed students' abilities such as the self learning's ability, self management's ability and the ability to make an opinion (Nurdyansyah & Fahyuni, 2016), and this abilities couldn't be skilled in just 3 meetings. The other factor was the students' exhaustiveness which based on their talent, degree of learning and time. Talent defined as the ability of the students to understand the learning topic. Degree of time was time functionally used by the students to learn, and time defined as a time was needed by the students to understand the learning topic. Every student has various degree of time and time according to their talent, so teacher shouldn't give the same learning process (either its time or quality). However, the learning process was implemented similar to 32 numbers of the students (either its time or quality). Consequently, the 11 students who have talent below the others would not pass the minimum score. The solution of this problem was the teacher should give the students, who not passed the minimum score, an extra learning process as the remedial action.

These above results indicated that these learning materials were effective with students' experimental skill score between 0.3 – 0.7 (of 0 – 1 scale), this score compared with the skill before the students used these learning materials. Consequently, 21 of 32 numbers of students passed the performance assessment with score between 79.2 and 92.7, this score is above the minimum score (78.0).

CLOSING

Conclusion

Based on the results and discussions that have been reviewed, the conclusions can be taken are:

1. The learning materials were very valid and can differentiate the 32 numbers of the students according to their ability.
2. The learning materials were practical with score 95 %, it meant that 95 % of all the activities in these learning materials were easy to be done by the teachers and students. Moreover, almost all the students gave positive responses.
3. The learning material were effective with the score of the students' experimental skill between 0.3 – 0.7 (of 0 – 1 scale), and 21 of 32 students were passed the minimum score in psychomotor aspect.

These conclusions above referred to a main conclusion, the learning materials based on Guided Inquiry were feasible to facilitate the students' experimental skill in Elasticity topic.

Suggestion

The researcher suggested that in analysis phase, the learning process in SMAN 1 Krembung should be analyzed to, and the students' experimental skill should be facilitated continuously then the students will able to do the experiment by their selves.

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