Development of physics practicum module based on collaborative teamwork learning model

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Abstract: This study aims to determine the feasibility of physics practicum modules based on collaborative teamwork learning models. Type of this research is a Borg and Gall development research. The stages are potential and problem, data collection, product design, design validation, product revision, product trial. The research subjects involved consisted of experts (material, media and religious) and VII grade students of SMP / MTs. The expert gives an assessment of the level of validity of the material and the suitability of the design physics practicum modules, while students assess the level of physics practicum modules. The results obtained were the feasibility of a physics practicum module based on collaborative teamwork learning models based on expert judgment was considered very feasible, with the percentage of material expert validation 83.40%, media experts 87.41%, and religious experts 95%. Educators and students response positively to the attractiveness of physics practicum modules based on collaborative teamwork learning models as learning media, with the percentage of educator responses 93.75%, small group test 90.19%, and field testing 91.18%. The development of physics practicum modules based on collaborative teamwork learning models was declared very feasible and received a positive response to be used as a learning media.

1. Introduction

Education is a determining factor in the success of development, and can improve the quality of human thought. Education that correlates well with improving the quality of human resources [1]. Education is a step in order to invite students to adjust themselves well to the environment, so it can affect changes in individuals and work in social life [2]. Educational theory that shows learning, both formal and informal, occurs most effectively when trainees are not active, engage in social processes, or seek and create new knowledge [3].

Learning illustrates a plan, can consist of various components that are interrelated with one another [4]. Good learning and teaching need to be able to attract more student attention, serve various groups of students, and put more emphasis on the practice of skills, thought processes [5]. Learning is a set of actions designed to support student learning processes, one of the processes success in learning is very dependent on the use of learning resources or media achieved during the learning process. One
form of learning media that supports the independent learning process is the physics practicum module [6].

In terms of learning theory, there is a strong support base for incorporating collaborative group work as part of student learning experiences [7]. Learning is a process that takes place and is not limited by time to achieve a goal [8]. Learning is an active process in which students actively build or reconstruct their knowledge [9]. The learning process can be done in the community, home or school. The learning process can be young and old age [10].

Modules are instructional materials that are arranged systematically and attractively that include the content of the material, methods and evaluations that can be used independently to achieve the expected competencies [11]. One of the learning models that can support the improvement of students' process skills is a collaborative teamwork learning model. The collaborative teamwork learning model is a learning model that emphasizes teamwork performance and cohesiveness formed by students in solving problems given by the teacher so that it is expected that practicums carried out by students can support student cooperation in groups and all students can play an active role during the implementation of practicum activities because physic practicum module based on collaboration teamwork learning models that are made there are verses of the Quran that related to the material, so that students can open insight to know God and arouse students’ gratitude for God’s power [12]. Team activities include analyzing, setting goals, and solving problems [13]. Teamwork can be defined as collective behavior that enhances effective functioning and team outcomes [14]. Collaboration between students is triggered by learning strategies based on teamwork and collaboration between teachers so that learning runs effectively [15].

Group work or collaboration can effective of approach learning to encourage active student involvement where students work together to achieve shared goals [16]. Collaborative activities have proven useful in maintaining attendance, stimulating student interest, and measuring students' understanding of learning material. [17]. Collaborative learning, which occurs as a result of interaction within a group, can occur anytime and anywhere, even outside the formal classroom environment. [18]. In addition, the concept of "Teamwork" is students who work in a team together to learn and solve a problem where all students contribute ideas and are responsible for the achievement of learning outcomes as a team or individually and provide a bond of cohesiveness [19].

Teamwork gives individuals the opportunity to get to know themselves better, use their leadership, to take responsibility in their relationships with others, to promote their ideas and perspectives, to open up to others, to listen to and question others' ideas [20].

The Collaborative Teamwork Learning Model has several stages according to Frances (2008: 11-17), namely: (a) Forming, team building activities, and discussing problems given by the teacher; (b) Stroming, includes the disclosure of hypotheses from students related to the problem given. Students in this case put forward a hypothesis related to the problem given; (c) Norming, determining sources related to solving the problems discussed in the worksheet. In addition to sources from related books, students can also conduct an investigation as another source in problem solving; (d) Perfoming, communicating the results of problem solving through team presentation activities; and (e) Adjourning, including understanding collaboration activities based on the percentage that has been done [21].

The form of the implementation of process skills in practicum activities includes several stages namely starting from the problem, formulating the problem, proposing a hypothesis, designing research strategies, compiling research instruments, collecting data, and analyzing data, and drawing conclusions [22].

