The Effect Of Project-Based Learning Model Using Three Dimensional Media And Computation On Achievement Of Study Reviewed based of Student’s Creativity

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Abstract. The aim of this study is to know: (1) effect of project-based learning using 3D and computational media on student achievement of study in material of molecular shape, (2) effect of creativity (low and high) on student achievement of study in material of molecular shape, (3) interaction of students learning creativity and project-based learning model using 3D and computational media on student achievement of study in material of molecular shape. The method used in this study is experimental method with factorial research design 2x2 and data collection was done by test techniques for achievement of study and questionnaire for students' creativity. Samples were collected randomly so that 4 experimental classes were obtained, the first 2 experimental classes used 3D media, and the last 2 experimental classes used computational media. Samples dispersion based on student creativity level which categorized as high or low creativity. The hypothesis was tested using two-way anava. The result of the study shows the score average of student achievement of study with low creativity using computational media is 67.75, score average of student achievement of study with low creativity using 3D media is 69.75, and score average of student achievement of study with high creativity using 3D media is 78.25. The result of statistical analysis shows that there was effect of project-based learning using 3D and computational media and student creativity (p<0.05), and there was no interaction between project-based learning using 3D and computational media and student creativity (p>0.05). based on the result it can be concluded, (1) there was effect of project-based learning using 3D and computational media on student achievement of study, (2) there was effect of creativity (high and low) on student achievement of study, and (3) there is no interaction between student creativity and project-based learning using 3D and computational media on student achievement of study.

Keywords: project-based learning, 3D and computational media, student creativity, student achievement

1. Introduction

Chemistry subjects need to be taught for more specific goals such as to supply the student with knowledge, comprehension, and abilities required to get into university also develop science and technology. The goals of the chemistry subject will be achieved by the student through various approaching, such as inductive approaching in the shape of the scientific inquiry process at the level of open inquiry. The goals of the scientific inquiry process are to grow the ability to think, work, behave scientifically and communication, as the most important thing in life skills aspect. Therefor chemistry subject emphasizes the supply of learning experience directly through the use and development of scientific skills and attitude[1], [2].
Student learning outcomes data in the last 2 years reflect that many students have not reach completeness limit because the scores are below the required KKM of 70. Subject related to the second semester of class X including chemical bond while subject related to the first semester of class XI including atomic structure (quantum mechanic), molecular shape and intermolecular force. Two factors that affect on achievement of study, such as internal factors (student: IQ, EQ, motivation, creativity, psychology) and external factors (teacher, method, media, curriculum, infrastructure, time, fund and other learning environment.

Obstacles might be faced by teachers in not optimal learning management including method/learning model selection have not been right, media usage/approaches that process skills and scientific attitude not been involved. Furthermore, ineffective learning strategies, so that learning process do not have all aspects belong to the student in the involvement of student in gaining learning experiences directly through process skills and scientific attitude. Observation outcome shows the learning activities applied is still verbalizes without giving a chance to the student to develop their mindset, lack of teacher initiative to utilize technology development such as computer and things around as learning media, and lack of teacher did demo, experiment, and other visual shapes. As a result, students tend to memorize rather than actively searching, applying knowledge, and utilize their experiences to build comprehension about chemical concept.

Molecular shape is development or learning application. Chemical bond (first semester of X class) and atomic structure (first semester of XI class). Learning of molecular shape is needed to understand the right concept and creative in transferring abstract to be concrete understanding. So the understanding process may be done is using media that can be observed directly or 3D and computational media concrete.

Media that can be used in understanding molecular shape concept such as 3D molecule as artificial objects which reconstruct molecule and computer-based media. Clearer visualization through both of media support student understanding. Besides, student receive variation of learning process. Higher student imagination then encourages the appearance of student creativity. To create molecular shapes by using 3D and computation media can give experience directly to students by grouping small groups of students so that students can solve difficult problems easily as if they discussed the problems together.

Come up from the above statement, the solution to affect the learning process and overcome difficulties on student learning is the application of learning model that activates student, such as learning-based project model. Besides that, enhancing learning interaction is required more communicative learning media either individual and group by using 3D and computation media, so that student can optimize ability, reasoning, and creativity to upgrade learning outcome in the material of molecular shape.

