DEVELOPMENT OF STUDENT WORKSHEET BY USING DISCOVERY LEARNING APPROACH FOR SENIOR HIGH SCHOOL STUDENT

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Abstract

The aim of this research is to create student worksheet for physics learning by using discovery learning approach as a learning material referring to curriculum 2013. The method used in this research is research and development. This research consists of five steps: 1) needs analysis, 2) product development, 3) Validation by expert, 4) field test in small scale, and 5) field test in large scale. The average score for student worksheet are 92% from concept expert, 79,56% from media expert, and 91,51% from physics teacher. After revised, the student worksheet was evaluated by a field test in a small and large scale. The average score from both scale are 70,66% and 75,08 respectively. It is conluded that student worksheet by using discovery learning approach can be used and distributed as a learning material in physics learning for senior high school student grade X

Keywords: Student worksheet; discovery learning; development research

Abstrak

Penelitian pengembangan ini bertujuan untuk menghasilkan produk berupa Lembar Kegiatan Siswa (LKS) pembelajaran fisika SMA dengan pendekatan Discovery Learning sebagai bahan ajar yang mengacu pada kurikulum 2013 pada Kompetensi Dasar praktikum kelas X semester genap. Metode yang digunakan pada penelitian ini adalah penelitian dan pengembangan. Prosedur penelitian dan pengembangan ini terdiri dari lima tahap, yaitu: 1) analisis kebutuhan, 2) pengembangan produk, 3) validasi ahli, 4) uji coba lapangan skala kecil, dan 5) uji coba lapangan skala besar. LKS fisika dengan pendekatan Discovery Learning telah melalui tahap uji validasi dengan presentase pencapaian sebesar 92%, menurut ahli materi, 79,56% menurut validasi ahli media, dan 91,51 % menurut guru fisika SMA. Setelah di revisi, LKS di uji cobakan skala kecil kepada 5 siswa menunjukan persentase capaian sebesar 70,66% dan uji lapangan menunjukan persentase capaian sebesar 75,08%. Dari penelitian ini, dapat disimpulkan bahwa LKS dengan pendekatan Discovery Learning yang dikembangkan sudah layak untuk digunakan dan disebarluaskan sebagai bahan ajar fisika kelas X semester genap

Kata kunci: LKS; discovery learning; penelitian pengembangan

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Introduction

The aim of curriculum 2013 is to prepare indonesian having ability to be a devout, productive, creative, innovative, and affective person who can contribute to nation and the world. Learning process in curriculum 2013 is based on student-centered learning in order to master basic and core competence so students can understand the whole concept. In curriculum 2013 implementation, students are involved actively to discover knowledge and teachers become facilitator in learning process. Students can gain their creativity through observing, questioning, experimenting, associating, and networking

Learning process is getting better through curriculum development but the learning condition is not supportable enough due to lack of learning strategy applied by teachers and teacher-centered learning. some teachers have not ask students yet to learn by themselves in understanding physics concept through teacher guidance planned in discovery learning. According to needs analysis, 97,5% students are not involved actively in the classroom and can not develop their creativity by trial-error and obersving phenomena. when students are involved actively in learning process through experiment, there are some problems related to experiment procedures which are hard to understand as found in needs analysis stating 80% students get difficulties in understanding experiment procedure. According to Hirca (2012), experimntal learning has influence on students' ability to arrange experiment.

In physics learning, students are demanded to be active in learning process so they have to use their creativity in developing their competence through discovery (Shalin Hai-Jew, 2009). It is occured because physics is related to observing, understanding, and predicting natural phenomena. Through creativity and innovative mind, students can improve their

cognitive skill, scientific proecss skill, and motivation to participate actively in learning process. Learning combining experiment and group discussion is a popular approach proved by 75% students undertstand clearly when they discover the concept by themselves through experiment, reading literatute, and having discussion with their friends or teachers. According to Feizioglu (2012), experimental based learning has significant influence to students' scientific process. In accordance with the result above, Musasia, Abacha and Biyogi (2012) state that students learning through experiment have better scientific process than students learning through conventional approach. Brunner in Agus Cahyo (2013) states that active participation and recognizing of different ability is more important than others. In order to improve learning process, environment have to facilitate students' curiousity in exploration stage. Environment where students can make discovery and exploration has a purpose to create good learning process and creative students.

