

PROJECT-BASED LEARNING IN VOCATIONAL AND SCIENCE FOR BLIND STUDENTS

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Abstract—Project-based learning is a learning that provides direct learning experience to students through scientific inquiry activities carried out by independent students (student-directed scoring inquiry) with the support of technology and collaboration to solve real problems in daily life (real world problems) (Krajcik et al., 1999). This study uses a systematic literature review. A systematic literature review is a series of studies using the internet, then synthesized on a particular topic. The literature used in this study is previous research on a national scale. Research in the form of articles during 2013-2017. Project-based learning can improve students' understanding of the material, especially those related to skills. In addition, active students, directly involved in making projects, make plans to obtain results, improve the ability of students with visual impairments, and improve the independence of blind students.

Keywords— project based learning, biotechnology, visually impaired skills

1. Introduction

The learning objectives of Natural Sciences (IPA) listed in the implementation of the 2013 curriculum are some of the answers to the answers to the problems of education in Indonesia. For visually impaired learners, teaching science (*Science*) is something difficult to understand, because of the obstacles in sight.

In blind children, the concepts of an object are not intact, this indifference causes children not to have the impression, perception, understanding, memory, and visual understanding of an object. (Kosasih.E, 2012: 182). In carrying out the learning process based on scientific learning the role of the teacher is very necessary, but the more mature the child is or the higher the class, the less help from the teacher (Daryanto, 2014: 51).

If we refer to the 2013 curriculum, there are two important things, namely the scientific approach and authentic assessment. These two studies were then used as the basis for changes to the 2006 curriculum into the 2013 curriculum. In the scientific approach there are three learning models namely *Problem Based Learning*, *Project Based Learning* and *Discovery Learning*.

Appropriate learning to improve understanding of concepts in science subjects, which is also recommended in the 2013 curriculum is Project-Based Learning. Project-based learning is a learning that provides direct learning experience to students through scientific inquiry activities conducted by independent students (*student-directed scoring inquiry*) with the support of technology and collaboration to solve real problems in everyday life (*real world problem*) (Krajcik et al., 1999). The assumption underlying this learning is taken from a constructivist social perspective, namely students need to find solutions to authentic problems by asking questions and

formulating problems, designing and conducting investigations, gathering and analyzing information and data, interpreting, drawing conclusions, and reporting findings (Blumenfeld et al., 1996; Krajcik et al., 1999). Collaboration and discussion are also included in an important part of this learning because it supports students to share understanding and ideas with each other during learning.

Literature search uses the internet on the google scholar page with keywords project-based learning and science. Literature chosen to answer questions (1) What is meant by a project-based approach (2) What is the learning process with a project-based approach to blind students (3) What is the excess of a project-based approach to blind students (4) What is the lack of a project-based approach to students blind.

2. Literature Review

A. *Children with special needs with vision obstacles (Blind)*

Children with special needs are children who experience physical, intellectual, motoric, emotional, behavioral and social barriers. One child with special needs with physical barriers is visually impaired, namely children with obstacles to the sense of sight. According to Soemantri (2006: 65) mentioned that, Blindness is a sense of sight in individuals who do not function in becoming a means to receive information in everyday life. Obstacles to vision make the tunes have to optimize the other senses that are still functioning, such as the senses of touch, smell, taste, and hearing.

All children have equal and equal educational rights. According to RI Law No. 20 of 1989 concerning the National Education System, among others, mandates that, "Every citizen has the same right to obtain education". (Article 5). Furthermore, it is also explained in Article 8 paragraph 1 that,

"Citizens who have physical and / or mental abnormalities have the right to obtain extraordinary education." Children with special needs need special education services, in order to receive learning in accordance with the obstacles experienced. To develop the potential possessed by blind people, it is necessary to provide appropriate, directed and sustainable learning.

Definition of Extraordinary Education according to Government Regulation No. 72/1991 that; "Special education is an education specifically held for students who have physical and / or mental disorders. The purpose of extraordinary education, mentioned helps students who have physical and / or mental disorders in order to be able to develop attitudes, knowledge and skills as individuals and community members in conducting reciprocal relations with the social, cultural and natural environment, and can develop abilities in the world of work or take part in further education"(article 2).