2. Method

This study is Quasi Experiment Research which aims to explore the differential effect between the application of project-based learning using 3D and computation media on chemistry learning achievement reviewed from student creativity in the material of molecular geometry. Study design in this study is 2x2 factorial. The population in this study is all student of class XI IPA SMA Negeri 2 Selong academic year 2017/2018 with total student 80. The sample used in this study was chosen by simple random sampling based on the student level creativity which categorized as high and low, so that was obtained 2 experiment classes using 3D media and 2 experiment classes using computation media. Data collection method used in this study is providing learning achievement test to the student. While creativity data was obtained from providing creativity questionnaire. The hypothesis in this study was tested using two-way anava.

3. Result And Discussion
Data obtained in this study is learning achievement data in the cognitive domain. Learning achievement data obtained from class used project-based learning using 3D and computation media from creativity review.

1. Student creativity

Student creativity data in this study obtained through creativity questionnaire. Student creativity was categorized into two groups, such as high and low creativity. High creativity group was divided into first high creativity and second high creativity. The low creativity group also divided into two groups, such as first low creativity and second low creativity. Average score student creativity shown in Table 1.

| Data Source              | Total Data | Min.  | Max.  | Mean    | St. Dev. |
|--------------------------|------------|-------|-------|---------|----------|
| First High Creativity    | 20         | 133   | 147   | 137.75  | 4.587    |
| Second High Creativity   | 20         | 133   | 149   | 136.90  | 4.471    |
| First Low Creativity     | 20         | 115   | 132   | 127.35  | 5.706    |
| Second Low Creativity    | 20         | 115   | 132   | 126.15  | 5.833    |

2. Student Learning Achievement

Result of student learning achievement obtained after doing the learning process using 3D and computation media reviewed from student creativity factor given in attachment 18 and the average learning achievement for high and low creativity group shown in Table 2.

| Media       | Low Creativity | High Creativity |
|------------|----------------|-----------------|
| 3D         | 69.75          | 78.25           |
| Computation| 67.75          | 73.25           |

The average result of learning achievement tends to increase, from 69.75 to 78.25 for 3D media and 67.75 to 73.25 for computation media reviewed from low to high creativity.

3. Hypothesis Test

The hypothesis was tested with a two-way analysis of variance (two-way anava). Result of hypothesis test using two-way anava shown in Table 3.

| Source      | JK     | df | RK     | F       | Sig.   | Decision     |
|-------------|--------|----|--------|---------|--------|--------------|
| Media       | 245.000| 2  | 245.000| 4.460   | 0.038  | Tolak Ho1    |
| Creativity  | 980.000| 1  | 980.000| 17.840  | 0.000  | Tolak Ho2    |
| Interaction | 45.000 | 1  | 45.000 | 0.819   | 0.368  | Terima Ho3   |
| Error       | 4175.000| 76 | 54.934 |         |        |              |
| Total       | 423050.000| 80 |         |         |        |              |

Based on Table 4 above, the conclusion is:
1. First hypothesis or Ho1 was rejected because F test value is 4.460, 0.038 (3.8%) significance, lower than α = 0.05 (5%) and it means there is a significant effect between project-based learning model using 3D and computation media on learning achievement.

2. Second hypothesis or Ho2 was rejected because F test value is 17.940, 0.000 (0%) significance, lower than α = 0.05 (5%) and it means there is a significant effect between student creativity on learning achievement.

3. Third hypothesis or Ho3 was accepted because F test value is 0.819, 0.368 (36.8%) significance, more than α = 0.05 (5%) and it means there is no interaction between project-based learning using 3D and computation media with student creativity against learning achievement.

Result shows that average of student learning result in class taught using 3D with high creativity is 78.25, while using low creativity is 69.75. The average student learning result in class taught by computation media with high creativity is 73.25 and 67.75 for low creativity. Results show both media of learning are giving a positive effect on student learning achievement in the material of molecular shape.

Based on data analysis using two-way anava, p-value of project-based learning using 3D and computation media is 0.038 < 0.05, then Ho was rejected, which means there is a different effect against student learning chemistry achievement between project-based learning using 3D and computation media.

The result of data analysis also showed that there is an effect on student creativity against learning chemistry achievement, student creativity p-value is 0.000 < 0.05, the Ho was rejected. It means student creativity support learning process achievement in the process of molecular shape learning.

