

The Correlation Between Project Learning Models and Student Activities in Online Learning for Chemistry Innovative Learning Model

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Abstract

This study aims to determine the effectiveness of project learning on student activity in chemistry innovative learning models courses. The research conducted used the experimental method. The results showed that students' activeness in action was included in the successful category, which is 72.7%, and student activity in understanding the innovative learning model was included in the successful category, which is 63.6%. Student responses to project learning are included in the very successful category at 81.8%. The results of statistical research using partial regression correlation analysis techniques and multiple correlations show a significant positive relationship between project learning and learning effectiveness with a correlation coefficient (r_{y1}) = 0.201. A significant positive relationship exists between student activities in innovative chemistry learning models and learning effectiveness with a correlation coefficient (r_{y2}) = 0.759. There is a significant positive relationship between project learning and student activities and learning effectiveness with a correlation coefficient (r_{y12}) = 0.769. Based on the results of these studies, it can be concluded that the effectiveness of learning can be increased through project learning and student activities.

Keywords: project learning; effectiveness; learning activities

Abstrak

Penelitian ini bertujuan untuk mengetahui efektivitas pembelajaran proyek terhadap aktivitas siswa pada mata kuliah model pembelajaran inovatif kimia. Penelitian yang dilakukan menggunakan metode eksperimen. Hasil penelitian menunjukkan keaktifan siswa dalam bertindak termasuk dalam kategori berhasil yaitu sebesar 72,7% dan aktivitas siswa dalam memahami model pembelajaran inovatif termasuk dalam kategori berhasil yaitu sebesar 63,6%. Respon siswa terhadap pembelajaran proyek termasuk dalam kategori sangat berhasil sebesar 81,8%. Hasil penelitian statistik dengan menggunakan teknik analisis korelasi regresi parsial dan korelasi ganda menunjukkan adanya hubungan positif yang signifikan antara project learning dengan efektivitas pembelajaran dengan koefisien korelasi (r_{y1}) = 0,201. Terdapat hubungan positif yang signifikan antara aktivitas siswa pada model pembelajaran kimia inovatif dengan efektivitas pembelajaran dengan koefisien korelasi (r_{y2}) = 0,759. Terdapat hubungan positif yang signifikan antara pembelajaran proyek dengan aktivitas siswa dan efektivitas pembelajaran dengan koefisien korelasi (r_{y12}) = 0,769. Berdasarkan hasil penelitian tersebut dapat disimpulkan bahwa efektivitas pembelajaran dapat ditingkatkan melalui pembelajaran proyek dan aktivitas siswa.

Keywords: pembelajaran proyek; efektivitas; aktivitas belajar

Introduction

The Industrial Revolution 4.0 is a state of the 21st-century industry where massive changes in various fields through a combination of technology reduce the barriers between the physical, digital, and scientific worlds (Brady & Higgins, 2015). Regarding the impact of the Industrial Revolution 4.0, namely the digitalization of the system, it requires educators and students to adapt to recent changes quickly. The pandemic in the world due to Covid-19 also requires all aspects of life to evolve quickly, including in education (Cranton et al, 2022). The learning system, which was conducted in the classroom directly, has adapted into an integrated learning system through the internet or online (in a network).

Online learning connects learners (students) with their learning resources (databases, experts/instructors, libraries) who are physically separated or even far apart but can communicate, interact, or collaborate directly/synchronously and indirectly/asynchronously (Fakhrudin et al, 2017). Online learning will certainly be less meaningful without the synergy of appropriate learning strategies and methods (Budiansyah, 2020). One of the implementations which can integrate online learning is project learning.

The main component of project learning is asking questions or problems to compose and initiate activities that emphasize a number of projects to get the final result as a product as a series of individual communication activities or the various task results from answering some questions (Sahin A, 2023). Learning project learning provides opportunities for students to learn concepts profoundly and increase their learning outcomes.

Adit (2020) state that project-based learning is a deep investigation of a topic from the real world. A well-designed project makes students tackle or solve the real problems and important daily issues, especially in the learning process. Thus, the projects built by students are based on observations of real problems around them

that will provide meaning for them (Kagerman et al, 2023).

