Effectiveness of Chemistry Learning Media Development Project in Improving Collaboration

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Abstract.
This study aims to examine the effectiveness of applying the project-based learning model in the form of developing chemical learning media in improving student collaboration. The sample used was 22 students of Academic Year 2023/2024 who attended the learning multimedia design lecture. The instrument used in this research is a questionnaire sheet for collaboration skills. The technique used to collect data in this study is a student collaboration questionnaire. Collaboration data before and after the application of the project-based learning model was tested for normality before hypothesis testing. The normality test results in this study amounted to 0.121, so the data in this study were normally distributed and could be parametric tested in hypothesis testing. Based on the hypothesis test conducted, a significance value of 0.00 was obtained, so that in this study it can be concluded that there is an effectiveness of the application of the project-based learning model in the form of developing chemical learning media in improving student collaboration. The magnitude of the impact of using the project-based learning model in learning activities, it is hoped that the project-based learning model can continue to be applied in learning to improve student skills and make learning more meaningful.

Keywords: *Project, Collaboration, Chemistry Learning Media.*

INTRODUCTION

Technological developments can make the delivery of information easy and effective, so as to improve the quality of learning carried out. The integration of technology in learning can indirectly improve the quality of learning [1]. However, technological developments can make a person more individual and reduce collaboration skills. Collaboration skills are an important skill that must be possessed by every student, especially in doing a job. Collaboration skills allow students to complete a project task effectively, share ideas, and find solutions together from the problems encountered. Collaboration skills are important skills to have because students can learn from the experiences and knowledge of other students, so as to improve critical thinking and communication skills [2]. Lecturer-centered learning cannot activate learning activities in the classroom, so that student skills can be improved. Learning activities that are able to activate students make the learning process more meaningful [3].Therefore, it is necessary to apply a learning model that can increase students to improve collaboration actively.

The project-based learning model is a learning model that has the potential to involve students actively in learning activities, so as to improve student collaboration skills. Students become the focus of learning activities while using the project-based learning paradigm [4]. According to [2] the project-based learning paradigm is one in which students complete learning assignments. Student involvement in learning activities can indirectly help students acquire new skills [4] Students can develop a project and work together to finish it while using a project-based learning methodology. Students can freely explore and develop their skills while working with other students to finish the assigned assignment thanks to the project-based learning paradigm [5].

Determining the project to be carried out, determining the steps to solve the project, determining the project work schedule, implementing and monitoring the project, making reports, and evaluating the project's progress are all steps in the project-based learning model [6] In working on projects given by lecturers, students can interact with each other to provide ideas and solutions to solve the problems found, so that the skills possessed by students can indirectly increase. The involvement of students in learning activities will provide skills and increase understanding of the material, so that it can be used as a provision in facing rapid changes [7].

Based on observations in the field, it shows that students' collaboration skills have not been maximally developed. One of the factors that

cause students' collaboration skills to not develop optimally is because students have a tendency to complete lecture assignments individually. Collaboration skills are one of the important skills that must be possessed to prepare students to be able to compete in the world of work. The application of the project-based learning model in lecture activties is expected to improve student collaboration skills. The application of the project-based learning model is an active learning model that is suitable for improving students' creativity and collaboration skills [8].

Therefore, this study focused on the application of project-based learning model in learning activities. This study aims to examine the effectiveness of the application of project-based learning model in the form of chemistry learning media development in improving student collaboration. The results of this study are expected to contribute to the development of an effective project-based learning model to be applied in learning activities, thus improving student collaboration skills.

METHODS

Pre-experimental research using a single group pretest-posttest design is the methodology employed in this study. The project-based learning approach serves as the independent variable in this study, and student collaboration abilities serve as the dependent variable. The sample used was 22 students of the 2023/2024 academic year who attended the learning multimedia design lecture. A collaboration skills questionnaire sheet served as the research tool. In this study, a student cooperation questionnaire was employed as the data collection method. Prior to hypothesis testing, collaboration data is examined for normalcy both before and after the project-based model is applied. The partnership data is normally distributed and eligible for parametric testing in hypothesis testing if the results of the normality test indicate a significance value higher than 0.05. The hypothesis test used in this study is one sample t test. The results showed the effectiveness of the application of the project-based learning model in the form of chemical learning media development in improving collaboration if it obtained a significance value smaller than 0.05.

RESULTS AND DISCUSSION

In this study, the first step was to provide the sample students collaborative questionnaires. Before using the project-based learning approach, collaboration questionnaires are distributed to students in order to assess their prior collaboration abilities. Table 1 displays the findings from the first partnership survey.

Table 1. Collaboration Skills Data

Before	After	Gain Score
66.36	85.91	19.55

An average score of 66.36 was achieved by the first collaboration skills, according to the results shown in Table 1. Despite these findings, the sample class's students' ability to collaborate still needs to be improved. The implementation of the project-based learning model as a means of enhancing students' teamwork abilities is the main emphasis of this study. The reason for choosing the project-based learning approach is that it can encourage students to participate in class activities and enhance their ability to work together. Due to their direct involvement in the learning process, students become more engaged and motivated when the project-based learning paradigm is used [9]. Learning activities carried out by students in completing projects given can indirectly improve students' ability to find solutions to problems encountered and collaboration skills [10].