The result of the hypothesis test was obtained and p-value the interaction between media and student creativity against learning achievement is 0.368 > 0.05, the Ho was accepted. It means there is no interaction between project-based learning through 3D and computation media with student creativity against learning achievement.

Project-based learning is a model of systematic learning which involve student in learning and skills through complicated inquiry construction, authentic question, work design and product. Goals of project-based learning is to help student to develop skills to solve problems in learning or problems around which completed with communication skills, use information, and current technology. Besides that, the existence of learning innovation through project-based learning train student to have critical thinking, creative, rational and enhance material understanding which been taught and provide real experience for students[3]–[7].

Project-based learning through 3D media is expected to make it easy for students to understand the concept of a real picture of a molecular shape by seeing and touching the object, while project-based learning through computation media is expected to make it easy for students to understand the concept of molecular shape visually by seeing or applying the program.

Based on the result of data analysis can be concluded that the application of project-based learning using 3D media has a better influence compared to project-based learning using computation media. Three dimensions (3D) and computation media have different characteristics and level of difficulties so that they use as a learning media for molecular shapes will also affect relatively different student achievement, it is caused by the character and level of difficulties of computation is higher than 3D media.

The use of 3D and computation media in learning provide direct experience to student, it can be done by grouping a small group of student, therefore student can solve difficult problem easily by discussing the problem together. Through this learning experience is expected can encourage the student to be brave to issued questions or provided answer which generate an unexpected idea, because a right question lead the student to a constructive solution and find the answer of the problem encountered. In the situation and condition, the important role of student learning creativity is to
stimulate student positive mindset for encouraging student learning achievement, so that student is expected to be encouraged their passion and think creatively in completing a whole series of learning activities in school[8]–[10].

Creativity level influenced chemistry learning achievement differently, students with high creativity and learned using 3D and computation media have an average score of 78.25 and 73.25, while student with low creativity have average score of 69.75 and 67.75. It can be understood because students have strong character in the case of self-confident, and persevering in solving problem.

Media and creativity is equal in influencing student learning achievement, it shows that student learning achievement can be influenced together. Students with high and low creativity in learning through 3D and computation media are together in creating the indicator of learning achievement. Creativity suppresses knowledgeability and experience they have before and communicable for new things, while media is a tool to help visualize abstract material.

Based on hypothesis test above, no interaction between media learning and student creativity in the series of learning achievement caused by not all students respond positively although they have creativity in using 3D and computation media as learning media which aims as learning process stimulant, therefore some students in class can not benefit in 3D and computation media. The student with high creativity in using 3D and computation media respond positively, conversely student with low creativity in using 3D and computation media less than maximum in realizing the learning achievement indicators.

The conclusion, students with high creativity which taught by every learning model whether by using media or without using media will contribute positively against achievement. However, creativity is still needed to be developed so that the result of the study are optimum.

Based on the study have been conducted, researcher concluded some points correlated with the advantages of project-based learning, such as student learning process give more chances on involving the students directly and interact with other students to solve problems correlated to material of molecular shapes as well as the influence of free electron pair against molecular shapes. Learning student actively build their knowledge (student-centered). Students can develop the ability to ask as a high cognitive thinking activity. Students can develop the abstracts of objects to be more concrete. Students can produce work of real value as molecular shapes and result of project research (paper) as project papers which been done by collaborating with the groups. Teacher only act as motivators and facilitators by planning and organizing students' activity and help the students to overcome problems(Baş & Beyhan, 2010; Efstratia, 2014; Han et al., 2015; Sumarni, 2013; Yiying Zhang, 2015).

4. Conclusion
Based on the result and discussion, it can be concluded:

a. There is an effect significantly between project-based learning using 3D and computation media on student learning achievement in the material of molecular shape. Students with model project-based learning using 3D and computation media give the average of learning achievement differently and both can realize learning indicators. Student taught by 3D have average of learning achievement more significance compare to computation media.

b. There is the influence of creativity (high and low) on student learning achievement on the material of molecular shapes. Students with high creativity showed a higher average of learning achievement compare to students with low creativity whether by using 3D or computation media.

c. There is no interaction between student creativity and project-based learning using 3D and computation media in the material of molecular shape. Students with high or low creativity showed the same average of learning achievement although using 3D or computation media. The student with high creativity used 3D and computation media showed a high average as well as the student with low creativity showed a low average of learning achievement.
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