The Chemistry Innovative Learning Model course is a compulsory introductory course for prospective teachers who learn about the characteristics of chemistry innovative learning models and the selection of appropriate innovative learning models (Gunawan et al, 2020). This course requires students to learn the material actively and can be practiced when they become teachers (Hermawan et al, 2016). From the results of interviews with Science Education students who have taken offline course in chemistry innovative learning model in the previous learning year, it was stated that 96% of them liked that this learning was carried out by teaching practice in the classroom so that the application of the selection of this learning model could be conducted correctly (Kagerman et al, 2023).

By teaching practice, student activity can be seen in the mastery of competencies. Activity is an activity that is both physical and mental, namely doing and thinking as a series that cannot be separated (Chasanah, 2016). In this research, the project would be carried out by students was making teaching practice videos by applying one of the innovative learning models adapted to the characteristics of the material and students then the other students analyze the video (Manasikana et al, 2022).

This study aimed to implement project learning in chemistry innovative learning model courses and determine the effectiveness of project learning on student activity. Noor (2017) stated that effective learning is learning that provides students with the opportunity to learn on their own or carry out the widest possible activities for students to learn. To achieve an effective and efficient learning concept needs to be a reciprocal relationship between students and lecturers to achieve a goal, besides; it must also be adapted to the current pandemic learning conditions (Yulianci et al, 2020).

Method

This research is a quantitative research using experimental methods. While the research design used was a control group pretest-posttest design. The use of this type of research aims to be able to control all external variables that can affect the experiment. The target of this research was semester 4 students in 2021 who were taking online courses on Innovative Learning Models (Made Wena, 2019).

The data obtained in this study included the student activeness during learning in the form of activeness when participating in project model activities, activeness in understanding innovative learning model material, and data of student

responses (Berkowitch, 2019). Data on students' mastery of concepts was obtained by comparing the pretest and posttest scores of students in chemistry innovative learning model course materials.

The activity data was analyzed by using percentages as Made Wena stated (2009) below:

$$P = \frac{f}{N} \times 100 \%$$

Note:

P = percentage of activity

f = the frequency of activeness

N = sum of the students

To know the learning activities shown in the table, Wena (2009) gave some criteria in the table below:

Tabel 1.

The criterion of activity success

Criterion	Success	Percentage (%)
Very poor	Failed	0-25
Poor	Less failed	26-50
High	Successful	51-75
Very high	Very successful	76-100

This research is quantitative research with a correlational approach, which consists of two independent variables, namely project learning (X1) and student activities (X2), and one dependent variable, namely learning effectiveness (Y).

Result and Discussion

According to Made Wena (2019:144), Project Learning is a learning method that provides opportunities for teachers to manage classroom learning by involving project work that contains complex tasks based on the questions and problems given. The concept and characteristics of project learning is an innovative learning model or approach that emphasizes contextual learning through complex activities. This approach allows students to work independently to shape their learning and accumulate it in real products (Subando J, 2020). The steps/syntax in implementing the project method used showed in Table 2.

The topic of the problem that became the project's theme was teaching practice with two learning models, one free and the other mandatory. In the free theme, students choose their learning model that is practiced but keep regarding the suitability of the characteristics of the material, students, time, and facilities (Yulianci et al, 2020). And the obligation theme is that students must apply the blended learning model. These two teaching practice projects were (Gardner, 1983) then recorded and uploaded on social media. The final step was that students made reports and presented them in online classes.

Teaching with a free theme through offline learning has some advantages of showing how students can carry the syntax out in the chosen learning model. And it also indicates class mastery of the teacher in teaching. The following is a picture of teaching practice with a free theme to the students showed in Figure 1 and Figure 2.

To find out student responses to the implementation of learning projects, questionnaires were given to the student's

participation in the Innovative Learning Model course. The questionnaire consists of positive statements and negative statements. The questionnaire has five alternative

answers that respondents can choose (Manasikana et al, 2022). Aspects of the statement can be seen in Table 2.

