
Project-Based Learning Activities: Analysis and Alternative Solutions in Teaching Materials

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Abstract –Teaching material are one of the learning tools that play an important role in supporting the achievement of learning objectives. Teaching materials must be in accordance with the syllabus and competencies to be achieved. If not, then the expected competence cannot develop properly. For this reason, revisions to the teacher's and student's books as teaching materials used in Curriculum of 2013 in Indonesia need to be carried out with the aim of perfecting and providing alternative solutions for learning activities. The purpose of this study is to analyze and provide alternative solutions that teachers can use in learning projects. This research is a descriptive study. The steps taken are the analysis, interpretation, and description stages. This research was conducted through focus group discussions conducted by three education lecturers. The results are: First, Project assignments for disturbance and abnormalities of the motion system and technology that are inspired by the structure of plants in the teacher's book need to be revised or can be replaced with other project assignments. Second, the digestive system material and additive and addictive substances the teacher can add project assignments to meet the achievement of competencies in knowledge, attitudes, and skills.

Keywords: Project based learning; Teaching material; Science

1. Introduction

One positive factor in achieving learning objectives is the use of teaching materials. Teaching material is a set of lesson substance that is systematically compiled which displays the competencies students (Hernawan et al., 2012) emphasizing student activities in the learning process (Setyowati & Widiyatmoko, 2013). Therefore, the use of learning materials in accordance with the learning objectives is needed. (Zulhelmi, 2017) Scientific attitude is a complex thing involving all aspects of human psychology including cognitive, affective and psychomotor. (Nurmaliza, 2018) Someone in choosing a career is basically related to the their personality.

The Quality of teaching materials encourage the implementation of quality learning and produce quality students (Nurdyansyah, 2018). Generic science skills that emphasize science processes and products are important in understanding students' theories and concepts (Khabibah, et al., 2018). Physics as a subject in the natural sciences requires appropriate learning materials that can help students to learn problems related to natural events, solve a natural phenomenon, and interpret the natural phenomenon. Good science learning materials in addition to assessing results can also assess the process. Physics teaching materials should contain activities that support scientific learning according to curriculum of 2013 that applied in Indonesia. On this occasion Law No. 20 of 2003 concerning National Education System states that early age education is an effort to guide children from birth to six years old through the provision of educational stimuli in order to help growth, physical and spiritual development; therefore children have readiness to enter further education (Chairilisyah et al., 2018).

One learning model that supports science learning and scientific approaches is the Project based learning model. The results of a study conducted by Tasci (2015) showed that project learning had a

positive effect on learning achievement and functionality. This model supports student success (Ergul & Kargil, 2014). PjBL allows students to develop creative ideas (Ismuwardani, et al., 2019) and skills (Sart, 2014). PjBL connects student science with real-world problems and connects theory with experience (Efstratia, 2014). This learning model can theoretically be used to internalize scientific methods in secondary students so that it has a long-term effect (Sumarni, 2013). Project activities enable students to gain more meaningful learning and are invited to take on roles in carrying out specific tasks aimed at obtaining information or solving problems in the real world. (Suryani, 2019) In order to be effective in implementing peer tutoring, the teacher must make preparations from various aspects including choosing and training tutors who are responsible and formulating materials and tasks to be given. (Latifah 2018) The main aspect was crucial and it emphasize the development and challenges of today's dynamic educational changes and demand teachers make a totally paradigm shift towards upbringing quality in their teaching strategy.

Currently in the curriculum of 2013, science learning in Indonesia is equipped with teacher books and student books. This book is adapted to the applicable learning syllabus. But, the teaching materials currently available still need improvements, especially for project-based learning. Improvements were made by considering: 1) the relationship between project activities and the syllabus and indicators of achievement of learning objectives, and 2) the relationship between teacher books and student books. Analysis of learning activities needs to be done in order to improve existing teaching materials and provide alternative solutions for project work to be carried out. Improving teaching materials can help in improving the quality of learning. The purpose of this study is 1) to analyze the teacher's books and student books used in the curriculum of 2013 in Indonesia, and 2) provide alternative solutions that can be used by teachers in carrying out PjBL activities.

