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# Project-Based Learning on Media Development Course to Improve Creativity of Prospective Physics Teacher

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**Abstract.** The development of learning media is one way to train the creativity of prospective physics. Creativity can be developed through a planned lecture program, one of which is through lectures on the development of physics learning media. The purpose of this study was to discuss project-based learning in training on media development for the creativity of prospective physics teachers. This study included experimental research. There were three students involved in this study. Each class is divided into several groups for the development of physics learning media. In total, there were 21 groups involved during this study, with various types of projects between each group. A group representative presents each product. The instrument used to measure creativity is a reasoned multiple choice test of 20 questions each for verbal, figural, numerical, and procedural creativity tests. Observation sheets are also prepared to assess the process and implementation of learning. The results of the study show that student creativity has increased in all aspects. Figural creativity has the highest average score, and numerical creativity has the lowest average score from other aspects.

**Keywords:** project-based learning; media development; creativity; thinking skills.

## INTRODUCTION

21st-century learning has principles that are student-centered to produce creative thinking skills, communication, collaboration, critical thinking, and solving problems well. Teachers in this century are required to become professional teachers who can face these challenges. Teachers are required to be visionary, have clear goals in educating. The teacher must also be able to collaborate with students to create meaningful learning. Meaningful and interesting learning is reflected in the skills of teachers in processing information and using learning media. Gunawan et al. [1] stated that good media would help teachers to visualize the concepts being studied.

Physics education in higher education is required to produce professional physics teachers who can improve the quality of education. Improving the quality of physics learning can be improved by improving the quality of learning [2]. One effort to improve the quality of learning is to develop good learning media. The course for developing learning media in physics education facilitates prospective teachers in learning to create innovative learning media. Quality learning is not just about using good media. Teachers must be able to have creativity in making and using learning media. Creativity is very important for prospective teachers to accommodate learning so that the creativity of their students also increases. Without creativity, learning will not create optimal results.

Creativity in learning involves a variety of ideas and ideas. Good creativity will help you find solutions to the problems faced. Creativity involves creative thinking processes in formulating and resolving problems according to cognitive concepts [3]. The learning process that facilitates creativity will reflect results that have novelty and value [4]. Learning that can develop creativity must be able to facilitate students in realizing imagination, provide opportunities to think, express ideas easily, and get new information [5]. One of the lessons that can facilitate students to develop their creativity is project-based learning.

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Project-based learning has the principle of student-centered learning to create an interesting and meaningful learning experience for students with project work [6]. This model creates a flexible learning environment to increase students' motivation to learn [7]. Project-based learning focuses on student project work. In this learning, students are required to investigate problems, submit hypotheses, and explain them through project performance [8]. Based on the description above, this article describes the effectiveness of project-based learning in media development course to enhance the creativity of prospective physics students.

## METHOD

This study included quasi-experimental research. The subject of this study consisted of three classes who participated in a media development course. Each class was divided into several groups for the development of physics learning media. In total, there were 21 groups involved, with different types of projects in each group. A group representative presented every product produced. The creativity instrument used was in the form of reasoned multiple choice tests of 20 questions each for verbal, figural, numerical, and procedural creativity tests. An observation sheet is also prepared to assess the process and implementation of learning. The data obtained were tested for simple statistics. The creativity score obtained was then compared to the differences based on each aspect of creativity.

## RESULTS AND DISCUSSION

Creativity is one of the learning outcomes that are expected to be increased. Creativity possessed by someone can provide good handling of problem situations and analyze them appropriately. A creative person, based on such analysis, can form an appropriate assessment of the situation and can create new solutions in situations that have never happened before [9]. Creativity can be developed from the learning process. Creative students can be formed from the process of creativity created by the teacher. Higher education, especially those that produce education personnel, must be able to develop the creativity of prospective teachers in managing to learn either from the making of media or learning methods. According to Bolden et al. [10], learning creativity comes from the teacher. Prospective teachers need to have creativity experience so they can convey creative things to students. If not, students will tend to adopt things that they think are easy.

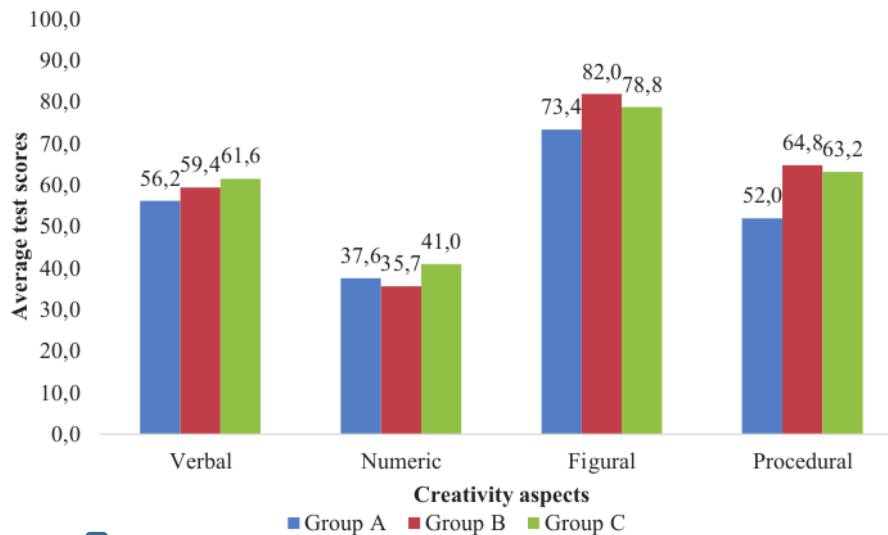
One of the subjects that can facilitate prospective physics teachers to develop their creativity is the learning media development course. The course discusses planning, selection, techniques for producing media, and presenting learning media. In this course, the prospective teacher is required to make a good media design and be able to facilitate creativity through a project-based learning model. Some students are divided into 21 groups to design and produce physics learning media. The sample of student's project work is shown in Figure 1.



