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Students' Creativity Profile Using Project Report through the STEM integrated Project Based Learning Model

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Abstract

Creativity is related to mental activities to build new ideas. Students' creative thinking skills need to be developed to overcome problems in everyday life, such as discovering and creating new things, new ways, and new models that are useful for themselves and others. Creative thinking is also a skill that demands 21st-century competencies developed through applying the curriculum 2013. The Project Based Learning (PjBL) is a recommended learning model in the curriculum 2013. The purpose of this study is to measure student creativity in compiling project reports. These creative thinking skills are developed through the Human Physiology Anatomy Course (Anfisman) by applying project-based STEM-integrated PjBL. The project in question is to explore problems in the form of diseases or abnormalities in the body system often suffered by the community and their solutions. Then the project report is packaged in the form of a video. The method used in the study is the mixed method with an explanatory design. The research sample was Anfisman class students, who were selected by purposive sampling totaling 38 people. The instruments used are creative product assessment and STEM-integrated PjBL implementation sheets. The results showed that students have good creative thinking skills, shown by the results of their project report products in the form of videos. Project reports in the very creative category, as much as 12%. In the creative category, as much as 75%, and in the quite creative category, as much as 13%. It also shows that the STEM-integrated PjBL model can grow and develop students' creative thinking skills.

Keywords: Creative thinking skills, Product report, PjBL, STEM

INTRODUCTION

The research results by Mahrawi et al. (2020) show that students' science literacy skills in Banten Province only cover up to levels 1 to 3. As for the value of HOTs, they can only get a good average at the analysis level, but the ability to evaluate and create still needs to improve, showing that the quality of education in Banten Province still needs to improve. This condition occurs because the applied learning process differs from the curriculum's demands and can be caused by the teacher's lack of understanding in designing and managing learning in the classroom. Therefore, students as prospective teachers need to be equipped with direct knowledge and experience to apply activities that hone and develop critical and creative thinking skills in solving problems through the learning process in their classes.

Project-based learning is the demand of the times. The 21st century demands resilient, productive, and competitive human beings (Luna Scott, 2015). Therefore, the ability to analyze collaboratively, communicatively, and creatively is indispensable. Facing this condition, the world of education must certainly adjust by formulating, compiling, and implementing a qualified curriculum. The answer is the curriculum 2013 (revision) by

implementing a scientific approach (Purnamaningwulan, 2019). One of the suggested and commonly applied learning models is Project Base Learning (PjBL).

STEM (Science, Technology, Engineering, and Mathematics) as an approach is applied in the learning process by combining the fields of science, technology, engineering, and mathematics used to solve real and contextual problems (Nuangchalerm et al., 2020; Siew et al., 2015). This perspective is very much in line with the demands to prepare the 21st century generation who have creative skills in thinking, critical in solving problems, and skilled in communicating and collaborating (Rusmiyati et al., 2021). PjBL as a learning model accommodates this perspective in its application in the classroom (Kusnawan, 2021; Afriana et al., 2016).

The development of science and technology, especially in communication technology, is very supportive of the world of education, which will develop in the form of distance learning. The learning process is, of course, inseparable from the media. However, the development of learning media is now in digital form. Therefore, prospective teacher students must be honed their skills to take advantage of this technological development to produce products in the form of media that can be used, one of which is as an activity/project report which is usually in written form.

METHOD

This research was carried out using a mixed method with an explanatory design (Creswell and Tashakkori, 2007). This method collects product creativity data from student projects through STEM-integrated PjBL Learning. The population in this study was all Department of Biology Education semester 5. In contrast, the sample in this study was students of the Department of Biology Education, semester 5 class A. The sampling technique used in this study was purposive sampling. Group selection in this technique is based on specific characteristics closely related to previously known population characteristics. The sample was chosen because class A students have never been given STEM-integrated PjBL learning.

This research data was collected through non-test techniques. Non-test techniques in this study include (1) direct observation or observation of the implementation of STEM-integrated PjBL learning. The type of observation used is systematic observation with guidelines as an observation instrument that contains a list of activities that appear and will be observed. In addition, (2) assessment of creative student products in the form of videos, carried out to measure the creativity of student products in presenting the results of their problem analysis made in the form of videos.

