Need analysis of student worksheet based on tracker on static fluid learning material in high school

Rizki Fadilah and Yohandri*
Department of Physics, Faculty of Mathematics and Natural Science, Universitas Negeri Padang, Indonesia

*yohandri.unp@gmail.com

Abstract. The 2013 curriculum is a student centre, which is centred on students to be able to be active, creative and critical in finding the concept of learning. Project based learning model (PjBL) as one of the student centre learning models that integrates projects in the learning process. LKPD is one type of teaching material that can help students achieve learning goals. LKPD will help students to improve the skills (psychomotor) of students in understanding the concept of physics. Technological advancements provide new innovations for science, one of which is in understanding the concept of analyzing video using a tracker application. This study aims to develop learner-based worksheets (LKPD) on static fluid material. This type of research is research and development with 4D model which has four stages, namely define, design, development, and disseminate. The instrument used for material analysis and learning objectives is the analysis sheet. While the instrument used for the initial analysis and analysis of students in the form of questionnaires. Data analysis techniques use percentage descriptors. The results of front end analysis showed that there was 85% performance aspect in the good category, 58% SKL in the good category, 80% in the learning objectives aspect in the good category, 64% in the needs analysis aspect in the good category, 59% in the good category and results analysis of students obtained 82% spiritual aspects in the good category, 68% in the social aspect in the sufficient category, 73% in the aspect of knowledge in the good category and 73% in the skill aspect in the good category.

1. Introduction

The curriculum is an important aspect of education in Indonesia. According to the National Education System Law No. 20 of 2003 concerning National Education Standards states that "The curriculum is a set of plans and arrangements regarding the purpose, content, and learning materials and the methods used as guidelines for the implementation of learning activities to achieve certain educational goals". All aspects of administering education are included in the curriculum. Curriculum is an educational program that contains various instructional materials and learning experiences that are programmed, planned and systematically designed on the basis of prevailing norms which are used as guidelines in the learning process for educational staff and students to achieve educational goals. Based on this definition the curriculum is a subject and subject matter where taught by the teacher and learned by students.

The curriculum is a "chip" which contains the desires and expectations of a particular community and society to improve themselves, now and in the future [1]. In the curriculum education system is often used as the center of a system of movement of other educational components. Learning is a
combination composed of human elements, materials, facilities, equipment and procedures that influence each other to achieve learning goals [2]. On the other hand, that learning is every activity designed by the teacher to help a person learn a new ability and or value in a systematic process, through the stages of design, implementation, and evaluation in the context of teaching and learning activities. Based on this statement, it can be concluded that learning is every activity designed by the teacher to help someone learn a new ability and or value in a process that includes human elements, facilities, equipment and procedures that affect the achievement of learning goals. There are many ways that teachers can improve the learning process such as the development of interactive learning media [3,4].

Learning model that is considered capable of facilitating student skills is a project-based learning model (PjBL), the learning model is an innovative learning model suggested in the 2013 curriculum. The main elements in the PjBL model according to Lamer [5], namely (1). Key Knowledge, Understanding, and Skills to be Successful (21st century skills), (2). Challenging problems or questions, (3). Continuous inquiry, (4). Authentic, (5). Student voice and choice, (6). Reflection, (7). Criticism and revision, and (8). Product publication. The elements in the PjBL stimulate students to conduct scientific activities, students solve real-world problems by designing their own questions, planning learning, organizing research, and applying various learning strategies.

According to Thomas [6], project-based learning models are able to trigger students to actively engage in inquiry and high-level thinking, so the project-based learning model is a key strategy for creating independent thinkers. According to Gultekin, through project-based learning students become reliable researchers, problem solvers, and have high-level thinking skills. Research shows PjBL has a positive effect on content knowledge and the development of critical thinking skills, problem solving, and collaboration.

Through PjBL students experience an increase in internalizing concepts and skills related to science subjects, and have a tendency to remember and understand various information obtained through the implementation of PjBL. He also stated that this was because students were directly involved in selecting the focus of the project to be worked on, this directly affected the intrinsic motivation of students to continue to search and explore information by themselves. With active involvement in this PBL, students can continue to deepen their knowledge and practice it in the construction of the project.

Student worksheets are sheets containing guidelines for students to carry out programmed activities. Each student’s worksheet contains, among other things, a brief description of the material, the purpose of the activity, the tools/materials needed in the activity, the work steps of the questions to be discussed, the conclusions of the results of the discussion and the repeat exercise.

Trianto [7] stated the student worksheet is a guide for students in conducting investigative or problem-solving activities. Can be in the form of guidance for training in developing cognitive aspects as well as other aspects of learning, in the form of experimental and demonstration instructions. In the development of teaching materials the Ministry of National Education explained that the Student Worksheets are sheets containing tasks that must be done by students, in the form of instructions and steps to complete the task. The tasks that are ordered must be in accordance with the basic competencies that will be achieved. Furthermore Prastowo [8] states that the student worksheets are a printed teaching material in the form of paper sheets containing material, summaries and instructions for the implementation of tasks that must be done by students, which refers to the basic competencies that must be achieved.