Students who have obstacles in vision result in impaired abilities in skills or fields of study that require vision, such as science. Students often have difficulty understanding concepts in skills and science. Learning made by the teacher should have concrete principles, totality, and independent activities. In addition, according to Wardani et al. (2009) learning for the blind should students get real, comprehensive, active, and independent experiences.

Good learning for all students is capable in academic and non-academic fields. This is a form of learning strategy in an effort to use every sensory that is still functioning to compensate for weakness as a result of the loss of the ability to see for blind children (Wardani et al. 2009: 4.42).

According to Wena (1995) an important aspect of dealing with blind children is:

"Instill the understanding that independence is the goal desired and wanted to be achieved. The opposite of a desire that is too strong to be independent is the power of withdrawing from total dependence."

Blind children are able to live independently and play an active role in community life. Project-based learning is one method based on constructivism that supports student involvement in problem solving situations (Dopplet, 2003). There is a comprehensive need to apply skills to improve work skills.

B. Biotechnology

The latest curriculum in Indonesia, namely the 2013 curriculum develops a link between aspects of the abilities that students are expected to achieve these aspects are spiritual, social, knowledge and skill aspects. These four aspects will later become the provision of students after graduating from school.

Obstacles held by blind people result in aspects of the curriculum not being achieved. For the independence of the blind, skills are preferred. There are various kinds of skills that can be used for life supplies, especially in science subjects, such as Biotechnology materials.

Biotechnology comes from the words biology and technology. Many definitions of biotechnology, including the following (Djatin J, et al., 1993):

- *The European Federation of Biotechnology* in 1982: integrated applications of biochemistry, microbiology, and engineering for the use of microbes, tissue culture, and its components on an industrial scale.
- Application of scientific principles and process engineering of materials, using biological intermediaries to produce goods and services, as well as processes such as handling waste.

Biotechnology is material that requires students to do, not only to the extent of knowing, but to obtain an industrial product or environmental treatment. The main components in biotechnology such as fungi, bacteria, animal cells, plant cells. This biotechnology has actually been used since prehistoric times, such as making alcoholic beverages. The beginning of biotechnology is a simple way of working, so it is often called traditional or conventional biotechnology. Examples of conventional biotechnology are cheese, bread, yogurt, tempeh, soy sauce, oncom.

Biotechnology is included in the XII class SMALB Blindness curriculum. In addition, this biotechnology can also enter into skill materials that can support the independence of blind students after graduating from school. One conventional biotechnology is tempe. Making tempeh can be done by blind people. Santoso (1993: 13) that soybean tempe is a food ingredient produced by fermented soy beans by molds in the form of solids and distinctive smells and grayish white.

C. Project-based approach

Mas learning process must now foster students more active learning is to change the learning strategy from *teacher-centered* learning (*student centered learning*). In Uno (2008), explained that students who learn must play an active role in shaping their knowledge. Student-centered learning strategies, students are required to build new knowledge that comes from knowledge that has been obtained previously. It is expected that constructivism theory can build and develop knowledge from information based on what is seen, heard, felt, and experienced.

Project-based learning is one of learning that uses constructivism theory. Project-based learning process is learning that is designed by using the project as a goal. The focus of project-based learning on student activities in gathering information, producing something, and its use is beneficial for students themselves and others (Pornsawan and S. Charan: 2012).

Some of the principles found in project-based learning are Wena based, namely; (a) The centralistic principle of emphasizing project work is at the core of the curriculum. (b) Principles that are focused on questions or problems that encourage the discovery of key concepts. (c) Principles of constructivist research, students are involved in decision making, problem finding, and modeling. (d) The principle of autonomy, encourages the independence of students in carrying

out the learning process by making their own choices, working in groups, and being responsible. (e) Realistic principles, changing students who are passive by choosing topics, assignments, and work roles, work collaborations, products, customers, and product standards.

Komalasari (2011) states that the *Project Based Learning* approach allows students to work independently to build their knowledge in learning and make it happen in real products.