The observation sheet is a checklist, a list of characteristics or criteria that provides a check mark (√) if each list item has been met. This observation is to observe the emergence of each stage in STEM-integrated PjBL learning. In addition, the goal is to observe and measure the executability of each step of STEM-integrated PjBL learning.

Product assessment sheets measure students' innovative products created in videos that include the stages of the process and its products. Creative product aspects include fluency, flexibility, originality, and elaboration (Kristensson & Norlander, 2003). It can be seen in Table 1.

Table 1 Creative Product Grids

Creative Product Aspects	Indicator	Statement Number
1. *Fluency*	Sparked many ideas	1 and 2
2. *Flexibility*	Generating varied ideas, answers, or questions, can see a problem from different perspectives	3 and 4
3. *Originality*	Able to give birth to new and unique products	5 and 6
4. *Elaboration*	Add or detail the details of an object, idea, or situation	7 and 8

Qualitative data analysis was carried out on the results of observations on the implementation of STEM-integrated PjBL learning. The observation data is used as supporting data for student creativity data (Katz-Buonincontro & Anderson, 2020) in compiling project reports with innovative products in the form of videos. In addition, quality data is also obtained from interview data. This qualitative data will be processed using stages in the Miles and Huberman model (Miles & Huberman, 1994), including three stages: data reduction, display data, and conclusion drawing or verification. Finally, qualitative data analysis is combined with hypothetical result data at the quantitative stage since qualitative methods in this study are only for proving and expanding quantitative data.

RESULTS AND DISCUSSION

STEM-integrated PjBL learning applied in MK learning Human Anatomy and Physiology produces products in the form of creative videos. The video results from a student project to raise the problem of abnormalities in the human body system that often occurs in society, then present it in the form of developing technology, namely video. First, each group is divided based on the human body system: respiration, circulation, digestive, motion, nervous, and excretory systems. Next, the group determined one example of abnormalities in the body systems that had been selected.

The video contains the results of each group's research on abnormalities in human body systems and discusses them through literature reviews and expert interviews (doctors and other medical personnel). Creative products are then analyzed, and the results of the creative product category are obtained in the following Figure 1.

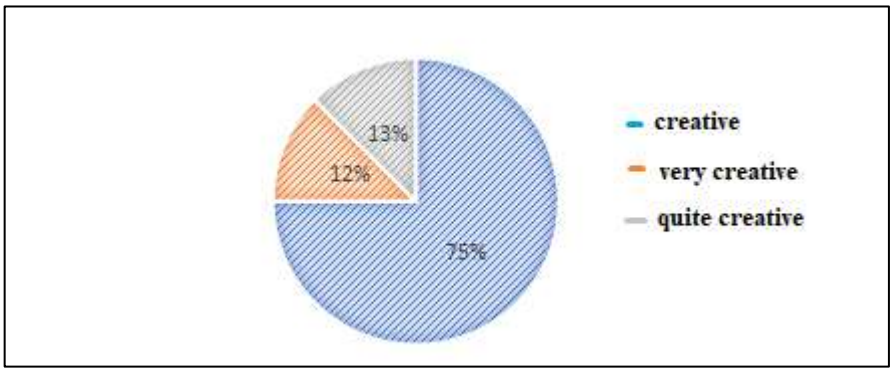

Figure 1. The category of students' creative products

Figure 1 illustrated that 75% of video products fall into the creative category. However, some videos fall into the wildly creative category by 12%, and videos that are quite creative by 13%. The video measured creativity includes several aspects, according to Kenedi (2017), namely fluency, flexibility, originality, and elaboration. The results of product creativity for each aspect can be seen in Figure 2. Moreover, the acquisition of indicator values from each aspect can be seen in Figure 3.