According to problems above, appropriate learning process is needed to create the environment. Learning process using discovery learning approach is appropriate to create that environment because the approach can help students to discover fundamental concepts through their mental process. This mental process as stated by Sund in Roestiyah (2001) is observing, classifying, measuring, and predicting. Physics is related to discovery and students have to be involved actively to be creative students so discovery learning approach is appropriate to be applied. Udo (2010) states that guided-discovery and student-centered-demonstration method is effective in communicating chemistry concept and inculcating relevant entrepreneunal skills in learners. Ali (2009) also states that there is a significant difference in favor of the experiment group (students learn through discovery

92-96 |

learning) over the control group in terms of academic achievement scores, perception of inquiry learning scores, and retention of learning scores in both affective and cognitive levels. In accordance with previous findings, Akanmu (2013) states that guided discovery learning strategy stimulated the low, medium, and high scoring students to better performance.

Learning by using discovery learning approach need special preparation, such as student worksheet that can support learning process.Unfortunately, there is no student worksheet supporting students to discover concepts by themselves because student worksheet used generally in schools only consist of problems. Andi Prastowo (2001) states that student worksheet is learning material containing concept, resume, and instruction of task completition referring to competence. Another point of view from Triantoro (2009), it is stated that students worksheet is a student guidance to conduct investigation or problem solving. According to Sirene S.Y, *et all* (2011), using student worksheet in learning process can significantly improve students' outcome. Dilek's (2010) study shows that use of worksheet as supplementary materials affect permanency positively. Another study about worksheet from Ufuk Toman (2013) states that worksheet developed based on constructivist approach enable the students to actively participate during learning process, help them to learn subject better, and increase students' success.

Learning process using conventional student worksheet can not improve student to be more active, creative, and develop their creativity through trial-error, observing, data processing, and formulating because they do not get direct experience to discover concepts. Therefore student worksheet demanding students to work scientifically and discover physics concept is needed. Students worksheet having that criteria has been made by Riza Ali in 2013 but he used 6E model according

constructivism learning.

According to problems above, student worksheet using discovery learning approach for students highschool grade X is needed to create. This student worksheet is printed learning material which can be used by students in experiment class. Creating process is begun by needs analysis to students, discussion with teachers and identifying to previous student worksheet. Planning step is started by analysing core and basic competence in some topics: elasticity, fluid, heat and themperature, and optic, creating concept map, drafting student worksheet, producing and evaluating student worksheet. After that, developed product would be validated by concept and media expert. Besides that, the product would be also tested by students and teachers.

By using this student worksheet, students are expected to understand physics concept by themselves through teacher guidance planned in discovery learning so students improve their scientific skill.The student worksheet is expected to achieve education goal by combining the student worksheet with other materials, such as text book, so students will discover learning content actively and construct their knowledge through discovery in experiment activities

Method

The method used in this research is reasearch and development. Research and development is planned to create learning material, such as student worksheet. The research design used in this research is adapted from Borg and Gall (1983) research model untill the product revising stage. The research design of student worksheet development is shown in figure 1.
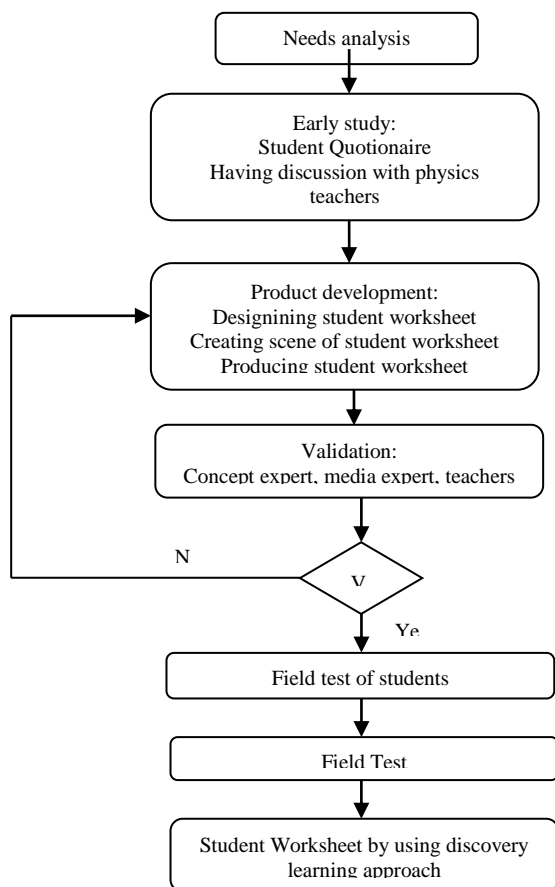
Figure 1. Reasearch design of student worksheet development

Instruments used in this research for data collecting are needs analysis and questionnaire. The data is analysed by likert scale. The validity of student worksheet is measured by score gained from validation. According to assesment, the score is averaged for each indicator. After that , the average score is referred to interval score to determine the quality of student worksheet as shown below

Table 1. Score interpretation

Score	Interpretation
0 % - 25 %	Fairly
25,1 % - 50 %	Fairly Good
50,1 % - 75 %	Good
75,1 % - 100 %	Very Good

Result and Discussion

Product created in this research is students student worksheet using discovery learning approach. This student worksheet is a printed learning material in accordance with discovery learning stages: stimulating, problems identifying, data collecting, data processing, data verivying, and conclussion.