FIGURE 1. The Sample of Student's Project on Media Development Course

Group representatives then represent the media according to the syntax of the project-based learning model used. This study aims to determine the effectiveness of project-based learning in the learning media development course to improve the creativity of prospective physics teachers. Creativity tests are given after the learning media

production process was complete. The creativity tests tested include verbal, numerical, figural, and procedural creativity tests. Based on the results of the creativity test given, the data obtained are presented in Figure 2.



8  
**FIGURE 2.** The differences in Average Score of Each Aspect of Creativity

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 Based on Figure 2, it can be seen that there are differences in the average score of creativity in each aspect. In all three classes, it was found that students had the highest creativity score on the figural aspects, then aspects of procedural and verbal creativity. The lowest average score is on numerical creativity.

Figural creativity is the ability to form new combinations based on the elements of an image or a pattern of shapes given and reflected in fluency, flexibility, originality, and then elaborating into a concrete idea. At the step of project-based learning, namely, project planning in making learning media, prospective teachers were required to create innovative media designs. Prospective teachers are trained in their creativity to design good and novelty media products. This is what causes the results of the figural creativity test to have the highest average score. Demirkan & Afacan [11] revealed that designing creative products must have certain characteristics such as novelty, unconventional, unique, rare, rare, and rational. Of course, this requires the prospective teacher <sup>12</sup> develop ideas and ideas through patterns of shapes or images to produce innovative media designs and according to the characteristics of creative products. The effectiveness of project-based learning was revealed by Bell [12] that through project work, students were guided to solve it by applying the knowledge they had themselves so that their skills could be well developed. Procedural indicators of student creativity experienced a high increase. This can be observed from the process of media development by students, they need good procedural creativity to develop and arrange ideas, then realize them into real objects in the form of a learning media. Research conducted by Wahyuni et al. [13] also found the same thing, that science students in applying learning media are able to develop good procedural creati<sup>11</sup>

In the third step of project-based learning, students are required to develop a project schedule correctly. After designing a project plan, students make a list of steps for making the media. At this stage, the procedure for making the specified media must be adjusted to the estimated time given. At this stage also, students are facilitated by their creativity to make the procedure right so that a previously designed design can be a valuable product. This is what causes student procedural creativity to be quite <sup>12</sup> d. Students are quite capable of developing ideas or ideas in arranging activities to produce the desired goals. According to Rahayu et al. [14] in project-based learning, students and groups use their creativity to plan work in developing useful products. This statement also supports that the use of project-based learning has a positive impact on student creativity.

At the next step, the products are presented by group representatives. This certainly aims to help students develop their abilities in expressing ideas through verbal communication and expressing their opinions about their innovative product. The results of the student's verbal creativity test are lower than the Figural and numerical

creativity. This is because that stage is not optimal in facilitating students' verbal creativity so that the average score is still relatively low. In contrast to the research of Gunawan et al. [6], it was revealed that the use of project-based learning was able to increase verbal creativity better than figural creativity. Students tend to associate ideas and ideas through verbal communication. According to Chu et al. [15] that collaborative project-based learning can improve literacy and communication skills. Learning is effective in motivating students to be active in learning. In addition, Amanda et al. [16] revealed that the model could also increase students' confidence in carrying out their duties or actions so that they can produce products well.

The numerical creativity score has the lowest average compared to other aspects of creativity. This is because the learning media development course does not depend on physical concepts and equations. The same thing was also found in the research of Gunawan et al. [17] that the numerical creativity indicator was the lowest increasing indicator compared to others. The learning media development course aims for students to have skills in designing, developing, and using good learning media. These topics certainly do not facilitate students to do numerical reasoning and logical thinking to describe physics equations.

Based on the description, in general, it can be concluded that the use of project-based learning can develop the creativity of prospective teachers in the learning media development course. Making learning media projects can encourage students to become creative individuals. Robertson et al. [18] revealed that creativity could be developed through improved communication and visualization that is characterized by the ability to design, then communicate with colleagues on the products produced. According to Wurdinger et al. [19], the projects that were carried out led students to think creatively in planning to make products. Creativity is used to explore and determine the problem-solving process so that it understands the concepts of the material being studied. Project-based learning is one of the good learning alternatives nowadays. Mihardi et al. [20] revealed that the creative process could be facilitated through the implementation of project-based learning. Students are accustomed to thinking creatively in solving problems during the learning process. Students not only create products but also contribute to planning problem solving so that it becomes an alternative solution. In addition, Amamou & Chelniti-Belchadi [21] revealed that project-based learning also allows students to find solutions to problems and develop creativity.

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## CONCLUSION

Based on the results of research, data analysis, and discussion it can be concluded that the use of project-based learning models in lectures on the development of learning media can improve the creativity of prospective physics teacher students. There are differences in the average score on each aspect of creativity. Figural creativity has the highest average score, then procedural and verbal creativity. Numerical creativity aspects have the lowest average score. The project-based learning model can develop student creativity in designing and developing innovative physics learning media. The recommendations that can be given for the next research are: (1) the time allocation in the implementation of project-based learning must be optimized especially in project work, (2) the project-based learning model should be an alternative learning model to enhance creativity in other courses.

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