Figure 2. Average Value of Product Creativity Aspect

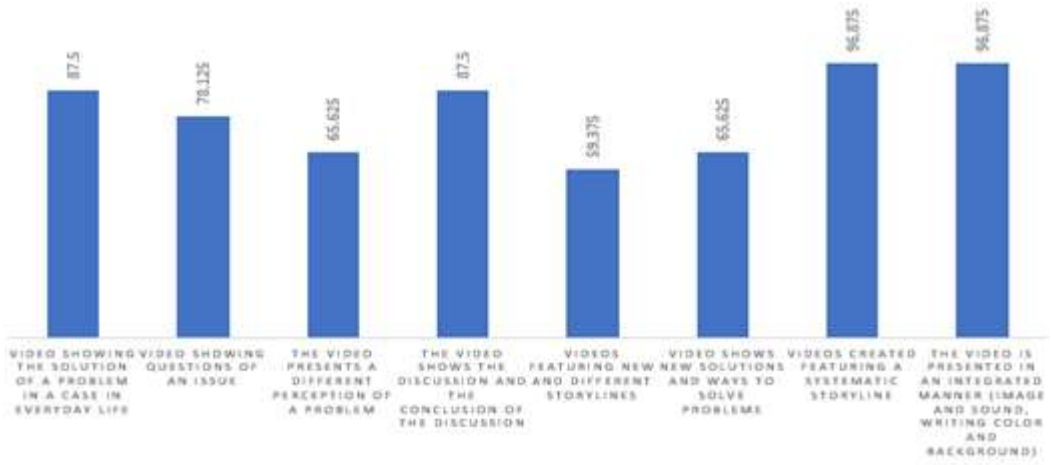

Figure 3. Average Value of Indicators Per Aspect of Creativity

Figure 2 illustrates the acquisition of each aspect of creativity. The highest aspect of creativity is the aspect of elaboration (thinking in detail), with an average score of 96.87. At the same time, the lowest aspect of creativity is originality, with an average score of 62.5. The detailed thinking aspect is lowered to 2 indicators with two measured statements, i.e.video featuring a systematic storyline, and the video is presented in an integrated manner (image and sound, writing color and background). This aspect gets the highest score because, in the fifth PjBL stage, which is monitoring students and project progress, lecturers guide and monitor the video creation process so that the videos made are by the directions. The first PjBL stage is to start the fundamental questions and determine the project. The project in question is to explore various disorders related to the body system often suffered by the surrounding community. Projects are carried out in groups. Each group discusses a different disease or disease obtained through a survey of the surrounding community.

Furthermore, they will explore information from sufferers through observation and interviews about the symptoms felt, the alleged cause, and how to manage them. The information is validated through reference studies and interviews with experts in their fields, namely health workers such as doctors, nurses, or midwives. The results of the group's work were made a report in the form of a paper which was then presented via video, making students able to successfully solve problems, by the opinion of Nurfitriyanti (2016), who stated that one of advantages of PjBL is that students can solve problems. This opinion is under the study's results that the fluency aspect also gets a high average score (82.81) because students have been able to display solutions to problems in cases and questions from a problem. On the other hand, the originality aspect, the lowest aspect of creativity, occurs because some innovative products produced by students have yet to display different

storylines and feature new ways to solve problems like group 7, which displays examples of cases of muscle cramps that often occur in everyday life and their prevention. In contrast, the other group only raised 1 case corresponding to the topic of choice.

After the learning, researchers captured student responses to learning and found that students enjoyed participating in STEM-integrated PjBL learning. Students feel bored because they learn to discuss contextual problems and provide authentic experiences by digging up data from respondents who experience the disorder and discussing it through literature reviews and expert interviews. This result follows the opinion of Tipani et al. (2019), who stated that the stem-integrated PjBL learning program aims to assist students in achieving student competencies so that they do not get bored quickly in learning. This STEM-integrated PjBL learning can help students working on a project in the learning process with the support of knowledge, technology, techniques, and a growing mathematics-safe learner. This is in line with research results from Jauhariyyah et al (2017) that there is an increase in students' creative thinking skills using STEM-PjBL learning with the resulting effect size being included in the large criteria. PjBL and STEM each have advantages; namely, there is PjBL learning, students can understand concepts by making products according to predetermined topics, while in STEM learning, there is a process of stepping up or redesigning (engineering design process) that makes students creative and can produce n its best products.

CONCLUSION

The results also showed that 75% of video products are included in the creative category. However, some videos fall into the wildly creative category by 12%. Videos are quite creative, by 13%. The results showed that students have good creative thinking skills, shown by the results of their project report products in the form of videos. Project reports that they fall into the category of very creative as much as 12%, those that fall into the creative category as much as 75%, and those that fall into the category are quite creative as much as 13%. It also shows that the STEM-integrated PjBL model can grow and develop students' creative thinking skills.

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