Explanation from several sources can be concluded that the student worksheets are the sheets used by students as a guide in the learning process, and contain tasks both in the form of questions and activities that students will do. The principle is that students' worksheets are not assessed as the basis of report card calculations, but only given reinforcement for those who successfully complete their assignments and are given guidance for students who have difficulty controlling problems (problem solving) so that students can develop their mindset by solving these problems.
Tracker is one video based laboratory software which is one of the learning media in the form of video analysis based education software that can be applied in teaching and learning activities in the classroom. Especially for physics subjects on the topic of Static Fluid discussion. This software is freeware that can be downloaded for free. This makes it easier for students to analyze the results of the lab.

Tracker is one of the software from VBL that has the privilege of being able to present physical symptoms in real terms and their representations in the form of quantitative data and graphs simultaneously [9]. Tracker is a method of video analysis about natural events, especially those related to speed, speed, acceleration, force, gravitational field, convergence and energy conservation.

2. Methods

This study aims to analyze the development of LKPD-based Tracker in Static Fluid material. This type of research is Research and Development using 4D models (Define, Design, Developmen, and disseminate). The type of data obtained from the Define stage is Front end analysis (performance, SKL, learning objectives, learning needs and difficulties) and analysis of students. This research instrument consists of analysis of Front end analysis, student analysis, task analysis, concept analysis and analysis of learning objectives. The instrument used for material analysis and learning objectives is the analysis sheet. While the instrument used for the initial analysis and analysis of students in the form of questionnaires. Data analysis techniques use percentage descriptors.

3. Results and Discussion

3.1. Front end analysis

Based on the research that has been done, by surveying using questionnaires, Front end analysis categorizes variables which include performance analysis, SKL analysis, analysis of learning objectives, needs analysis, analysis of students’ learning difficulties. Based on observations that have been made, the results of Front End Analysis analysis are presented in Table 1.

| No | Component                  | Indicator                      | Value | Average |
|----|----------------------------|--------------------------------|-------|---------|
| 1  | Performance Analysis       | Teacher identification         | 73    |         |
|    |                            | Facilities and infrastructure  | 83    | 85      |
|    |                            | School Policy                  | 93    |         |
|    |                            | Social and Psychological       | 90    |         |
| 2  | SKL analysis               | SKL                            | 58    | 58      |
| 3  | Learning Objective Analysis| Learning objectives            | 80    | 80      |
| 3  | Needs Analysis             | LKPD                           | 57    |         |
|    |                            | Learning model                 | 68    | 64      |
|    |                            | Learning approaches            | 67    |         |
| 4  | Analysis of Student        | Developmental Tasks            | 60    | 59      |
|    | Difficulties               | Information Processing         | 56    |         |
|    |                            | Academic Difficulties          | 60    |         |

Based on Table 1, it can be seen that performance analysis includes teacher identification, facilities and infrastructure, school policies, social and psychological. Each item has a set of indicators from several statements. The results of the Performance analysis are presented in Figure 1.
Based on Figure 1 shows that the performance analysis consists of four indicators, namely teacher identification indicators 73% in the good category. The good teacher identification results show that the teacher has planned, implemented, and evaluated the learning well. Facilities and infrastructure 83% in the very good category. Facilities and infrastructure function to support the performance of educators, so that good facilities and infrastructure can be used as a benchmark to support existing learning activities. This can be seen in the well-available school laboratories, but the existing laboratories have not been fully utilized in supporting the learning process. School policy is 93% in the very good category, this means that school policies have supported the success of the learning process. Social and psychological 90% in the very good category, this shows that the school atmosphere has supported the implementation of learning well.

Analysis of graduate competency standards obtained a score of 58% in the good category, but it needs to be improved because the results of the replication of students are mostly still under the KKM set by the school, students still cannot do the experiment well and have not been able to work the questions with confidence. Then the needs analysis is presented in Figure 2.

Based on Figure 2, the needs analysis consists of three indicators, namely the LKPD indicator with a value of 57%, a learning model with a value of 68%, a learning approach with a value of 67%. The results of the learning model indicator acquisition are in a good category where educators have used the learning model according to the 2013 curriculum recommendations, but the LKPD indicator has not been maximized because the developed LKPD does not contain the competencies to be achieved, indicators and assessments. And not yet contain real-life problems that can lead students to be active, creative in discovering the concept of physics.

Analysis of learning difficulties of students get a score of 59% in the good category, where students are very interested if physics learning can utilize technology and practicum activities are carried out but students have difficulty in practicing and understanding the instructions for steps in practicum activities, difficult to remember subject matter that has been learned, it is difficult to focus on the learning process, it is difficult to express opinions in learning. To overcome these learning difficulties educators must develop student worksheets that are used as guidelines in conducting learning activities and practicum activities.
3.2. Student Analysis

The analysis of students is carried out with the aim of examining a number of things related to the initial conditions of the students that will later be used to design the development of students’ worksheets. Participant analysis is seen from the aspect of spiritual attitudes, social attitudes, knowledge and skills. The results of the analysis of students can be seen in Figure 3.