3. Methodology

This study uses a systematic literature review. A systematic literature review is a series of studies that use the internet, then synthesized with certain topics. The literature used in this study is previous research on a national scale. Research in the form of articles during 2013- 2017. In the year the journal was published using the most recent year so the results still had the latest validity and did not miss other studies. After determining a number of questions, the author answers the question by identifying relevant literature. Literature is found from the Google Scholar publication portal. The keywords used for the search are "Project-Based Learning and Science, then" Project-Based Learning in the elderly. Finally, 4 selected journals that will be analyzed and synthesized according to the research question.

4. Result and Discussion

A. Result

National-scale journals that match this literature study. Each article has one or two appropriate variables, listed in table 1. The research conducted by Damay Nur Wahyu Sampurna (2013) entitled "Project Method in Improving Pre Vocational Skills in Making Tempe in Children with Visual Impairment in SMPLB". The background of this research is : (1) Pre vocational skills and career development for blind people is the most important part in the framework of establishing blind people ; (2) The skills usually possessed by blind people are in the field of music and masange.

From quantitative pre-experimental research using the "*one-Shot Case Study*" design , results were obtained. There was a significant effect on the use of the project method in improving pre-vocational skills to make tempe VII grade blind children in SMPB-A YPAB Gebang Putih Surabaya.

The research conducted by Hafsa Choirun Nisa (2016) with the title "Project Based Learning Model on the Ability to Make Blind Soybean Milk. The background of this research are: (1) Children with visual impairments depend on other functioning senses. (2) The skills usually possessed by blind people are in the field of music and masange. (3) Children can learn real by the project method.

With quantitative *pre-experiment and* research design, *one group pre-test post-test design* , the results were obtained. There was a significant effect on the project-based learning model on the ability to make blind children with soy milk at YPAB Surabaya SMPLB-A.

The research was conducted by Ninis Ladytia (2016) with the title "Training on Making Salted Eggs on Pre-Vocational Skills for Blind Children. The background of this study is that producing salted eggs is a relatively easy form of skill that can be mastered and mastered by blind children, because to make the salted egg sensory more necessary is the sense of touch.

With quantitative pre-experiment and using the design of "*the one group pretest post test design*", the results were obtained. There was an effect of training on the learning outcomes of skills in blind children of YPAB Surabaya SMPLB-A.

The research was carried out by Loukis Dewwa Rissona Anditta (2017) with the title "Project Method for Skills in Sorting Out Blind Student Waste in the SMPLB. The background of this study is (1) Based on the results of field observations, blind students in Surabaya YPAB-A SMPLB have not mastered the differences in organic and non-organic waste (2) In the process of sorting waste skills in schools using the project method because in the process students apply various related competencies in an integrated manner to produce a product or work that is real and complete.

The research design used was "*one group pretest - post test design*", obtained results. There was an effect of the project method on the skill of sorting the waste of blind students at YPAB Surabaya SMPLB-A.

B. Discussion

a) First question: What is a project-based approach?

Some of the principles found in project-based learning are Wena based, namely;

- The centralistic principle of emphasizing project work is at the core of the curriculum
- Principles that are focused on questions or problems that encourage the discovery of key concepts.
- Principles of constructivist research, students are involved in decision making, problem finding, and modeling.
- The principle of autonomy, encourages the independence of students in carrying out the learning process by making their own choices, working in groups, and being responsible.
- Realistic principles, changing students who are passive by choosing topics, assignments, and work roles, work collaborations, products, customers, and product standards.

The focus of project-based learning on student activities in gathering information, producing something, and its use is beneficial for students themselves and others. (Pornsawan and S. Charan: 2012). Komalasari (2011) states that the *Project Based Learning* approach allows students to work independently to build their knowledge in learning and make it happen in real products.

b) Second question: What is the learning process with a project-based approach to blind students?

Blind children are able to live independently and play an active role in community life. Project-based learning is one method based on constructivism that supports student involvement in problem solving situations (Dopplet, 2003). In particular there is a need to holistically apply skills in a project-oriented work environment (Taylor, et al., 2003) & Moore, 2003). Project-based learning is suitable to be applied to blind students. Biotechnology is included in the XII class SMALB Blindness curriculum. In addition, this biotechnology can also enter into skill materials that can support the independence of blind students after graduating from school. One conventional biotechnology is tempe. Making tempeh can be done by blind people.

c) What are the advantages of a project-based approach to blind students?