2. Methodology

This research is a descriptive research. The research seeks to describe the material and task of project learning on the science teaching materials used. The procedure of conducting this research consists of the stages of analysis, interpretation, and description. The activity at the analysis stage is to review and analyze the relationship between the syllabus with the teacher's book and between the teacher's book and the student's book. Interpretation stage is the stage where the researcher provides an argument and compares the research results obtained with the results of other studies. At the description stage, the results of the study are explained qualitatively. The study was conducted through focus group discussions (FGD), consisted of three lecturers involved in eighth grade teaching materials research, two physics education lecturers and a biology education lecturer. The FGD was carried out in July - August 2019. This discussion (FGD) conducted an analysis of the eighth grade syllabus, teacher's books, and student books. This FGD data is needed in perfecting student assignments especially project work. The results of the analysis activities carried out are the basis for making improvements and making alternative other tasks that the teacher can do outside the assignment in the teacher's book.

3. Result and Discussion

The science teaching materials in the curriculum of 2013 have actually been revised since it was first published. This teaching material basically helps the teacher carry out learning activities. The teaching materials used are also equipped with project assignments. Melalui FGD, This activities aims to analyze and provide other alternatives for teachers in implementing learning projects in eighth grade. The analysis was carried out on the material of the motion system, motion and force, structure and function of plants, human digestive system and food substances, additives and addictive substances. The results of the FGD activities provided some conclusions. First, the task in the chapter on the

motion of living things and objects about identifying disorders and abnormalities of the motion system through interviews with medical personnel, should be improved by identifying disorders and abnormalities of the motion system that are often handled by hospitals or medical personnel in the vicinity of student residence. Because, if only identifying students are concerned, they will only record what is in the book because the material's book of disorder and abnormalities in the motion system has been explained in full. Second, on the same material, it is the motion system in living things and objects, there is a project assignment that can be used as an alternative for student project activities, is identifying the type of ant motion. Third, the project task in the teacher's book on technology inspired by plant structure is to observe the plants around and then students choose the technology to be designed that is inspired by the structure of the plant. This task has also been given to learning activities in class. If it is still given, of course it will overlap. In addition, asking students to think about and choose plant structures that inspire technology in one hundred minutes is not effective. Fourth, the task of the digestive system in the teacher's book is to analyze the way heartburn medication works. Another alternative activity that can be done is regarding the project assignments about nutrition contained in food substances. Fifth, the project assignment on additive and addictive substances is about the poster of the dangers of addictive substances. The teacher can do other project activities about additives. Poster assignment is more inclined towards attitude and skill competency, for that it can be assisted through other tasks to support cognitive competence.

The first material in the teacher's book and student's book is material about the motion system, in the 2017 revised science teacher's book, the first material discusses motion in living things and objects. In this material, students are given two project assignments, it is: 1) identifying the types of forces acting on objects that move in daily life, and 2) identifying disorders and abnormalities in the motion system by searching for information from various sources such as interviews to the health center, clinic, hospital, or mass media. Each project task is carried out within one week. Analysis of student books gives the results that the material of the system of motion disorders has been well described. The results displayed in the student book are presented in Figure 1.



Figure 1. Examples of Motion System Disorders in Student Books

Based on the analysis of the relevance of teacher's books and student books, if the teacher gives project assignments to identify disturbances and movement disorders from various sources where the material has been widely presented in the student book, it is feared that students will only copy what is in the book. Suggestions addressed to teachers who want to do project assignments for material disorders and motion system disorders is that project assignments should be replaced by doing survey assignments where students act as survey workers. The alternative project assignments given are

asking students to record and obtain information from medical staff about motion disorders that are mostly experienced by the community around their residence. According to Anderson & Pešikan (2016), teachers must choose assignments by balancing authenticity and relevance. Authenticity means reviewing how something students learn can be applied in real life. Relevance means ensuring examples of its application can be seen in the environment.

Another alternative to the material of the motion system is that the material is different from disorders and abnormalities of the motion system but still in the material of the motion system that is identifying the type of motion of ants. Students are asked to look for traces of ants on the ground, the tracks taken are those that produce a straight line, start recording when the ants pass through two points on the specified straight line. Next measure the line and determine the time it takes for the ant to cross the line. According to Roessingh & Chambers (2011), when project assignments take place students collaborate on real-world learning tasks by respecting the needs, interests, learning styles and backgrounds of students' knowledge and experience, the work produced by students is work that details knowledge and understanding through experience.

The third material is the material structure and function of plants. In the teacher's book there is material about technology that is inspired by plant structure. The activity in the class in the teacher's book is to discuss technology material inspired by plant structure. However, in the student book this material has been written in full. Material that has been explained in full is solar panel material, protective coatings and polishes, and purification equipment. As a result, if it is used it is feared that students only read and scientific learning is not going well. in the teacher's book shown in Figure 2.