Table 2.
Steps of Project Method

Steps	Teacher Activities	Student Activities
Teacher propose the problem	Propose some actual research problems completed by the explanation	Studying or learning the prefer and interesting topic or title to choose
Students make a small groups and decide steps of solving	Let the students to decide a research group consisting 2 people in each group	Decide a friend to be in a group
Students find the related sources	Facilitate students need as like coordinating to the laboratory and library staffs to get information related to the student need in conducting the research	Find the source based on the teacher instruction or students need and know
Students conduct the observation	Guiding the students on conducting the research	On the certain time, students are on the research location
Students make a report	Decide framework of the report Introduction Material and method Experiment Result and discussion	Write the framework of the report

Figure 1.
Practice of Teaching and Learning (<https://youtu.be/T4DtcVxPH34>)



Figure 2.
Teaching Practice (<https://youtu.be/p60nCVa3oS4>)
<https://youtu.be/p60nCVa3oS4>

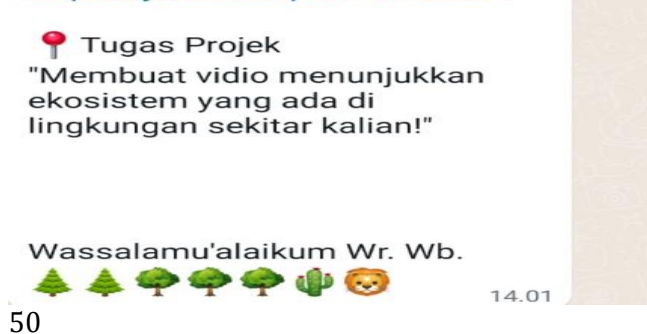


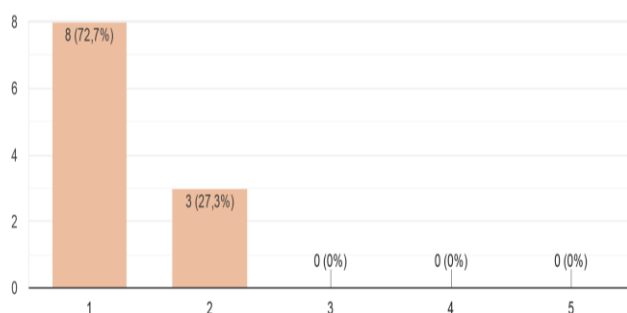
Table 2.
The Questionnaire Criterion of Student Response Toward Learning Project

Number	Criteria item of questionnaire	Number of Questions	
		Statement (+)	Statement (-)
1.	Students perception toward chemistry innovative learning model course	1	2
2.	Students motivation toward chemistry innovative learning model course	3	4
3.	Students comprehension toward chemistry innovative learning model course	5	6
4.	Students activity on project model	7	8
5.	Students impression toward project learning	9	10

The results showed that student activity in project activities was included in

the successful category; it is 72.7% as follows in Figure 3.

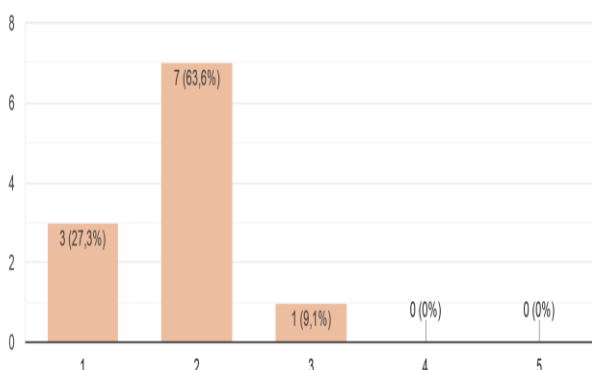
Figure 3.
Students Activeness in Project



The students activeness in comprehending the learning innovative learning model course was a successful

category, it is 6% as shown in graphic below in Figure 4.

Figure 4.
Table of Student Activity in Innovative Learning Model Lectures



Student activities during lectures became more active in each meeting; it was proved by the increasing number of students who asked some questions, objections, discussions, and responses to one another

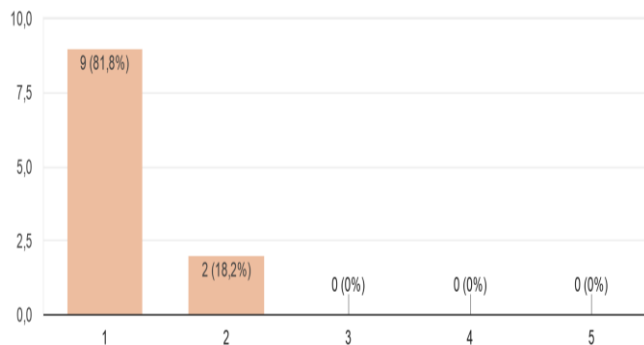
during the presentations. The increase in student activities cannot be separated from the principle of project learning, relating the real concepts to the activities experienced in the field (Gunawan et al, 2020). Those

caused students to understand what needed to be done in the field, from planning to implementing teaching practices so that the project implementation was successful.

