An early childhood teachers teaching ability in project based science learning: A case on visible light

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Abstract. The research aims to describe teacher’s ability in teaching science toward project based learning for early childhood (EC) students. The EC teacher’s ability in term of using learning model are very useful. The instrument used in this study is teachers teaching ability assessment tool based project learning. This study was conducted on 2 teachers of early childhood education in Bandung. Design the research used is descriptive qualitative. The results obtained indicate that teachers teaching project based science learning have not been compatible with project based learning steps. This happens because the teacher is less understanding of project-based science learning. Thus the ability of early childhood education teachers to understand project based learning in project based science teaching is essential.

1. Introduction

The number of innovative learning models at the level of early childhood education making teachers more innovative in choosing and having the ability to use it. One of the innovative learning models in early childhood education is project-based learning. Project-based learning is very effective in early childhood education. This is closely related to aspects of child development in learning activities. in this study will be used project based science learning. The results of the study [1] show that teaching science through experience (project) is an essential approach to stimulating the understanding of the model of science of kindergarten students.

Project based learning has been around for a long time. In 1900, John Dewey supported the existence of learning by doing. This is in line with the theory of constructivism in which individuals build knowledge through interaction with the environment. Through investigation activities, conversations or activities, an individual learns by building new knowledge. This learning will provide knowledge and different experiences on each individual. Thus the project based learning model was born which emerged as one of practice which promise to meet various needs and interests of the child culminating in the final product or question and answer events with presentations for develop potential e.g. [2,3].
Project based learning is a comprehensive approach for learning process. Learning based project learning is designed to engage students in authentic problem investigation. Characteristics of project-based learning is child-centered. Where children are given the opportunity to conduct learning activities according to his wishes. In project-based learning, students work in groups to solve its authentic challenging problems, based curriculum, and often interdisciplinary. The child decides how to solve the problem and choose what activities will be doing. They gather information from various sources according to what the child gained of the results. Their learning becomes valuable because it is connected with something real and involves various objects. Starting from the collaboration with peers, adults or teachers, collaborate with peers, to reflect with adults. Eventually, children show their newly acquired knowledge, judged by how much they learn, and how well they communicate it. During this process, the role of the teacher is to guide and advice rather than directing and managing children's learning. So that learning is not teacher centre e.g. [4-6].

Correspondingly, that teachers should provide opportunities to the child to determine and conduct his own activities. Early childhood education teachers are responsible for specific pedagogical work which meets the unique needs of children. National Association for the Education of Young Children (NAEYC) recommends that teachers take attention of young children concluded an integrated approach, based play, building relationships, social-emotional learning, and documenting learning development for children can be through administration strategies such as anecdotal notes, sample work, and portfolios. Other than that, early childhood education teachers must have the ability to teach. It aims to achieve the learning as expected. Using a project-based learning model teachers can have appropriate teaching skills with pedagogic competence. Because teachers are an important component in learning [7]. The material given in early childhood is the process of color recognition. There are two activities in this study. The first is the color mixing process. The second is the color classification.

**Figure 1.** Color primary color composition.

The visible spectrum is part of the electromagnetic spectrum realized by the human eye. Electromagnetic radiation in this wavelength range is called visible light or just light. The typical human eye will react to wavelengths from about 390 to 700 nm. In relations of frequency, this matches to a posse at around 430-770 THz. The spectrum does not, however, contain all the colors that can decide the human eye and the brain. Colors are not as saturated as pink, or purple variations such as magenta, none, for example, because they can be made with just a mixture of several wavelengths. Colors that contain only one wavelength are also named pure colors or spectral colors [8].
Table 1. Colors in the spectrum.

| Color   | Frequency | Light Wave |
|---------|-----------|------------|
| Purple-Indigo | 668-798 THz | 380-450 nm |
| Blue    | 606-668 THz | 450-495 nm |
| Green   | 526-606 THz | 495-570 nm |
| Yellow  | 508-526 THz | 570-590 nm |
| Orange  | 484-508 THz | 590-620 nm |
| Red     | 400-484 THz | 620-750 nm |

Figure 2. Light wave.

From the results of early observations in 2 groups of early childhood education teachers, teachers are still in the weak category in a project-based teaching process. So the author decided to find out how the ability of early childhood education teachers in project based science learning. With this research is expected to afford an overview for later researchers who are interested in this field.

2. Method

Qualitative-descriptive is the design which used in this research. The subject in this research are the teachers of early childhood education in Bandung. The teacher who participated in this research this research was conducted on 2 teachers of early childhood education (38 and 56 years old). One teacher is from the centre of natural materials and another teacher from the preparatory centre. The teacher was selected based on his role in the activities of the central group in kindergarten.

The instrument used is a project-based teacher-based measurement tool observation. The instrument uses an observation sheet accompanied by a Liker scale. The observation sheet consist of 20 item which include teacher activity in determining the fundamental questions, designing project plans, arrange schedule, keep an eye on the project, assessing results, and evaluate. The data that has been obtained then categorized into categories very less, less, medium, good, very good.

3. Result and discussion

There are 6 indicators used to measure the teaching ability of teachers in project-based science learning. Figure 2 shows the recap of test results of teaching ability of teachers in project-based science learning, as follows.

3.1. The results obtained from the teacher’s teaching ability are as follows:

From the diagram results in figure 3 obtained data averaged of both teaching skills of early childhood education teachers. There are three indicators that are categorized very less that is Arrange Schedule,
Assessing Result and Evaluate. While the other three indicators as determining the fundamental question, designing project plans and keep an eye on the project are in the medium category. Thus it is necessary to improve the teaching ability of teachers in project-based science learning.