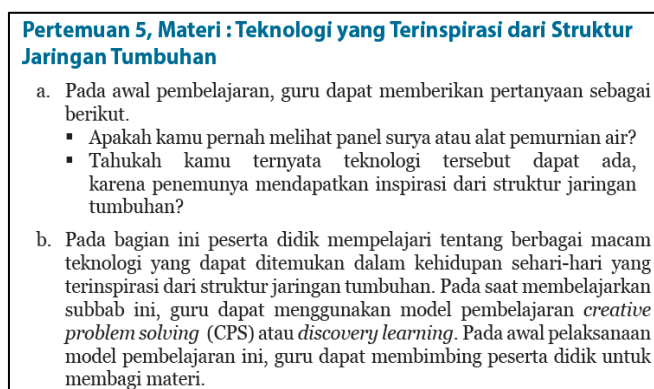


Figure 2. Learning Activities in the Teacher's Book for Material of Technology Inspired by Plant Structure

The activities and information contained in the student book have explained information about the technology inspired by the structure of plants. Creative problem solving or discovery models used can be implemented in scientific learning. However, if the teacher asks students to find the technology inspired by plant structures in class learning that day, the most likely obstacle to face is that in a total of 100 minutes of learning it will be difficult for students to find structures in plants that can inspire technology. According to Sumarni (2013), one of the shortcomings of PjBL is it takes a long time, especially for large classes. Therefore, the teacher must be able to choose the appropriate assignment for the duration of time available. An alternative activity that can be used by the teacher is to conduct activities to observe the "pulutan" plant and describe the structure of the plant to be compared with Velcro adhesives. In addition to being more likely for 100 minutes of learning time, an explanation of pulutan and Velcro plants is available in student books. Project assignments carried out by students contained in the teacher's book are to determine the type of technology to be designed that is inspired

by plant structure. This task is very good in developing students' creative thinking skills. According to Ismuwardani et al., (2019) the implementation of PjBL in learning can increase student creativity.

The digestive system material has a project task in the form of analyzing the work of antacid drugs in neutralizing stomach acid. In this assignment, students are asked to do activities by testing acid solubility with ulcer drugs. Project assignments on the digestive system regarding food ingredients can also be made project assignments. In this material, one that can be used as an alternative for teachers is the task of identifying the food consumed by students for one week by calcifying the food ingredients into three nutrients consisting of: carbohydrates, fats, and proteins. The observation table form that can be used is shown through Figure 3.

No	Bahan Makanan	Nutrisi			
		Karbohidrat	Protein	Lemak	Vitamin

Figure 3. Observation Tables that Students Can Use in Alternative Project Assignments on Food Identification

The teacher’s book provides project assignments in the form of writing works on the effects of the abuse of addictive substances on health. This is a project assignment about addictive substances. If the teacher wants to take on project assignments about additives, an alternative can be done is to write a list of food compositions in the package purchased and additives used by students or their mothers at home to cook, then classify them into types of coloring, preservatives, flavorings, sweeteners, scent, thickener, and so on. Alternative observation tables that students can use are shown in Figure 4.

No	Jenis Bahan Makanan	Klasifikasi Zat Aditif									
		Pewarna		Pemanis		Pengawet		Penyedap		Antioksidan	
		Alami	Buatan	Alami	Buatan	Alami	Buatan	Alami	Buatan	Alami	Buatan
1.											
2.											

Figure 4. Observation Tables that Students Can Use in Alternative Project Assignments on Additive Substances

Based on the information that has been explained, if the project assignments given have been described in full in the student book, the project assignments given are replaced with project tasks that are more likely, the alternative given can be one of the alternative choices as project assignments given by the teacher to students. The teacher can choose project assignments that are possible to be carried out by students without significant obstacles by giving assignments such as alternative project assignments on digestive system material and additives and addictives.

4. Conclusion

Project assignments in books used by teachers and students are in accordance with the syllabus and are good for learning using a scientific approach. There are several things that can be done because the project assignments given in the teacher's book have been explained in the student's book, one of them is material for disorders and abnormalities in the motion system. This material has been described in the student book. For this reason, teachers can use alternative project tasks in order to develop students' attitudes of responsibility towards their work by gathering knowledge and understanding through experience.

The teacher needs to choose project assignments that help students implement what they learn into real life. In addition, the teacher must also be able to choose which project assignments require long time and which do not require long time so that learning activities become more effective. In addition, the teacher can also choose tasks that make it possible for students to do without significant obstacles, and show the attitude of student responsibility towards the given task.

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