Active students, directly involved in making tempeh, make plans until results are obtained. Improve the ability of students with visual impairments. Increasing the independence of blind students.

d) What are the shortcomings of a project-based approach to blind students?

Long time in implementing project-based methods. Lack of preparation of tools and materials. The absence of sustainable learning.

5. Conclusion

Project-based learning can improve students' understanding of the material, especially those related to skills. In addition, active students, directly involved in making tempeh, make plans to obtain results, improve the ability of students with visual impairments, and improve the independence of blind students.

The weaknesses of project-based learning are long-standing in implementing project-based methods.

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Table 1:

| Reference | Basic Findings | Aim | Sample and location | Design and Research Instruments | Project Area | Research result | Advantages | Deficiency |
|------------------------------------|--|--|--|---|--------------------|--|---|---|
| Damay Nur Wahyu Sampurna (2013) | 1. Pre-vocational skills and career development for blind people is the most important part in the framework of establishing blind people 2. The skills usually possessed by the blind are in the field of music and masange. | Alternative new skills to make tempeh | Grade VII YPAB Surabaya SMPLB-A A total of 6 people | quantitative pre-experiment using the "one-Shot Case Study" design | Making tempeh | There is a significant influence on the use of the project method in improving pre-vocational skills to make tempe for blind children of class VII in SMPLB-A YPAB Gebang Putih Surabaya | 1. Active students, directly involved in making tempeh, make plans until results are obtained. 2. Improve the skills of students with visual impairments. 3. Increase the independence of blind students. | Long time in implementing project-based methods. |
| Hafsah Choiru Nisa (2016) | 1. Children with visual impairments depend on other functioning senses. 2. The skills usually possessed by the blind are in the field of music and masange. 3. Children can learn real with the project method. | 1. Alternative new skills for making soy milk 2. Project-based learning can improve independence and skills. 3. Project-based learning has enormous potential to train children in the process of critical thinking and being independent and active in skills learning activities | Grade VIII YPAB Surabaya SMPLB-A A total of 7 people | 1. Quantitative 2. Pre-experiment with research design, one group pre-test post design test. Pre-experimental research | Making soy milk | There is a significant influence on the project-based learning model on the ability to make blind children's soy milk at YPAB Surabaya SMPLB-A | Students better understand the concept of how to make soy milk because they immediately complete the project to make soy milk. | Long time in implementing project-based methods |
| Ninis Laditya (2016) | Producing salted eggs is one form of skill that is relatively easy to do and is mastered by blind children, because to make the salted egg sensory, which is more needed is the sense of touch | 1. To develop the senses of blind children 2. To increase the independence of blind students | YPAB Surabaya SMPLB-A Students A total of 6 people | quantitative pre-experiment using the design "the one group pretest post-test design" | Making salted eggs | There is an effect of training on the learning outcomes of skills in blind children of YPAB Surabaya SMPLB-A | Improve pre-vocational skills of YPAB Surabaya SMPLB-A students | 1. Lack of preparation of tools and materials 2. The absence of learning keberlanjutan |
| Loukis Dewwa Rissona Andita (2017) | 1. Based on the results of field observations, blind students in Surabaya's YPAB-A SMPLB have not mastered the differences in organic and non-organic waste 2. In the process of sorting waste skills in schools using the project method because in the process students apply various competencies related in an integrated manner to produce a product or work that is real and complete | The application of this project method is expected to be able to sort organic and inorganic waste to foster collaboration between students, teach students to think creatively, foster good interaction between teachers and students in the skills process | YPAB Surabaya Senior High School-A Student 7 people | The research design used was "one group pretest - post test design" | Sorting waste | There is the influence of the project method on the skill in sorting out garbage from blind students at YPAB Surabaya SMPLB-A | 1. Able to sort organic and non-organic waste 2. Able to improve concentration skills 3. Growing collaboration between students, creative thinking. | Long time needed. |