![Teacher Activity](image)

**Figure 3.** Teachers' ability in project science based learning.

Teachers from the preparatory group scored the most at 3 stages between the stages determining the fundamental question. While the lowest in phased Evaluate 56, 25%. From all indicators of project-based science-based teaching abilities, Teachers in the preparatory group scored an average grade with a percentage 68.75%.

Teachers from the highest grade of natural ingredients are at the designing stage of the project plans with percentages 70%. While the lowest in the stage Arrange Schedule with a percentage 25%. From all indicators of project-based science-based teaching abilities, Teachers in the group of natural ingredients derived average values by percentage 48.75%.

Figure 2 shows that the result of teaching-based learning skills of project-based learning. This is derived from the instruments related to aspects of teacher ability. On the ground the results were immediate that the two teachers practically did not see any collaboration with the children. Teachers at the beginning of learning to have a conversation first. Then the teacher gives information about the activity which will be done on that day. Children are not given the opportunity to define activities that match the theme of learning on the same day. The basic question on the child when the preliminary activity is not done.

Preparation of the schedule in the project learning process is not discussed with the child, but the teacher gives a warning when the lesson takes place. At the time of project learning take place, teachers are less motivating to the child. There are some children who ask the teacher related to learning activities, but the teacher is less responsive to the child with the question he asked. This has an impact on the problem-solving process for an unfinished child. In the observation of the child's behavior has not been done optimally.

Project-based science-based learning activities are still running in accordance with classical activities. The stages in project-based learning are not yet mince. This has an effect on the project-based learning steps. In project-based learning there are proven steps in which teachers collaborate with children. As it says [9] that this Model has a stages that is the phase of each activity, they get ideas, focus projects, work on projects, create projects and take projects. One of the children is involved in the learning design. But what happens in the field is the teacher to do the learning conventionally. Teachers have a major role in learning activities. When designing lessons is determined by the teacher but the child is given the opportunity to determine the learning activities. Teacher center for early childhood education is not recommended. Because it will affect the development of children's abilities. This is the basis for the selection of a project-based learning model, but when using project-based learning, the teacher remains a key role in the lesson.

Other than that, to see results from child activities, teachers still need to improve their ability to monitor children as well as doing a good learning evaluation. It aims to see the development of children
from various aspects of development that children have. Sera cultivates five aspects of child development that are lacking.

3.2. Preparatory group
Learning activities conducted by 18 children. Activities in groups of 2 children. Group members are determined by the child. The activities undertaken by teacher one is the color classification. This is done with various learning media such as hair clips, glue, color paper and paper plates. The media are grouped according to the same color. This learning activity on the instruction of non-child teachers that determine its activities. At the time of the learning process teachers have been able to provide motivation for children to perform activities. But when doing the evaluation of learning, children are not given the opportunity to show their work to be presented in front of the class.

Teachers on this project activity do in a group way. Group formed by the child by determining his group's friends. But when the activity takes place, children perform activities independently. Each has media to classify the color. There are several groups that interact with their group mates. The activity lasts from beginning to end of learning.

![Figure 4. Color classification activity.](image)

The child clarifies the same color. Step activity, the child selects the dish that the teacher has provided. On the disc there is already color paper which is taped in a circle. Number of collared circles and the colors on the paper plate vary. Colorful hair clips serve to be affixed on the paper plate. Red stitches are clipped to a red paper plate, as well as with other colors. Teachers make an assessment during the learning process takes place by recording the work of the child.

After the activity is over, the teacher asks the child to immediately clean up the media that has been used. Then the children tidied up and save the media into the locker. The results of the child's activities are not presented at the time of evaluation, so the child cannot show his work to his friends. So there is no question and answer process from peers on the work of children at the time of evaluation of learning. But the teacher did some questions such as impressions during the project-based learning process.

3.3. Group of natural materials
Learning activities conducted by 18 children. Activities in groups of 2 children. Group members are determined by the child. The activity of teacher 2 is the process of color mixing. The same is true with teacher 1, teacher 2 does not give children a chance to design a lesson. The child is directly directed to perform the activity of color mixing. At the time of the activity the teacher is less motivating the child. Teachers only see the course of these activities. So children do activities independently without any teacher assistance. There are some children who do color lighting that makes the color change. Unfortunately the teacher did not give a deep explanation to the child. at the time of evaluation, children are not given the opportunity to show their work. So the child does not show the results of his work. While at the end of the activity, children do not apresisi each other with the results of the project is made.
Figure 5. Mixing colors.

The process of coloring activities conducted in the group of materials done in groups. one group consisting of two people. Group selected by child. media used in this activity is plastic container, water, dye, sponge, and chair. The media used is prepared by the teacher. children just choose to sit in which seat. Step activity on the group of natural materials the child can mix the colors available into the bottle by using a sponge. Activities are carried out until the end of the activity.

After the activity is over, the media is taken care of by the child. then the child moves into the class to conduct an evaluation. It's the same with the preparation group, work done by the child cannot be presented to his friends. The child just tells what activities have been done during the learning process.

4. Conclusion

In science-based project learning activities, teachers are still less than optimal in teaching. So the ability of teachers in kindergarten in the process of teaching the project is still lacking. Whereas, in the use of project-based learning can adoptive problem solving in children [10]. In this case, teacher-based teaching skills need to be improved through teacher training. As mentioned [11] Productive reflection on action is one method by which hypothetical knowledge capacity be linked to actual practice, and teaching practices could be enhanced.

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