Based on Figure 3 obtained the analysis of students consisting of spiritual aspects with a value of 83% with good categories, social aspects with a value of 68% with enough categories, aspects of knowledge with a value of 73% with good categories, aspects of skills with a value of 73% with good categories. The description of the analysis of students can be seen in Appendix 2. From the results of the analysis the researcher can conclude that the characteristics of students in MAN 2 Padang generally like learning are real in everyday life and learning is research (research). However, the learning process that takes place in schools rarely uses laboratory activities, even though school facilities and infrastructure are adequate. In addition, students have difficulty understanding the physics formulas and are less aware of the application of the subject matter. Therefore, researchers developed the Tracker-based student worksheets using the Project Based Learning (PjBL) model. Student worksheets are designed so that students can be creative to find their own concepts of physics by conducting laboratory research.
3.3. Task Analysis
Task analysis is carried out to identify tasks that must be done by students at each meeting to achieve the learning objectives. Assignments in the form of a job that can be done individually or in groups that are tailored to the characteristics of the task given by educators. Task analysis includes tasks on competencies in knowledge, attitudes and skills. In the knowledge competency of the students assigned to do the Essay test in the form of evaluations given at each meeting and multiple choice tests at the end of learning, attitude competency is seen during the learning process and the skills competencies of students are assigned to practice in LKPD.

3.4. Concept Analysis
Concept analysis is the identification of the main concepts and arranged systematically and find the relevance of concepts learned with reality in everyday life. The results of this concept analysis are described in the designed LKPD. Concept analysis is adjusted to the demands of the curriculum and learning model that will be applied in class. Concept analysis is also used so that the material, models and approaches used can run synchronously and effectively to achieve learning objectives.

The results of the analysis of the concepts that have been carried out are used as the basis for determining the main concepts in static fluid material. The concepts of static fluid material are applied with the steps of the Project Based Learning (PjBL) model. Where these learning activities are used to optimize the implementation of the learning process in order to optimize the learning outcomes of students in the attitudes, knowledge and skills competencies. In general, the material on static fluid can be divided into facts, concepts, procedure principles and cognitive aspects that students need to master.

3.5. Learning Objective Analysis
Formulation of learning objectives is done to find out the objectives to be achieved in the learning process. Learning objectives are developed from core competencies and basic competencies.

4. Conclusion
The results of the analysis were carried out through several analyzes, namely front-end analysis, analysis of students, concept analysis, task analysis and analysis of learning objectives. Front end analysis results are educators, infrastructure, policies, and the school environment has good performance to support the implementation of the 2013 curriculum learning. The learning objectives are in accordance with the 2013 curriculum requirements, but students still cannot remember the lessons and focus on the learning process so some students have not reached the minimum completeness score set at school. Students really like learning that is real in everyday life and enjoys research / research-based learning. The results of the material analysis stage can be explained based on facts, concepts, principles, procedures and metacognition. From the results of Front-End analysis, student analysis, task analysis, concept analysis and analysis of learning objectives, it is necessary to develop Tracker based student worksheets using a project-based learning (PjBL) model on static fluid learning material in class XI SMA.

References
[1] Yani, Ahmad. 2014. Mindset Kurikulum 2013. Bandung: Alfabeta.
[2] Hamalik, Oemar. 2001. Teaching and Learning Process. Jakarta: Rineka Putra.
[3] Djamas, D., Tinedi, V., and Yohandri,. (2018). Development of Interactive Multimedia Learning Materials for Improving Critical Thinking Skills. International Journal of Information and Communication Technology Education (IJICTE), 14(4), 66-84. doi:10.4018/IJICTE.2018100105
[4] Tinedi V, Yohandri and Djamas D,. (2018). How Games are Designed to Increase Students' Motivation in Learning Physics? A Literature Review, IOP Conference Series: Materials Science and Engineering, Volume 335. https://doi.org/10.1088/1757-899X/335/1/012065
[5] Lamer, J. 2014. How Can We Teach and Assess Creativity and Innovation in PBL? Buck Institute for Education. Available: http://bie.org/blog

[6] Thomas .2007. Designing Effective Projects: Characteristics of Projects Benefits of Project-Based Learning. Intel Corporation: Intel Teach Program. Available: http://download.intel.com/education/Common/ro/Resources/DEP/projectdesign/DEP_pbl_research.pdf

[7] Trianto, 2010. Integrated learning model. Surabaya: Bumi Aksara.

[8] Prastowo, Endi. 2011. Creative Learning Makes Innovative Teaching Materials. Jogjakarta: Diva Press.

[9] https://physlets.org/tracker/