Practical activities also make learning more meaningful because students are involved in the learning process and gain hands-on experience. [21]. Based on questionnaire and interview data obtained from physics teachers and class V11 students at MTs Al Muhajurin Bandar Lampung, conclusions subordinates students still do not use physics practicum modules compiled by the teacher do not even have a module for independent learning, students cannot link learning materials with daily life. So students need modules as an alternative to independent learning. In contrast to MTs Nurul
Huda Pringsewu it is known that students in participating in learning physics are pretty good, students are enthusiastic in taking lessons, because teachers have used additional media in the form of physics practicum modules, but there are still many shortcomings, the modules used are still in the old edition, the writing is unclear blurry and unattractive. The existence of the latest edition of the physics practicum module that is easy to understand, interesting so that the learning process becomes more effective. The results carried out at SMP N 3 Pugung also in the process of learning physics are pretty good because they have used physics practicum modules, but in the school there are no modules that emphasize the active role and cooperation of students in groups.

Modules are made to be able to transfer learning messages from teacher to students so that they can stimulate the thoughts, feelings, interests and willingness of students to learn. This module is part of teaching materials in printed form [23].

Practicum modules similar of the laboratory worksheet that are available in textbooks or modules created by subject teachers have not been able to support the active role of students and do not emphasize student cooperation in groups, causing some students to become passive when doing practical work. Therefore, it is necessary to develop physics practicum modules that are able to enhance the active role and ability of students to work together.

Practicum modules based on collaborative teamwork learning models are feasible and effective to be used in learning obtained from the results of students' post tests after carrying out science practicum activities on vibration and wave material. ([24]). The results of the study that there are differences in learning motivation and learning achievement between students who follow the collaborative teamwork learning model with conventional learning models. ([27]. Student learning outcomes after participating in physics learning by applying the collaborative teamwork learning model class X in SMA Negeri 9 Lubuklinggau in 2015/2016 were significantly completed ([28. Based on several studies conducted above, it can be concluded that the practicum module based on collaborative teamwork learning model is effectively used in learning. This is because it can increase the active role of students in work groups so that it is easier to understand the material. So that researchers are interested in conducting research to develop physics practicum modules based on collaborative teamwork learning models. The difference between previous research and researchers is the physics practicum module based on collaborative teamwork learning models that are made with verses of the Qur'an related to the material, so that students can open their insights to know Allah and arouse students' gratitude for Allah power's.

2. Method

The research method in this study uses research and development methods. In this research, a VII class SMP / MTs physics practicum module will be developed based on a collaborative teamwork learning model. The development model in this study uses the Borg and Gall model. Includes: 1) Potential and problems, 2) Data collection, 3) Product design, 4) Design validation, 5) Design revision, 6) Product testing, 7) Product revision, 8) Test usage, 9) Product revision and mass production 10). (Sugiyono, 2016). In this study, the research steps are limited to development from ten steps to seven steps due to the limited time and material of researchers in research. The following are parts of the stages of developing physics practicum modules based on collaborative teamwork learning models based on the Borg and Gall model.

The instruments used in this study were non-test instruments in the form of validation sheets (knowing eligibility) such as material experts, media expert validations, religious experts, student response instruments and educator responses. Instrument data analysis the form of a questionnaire using a Likert scale. In this study using a scale of 1 to 5 with the lowest score of 1 and the highest score of 5 [25].

In this study using a scale of 1 to scale 5 with the highest score 5 lowest score 1. The percentage of the final value of the validation results obtained using the formula:
\[ V = \frac{T}{U} \times 100\% \]  

Information:
V: Validity \hspace{1cm} Q: Validity score obtained \hspace{1cm} U: Maximum validity score [26, 27]

While the total assessment score can be searched using the formula [28]

\[ P = \frac{\sum x}{\sum xi} \times 100\% \]

Information:
P: Percentage \hspace{1cm} \sum x: Number of respondents' answers in one item \hspace{1cm} \sum xi: The ideal number of values in an item

Then look for the percentage of validation criteria. The validation criteria used can be seen in table 1:

| Interval    | Criteria            |
|-------------|---------------------|
| 0% - 20%    | Very not decent     |
| 21% - 40%   | Not Decent          |
| 41% - 60%   | Enough Decent       |
| 61% - 80%   | Decent              |
| 81% - 100%  | Very decent         |

3. Results

3.1 Analyze and Problem

The results of the analysis indicate that it is necessary to develop a physics practicum module. This research was conducted at MTs Al Muhajirin Bandar Lampung, MTs Nurul Huda Pringsewu, and SMP N 3 Pugung. This study uses the Borg and Gall research model. Here are some of the results of the needs analysis, including: a. In learning, teachers still use the media more printed books and worksheets in conducting the learning process including learning in the laboratory, so that teachers still need a lot of time which results in teachers not maximizing the time in delivering the material, b. Lack of development of innovative and interesting learning media, c. Limitations of the modules used in the practicum, d. Physics practicum modules that facilitate students in practicum are still not feasible.