According to result of validation from concept expert, media expert, teachers, and students. This student worksheet can fulfill students' needs. Validation of concept expert shows that this students worksheet is in accordance with standart competence and basic competence containing suitable concept and learning activity with average score 92% as shown in figure 2.
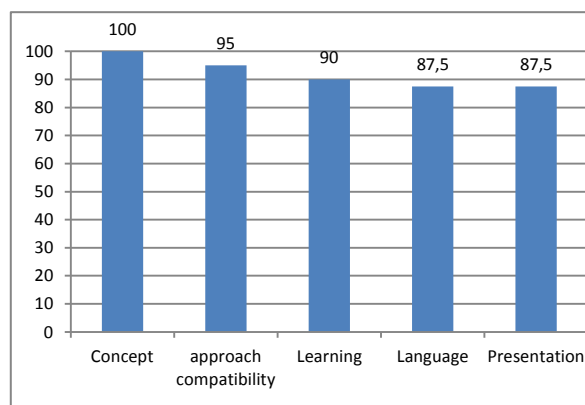

Figure 2. validation result of concept expert

Average score for validation of media expert is 79,56%. It shows that this package of student worksheet can attarct student interest and participation. This student worksheet also meet all componets.
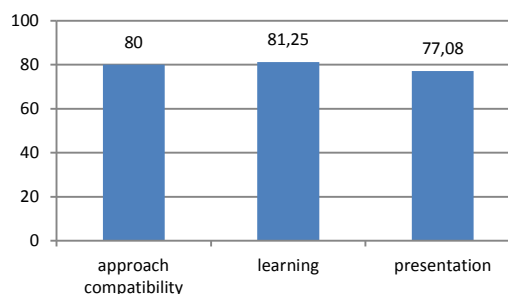

Figure 3. validation result of media expert

According to validation of teachers, average score of the student worksheet is 91,51% and

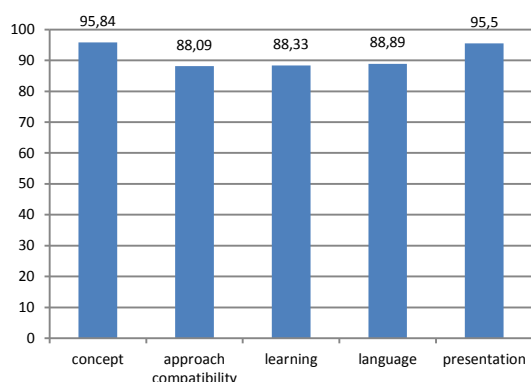the student worksheet could be tested to students as shown on figure 4.

Figure 4. validation result of teachers

The result of student worksheet assesment by field test in small scale shows that the student worksheet can be used but revision is needed in order to students can understand clearly. It can be shown by average score which is 68,37%. After that, the student worksheet is tested by field test in large scale. The test was held in grade X students. The average score is 75,08% and it shows that the student worksheet can be used as learning material for grade X students.
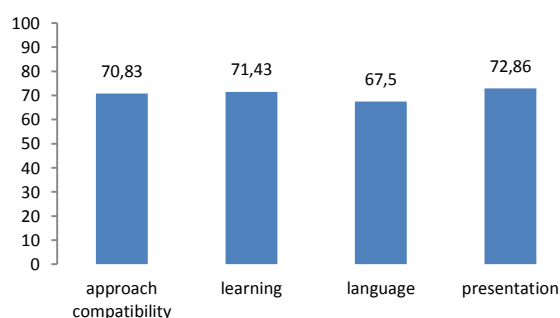

Figure 5. validation result of students

According to interview with students using the student worksheet, they feel curious and enthusiastic in learning because they get direct experience and they stated that they are motivated to conduct experiment and could understand the concept clearly.

By using this student worksheet, students are interested in learning process. It could be seen when students having enthusiastic

discussion with their friend or teachers. Students learn actively in learning process by conducting experiment and each group used their time to complete their student worksheet and present the data gained from experiment.

The result of this research states that student worksheet using discovery learning approach can be developed. This is in accordance with the data from concept expert, media expert, and teachers stating this student worksheet is suitable to develop as physics learning material. Field test in small and large scale show that this student worksheet can make student feel interested, motivated, and participated actively in learning process by this student worksheet.

This student worksheet also contain pictures in accordance with Tony Fetherson's (2008) finding which states picture application which is appropriate with culture can improve student interest.

Conclussion

According to research and discussion, it can be concluded that student worksheet by using discovery learning can be used as learning material for senior highschool student grade X.

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