Project learning also trains the students to be responsible, cooperative, and challenging (Widiyanti et al, 2021). There are various difficulties in implementing teaching practices such as classroom management, teacher creativity in planning, assessment,

and understanding in the IT field to make videos in designing blended learning. Various difficulties faced during project learning did not decrease the students' intention and enthusiasm to complete the assignments (Fakhrudin, 2023). Those are proven from the student's responses to project learning; it was a very successful category, 81.8%, as shown in the following Figure 5.

Figure 5.
Table of Students Responses on The Project



Noor et al. (2017) revealed that e-learning in project-based learning is significantly effective in achieving of spiritual attitudes, social attitudes, projects, products, and student learning completeness. Based on the research results described above, project-based online learning can be a solution in optimizing learning, especially in during the Covid-19 pandemic. Through project-based online learning, students can go through meaningful learning so that the knowledge and science gained has meaning, which can be used as a provision for them to become problem solvers of the problems they face. It can be seen from the mastery of the students' concepts increases from the pretest result of 45.8 to the post-test result of 85.8.

Combining online learning with a suitable learning base will provide a more optimal learning effect. One of the learning approaches that can improve the students' competence from various types of research that have been carried out is project-based learning. An interaction can occur effectively in project-based learning by utilizing the inquiry process by guiding the students to

create or develop applicative and related products to daily life.

Project-based learning consists of inquiry-based tasks that help learners develop the curriculum's technological, social, and core importance (Sahin, 2023). Several research results showed the effectiveness of project-based learning; Adit (2020) revealed that project-based learning models can improve students' life skills. This increase occurred in all aspects of life skills: personal skills, social skills, academic skills, and vocational skills.

The project-based learning model is an alternative learning model that can be implemented to foster student life skills in college or students at school, especially in science-related learning. The research results in Chasanah et al. (2016) found that learning with project-based learning models was more effective than conventional learning models in improving learning outcomes in the form of student's creative thinking skills and science process skills.

The results of the correlation test show that the correlation coefficient between project learning and learning effectiveness (r_{y1}) is 0.201. The probability

value is $0.029 < 0.05$, which indicates the correlation coefficient is significant. Thus, this study states a significant positive relationship between the effectiveness of learning and project learning. The contribution of project learning to learning effectiveness (r_{2y1}) is 0.040, so it can be stated that 4% of the diversity in learning effectiveness is explained by project learning. Based on the results, it is known that the correlation coefficient between student activities and learning effectiveness (r_{y2}) is 0.759. The probability value is $0.000 < 0.05$ and 0.01 , which indicates the correlation coefficient is significant. Thus, this study confirms a significant positive relationship between effective learning and student activities. The contribution of teamwork to learning effectiveness (r_{2y2}) is 0.575 so it can be stated that 57% of the diversity in learning effectiveness is explained by student activities. From the results, it can be seen that the correlation coefficient of the relationship between project learning and student activities with learning effectiveness (r_{y12}) is 0.769. Thus, this study confirms a significant positive relationship between the three variables. The contribution between project learning and student activities with learning effectiveness (r_{y12}) is 0.591, so that it can be stated that 59.1% diversity in learning effectiveness can be explained by project learning and student activities together. At the same time, the remaining 41.9% is explained by other variables not examined.

Conclusion

Based on the research results, students' activity in project activities is successful category 72.7%, and student activity in understanding the learning of chemistry innovative learning models is successful, category 63.6%. Student responses to project learning are very successful category, 81.8%. Mastery of student concepts has increased from 45.8 to 85.8. The results of statistical research using partial regression correlation analysis techniques and multiple correlations show a significant positive relationship between

project learning and learning effectiveness with a correlation coefficient (r_{y1}) = 0.201. A significant positive relationship between student activities exists in innovative learning models and learning effectiveness with a correlation coefficient (r_{y2}) = 0.759. There is a significant positive relationship between project learning and student activities together with learning effectiveness with a correlation coefficient (r_{y12}) = 0.769. Based on the results of these studies, it can be concluded that the effectiveness of learning can be increased through project learning and student activities.

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