The results of the needs analysis show that educators have not created innovative and effective learning through practicum activities, therefore researchers are trying to develop physics practice models based on collaborative teamwork learning models, which are able to improve the process of learning for support the improvement of students’ process skills is a collaborative teamwork learning.

3.2 Data Collection

Data collection was carried out to overcome the potential and problems of the condensation conducted by researchers. Collecting information was obtained from pre-research conducted at the MTs Al Muhajirin Bandar Lampung school, MTs Nurul Huda Pringsewu, and Pugung N 3 Middle School. The information was obtained from distributing questionnaires to students and observations related to the use of physics practicum modules. The feasibility of the product determine by 3 aspects: validity, practicality, and effectivity. Instruments use for assess the validity, practicality, and
effectivity of the product with a Likert scale questionnaire adjusted to what students felt after doing media-based learning.

### 3.3 Product Design

Physics practicum modules can connection of the collaborative teamwork learning models. The process of making physics practicum modules is designed using Microsoft Word 2007 and Adobe Photoshop CS5 which are arranged based on learning objectives. The type of theme fonts used in the Times New Roman practicum module, comics sans MS, cooper black, and algerian with font size 12 and 10. The colors in the black lab module font except in the title and sub-subtitles use colors as a pressure in the delivery, in order to attract the attention of readers. For some images can be seen in the following image.

**Figure 1.** Example of design design.

#### 3.3.1 Design Validation

After the product is successfully developed, the next step is to conduct a feasibility test for the physics practicum module by validating the product. Design validation on this product is carried out by the validator in accordance with the field.

| No. | Rating               | Percentage final score | Criteria   |
|-----|----------------------|------------------------|------------|
| 1   | Expert Material      | 83.40%                 | Very decent|
| 2   | Media Expert         | 87.41%                 | Very decent|
| 3   | Religious Experts    | 95%                    | Very decent|

Scores of the results of the assessment by the three experts stated that the physics practicum module based on the collaborative teamwork learning model fulfilled the criteria very feasible to be used as practical learning materials.

**Table 2.** Assessment of physics practicum modules based on collaborative teamwork learning models by experts Content, Media, and Religious Validity

**Table 3.** Criteria for Interpretation of Winning Assessment of physics practicum modules based on collaborative teamwork learning models by educators and students.

| No  | Rating             | Percentage final score | Criteria     |
|-----|--------------------|------------------------|--------------|
| 1   | Educator response  | 93.75%                 | Very interesting|
| 2   | Small trial        | 90.19%                 | Very interesting|
| 3   | Field test         | 91.18%                 | Very interesting|
Assessment of physics practicum modules based on collaborative teamwork learning models in small group trials of 30 students, 10 students from MTs Al Muhajirin Bandar Lampung, 10 students from MTs Nurul Huda Pringsewu, 10 students from SMP N 3 Pugung 10 students get results with a percentage of attractiveness of 90.19%. With Very Interesting criteria from all aspects assessed, namely material aspects, presentation aspects, CTL aspects and language aspects.

In the field trial of 96 students, 32 were students from MTs Al Muhajirin Bandar Lampung, 32 students were from MTs Nurul Huda Pringsewu and 32 were students from SMP N 3 Pugung. Get results with a percentage of attractiveness of 91.18%. With Very Interesting criteria from all aspects assessed, namely material aspects, presentation aspects, CTL aspects and language aspects.

The final product in this research development is a physics practicum module based on collaborative teamwork learning models, odd semester class VII.

4. Conclusion

Based on the results of the development of physics practicum modules based on collaborative teamwork learning models and research that has been done it can be concluded that: 1) The research product is a physics practicum module as a learning support that is made using the Microsoft word application and Adoble Photoshop CS5, this research and development step uses the Borg model and Gall until the seventh stage, 2) The feasibility of physics practicum modules as supporting learning in odd semester material according to experts is very feasible. The results of the validation of media experts get an average percentage score of 90%, material experts get an average percentage score of 89%, and religious experts get an average percentage of scores of 95%. All recapitulation results of the questionnaire at the product validation stage get very decent criteria, 3) Educators and students provide positive responses to the physics practicum module based on collaborative teamwork learning models. The results of the average percentage score of educators by 90.07%, the results of the average percentage score of students by 90%, the results of field trials obtained an average score of 98%, the results of small group trials obtained an average percentage score average of 96% of the collaborative skill.

5. Recommendation

Based on the research that has been done, it is suggested the following things: 1) Physics practicum module based on collaborative teamwork learning models in the odd semester material of class VII can be used in the learning process at school so that the quality of physics practicum modules as a whole becomes more useful, 2) Modules Physics practicum based on collaborative teamwork learning models that are developed in the future will be developed again not only in the odd semester VII class material, but can be developed in other materials.

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