In lecture activities by applying the project-based learning model, students create projects by developing interactive learning media using the construct application. Learning activities with the project-based learning model begin with providing stimulus questions to explore students' basic abilities in understanding learning media and the use of construct applications. The next step is designing the project planning. At this stage students are asked to determine the chemistry material that will be included in the construct application. The third step is to develop a schedule. At this stage, students agreed to complete the learning media development project in four weeks. Students are asked to compile a timeline for each week to monitor the development of construct-based learning media

being developed. The next stage is to monitor the progress of the project. At this stage students fill in the monitoring sheet that has been given and convey the obstacles encountered. Students exchange thoughts and ideas, and provide solutions to problems encountered in developing learning media. The fifth stage of implementing the project-based learning model is testing the process and results of learning performance. At this stage students present the results of the construct-based learning media project that has been developed. The lecturer gives feedback on the presentation. The last stage is evaluation. At this stage, students and lecturers reflect and share experiences about the learning tool project that has been carried out by conducting discussions.

Researchers gave out collaboration questionnaires to students in the sample class once again following the adoption of the project-based learning paradigm. After learning, students are asked to complete a questionnaire to determine whether the project-based learning paradigm had an impact on their ability to collaborate with others. Student collaboration abilities have increased by 19.55 percent, according to the findings of the first and final collaboration questionnaires, which are shown in Table 1. To ascertain whether or not the data distribution in the sample class is normally distributed, the acquired cooperation data is subsequently subjected to a normality test. Table 2 displays the findings of the normalcy test.

Table 2. Normality and Hypothesis Test

Test	Significance
Normality	0.121
Hypothesis	0.000

Based on the normality test data in Table 2, it shows that the significance value is greater than 0.05 so that the data in this study are normally distributed and can be tested parametrically in hypothesis testing. The hypothesis test used in this study is the one sample t test. Based on the hypothesis test presented in Table 2, the significance value obtained is smaller than 0.05, so that this study shows the effectiveness of applying the project-based learning model in the form of developing chemical learning media in improving student collaboration. The increase in student collaboration is due to the project-based learning model applied to the learning process. Students seemed very enthusiastic in developing learning media based on the construct application, because students were given the freedom to express their ideas. Increasing collaboration skills can be done through the application of project-based learning models [11].

Because the project-based learning model requires students to work together, it helps them develop their collaboration skills. In addition, by allowing students to plan projects that will be completed, the model can enhance their critical thinking and creativity, making learning more meaningful [12]. Students' performance in finishing projects can be enhanced by using a project-based learning paradigm, which fosters better teamwork and management abilities [13]. The magnitude of the impact of using the project-based learning model in learning activities, it is hoped that the project-based learning model can continue to be applied in learning to improve student skills and make learning more meaningful.

CONCLUSION

Following the implementation of the project-based learning paradigm, students' teamwork abilities increased by 19.55. A significance value of 0.00 was obtained from the hypothesis test using the one sample t test, allowing this study to conclude that the project-based learning model, in the form of creating chemistry learning media, is effective in enhancing student collaboration.

SUGGESTIONS

Given the significant effects of incorporating the project-based learning model into educational activities, it is hoped that this approach will be used going forward to enhance student abilities and give learning greater significance.

LITERATURE

[1]   F. (2024). Syahri, W., Fuldiaratman, & Ekaputra, "Development of Project Based Learning E-Modules in Chemistry Learning Design Course Using Flipbook

Builder Application.," *J. Penelit. Pendidik. IPA, 10(11), 8311–8318. https//doi.org/10.29303/jppipa.v10i11.86 86*, 2024.

[2] G. (2023). Devi, R. S., Mulyasari, E., & Anggia, "Peningkatan Keterampilan Kolaborasi Peserta Didik Melalui Penerapan Model Kooperatif Tipe Group Investigation Berbasis Pembelajaran Berdiferensiasi pada Mata Pelajaran IPA di Sekolah Dasar.," *Didakt. J. Ilm. PGSD FKIP Univ. Mandiri, 09(01), 517–526.*, 2023.

[3] F. (2020). Ekaputra, "Implementasi Pembelajaran Daring Untuk Mengingkatkan Aktivitas Belajar Kimia SMA Muhammadiyah 1 Yogyakarta.," *LENTERNAL Learn. Teach. Journal, 2(2), 1923.https//doi.org/10.32923/lenteral.v1 i2.1245*, 2020.

[4] T. W. (2019). Andrini, V. S., Pratama, H., & Maduretno, "The effect of flipped classroom and project based learning model on student's critical thinking ability.," *J. Phys. Conf. Ser. 1171(1). https//doi.org/10.1088/1742-6596/1171/1/012010*, 2019.

[5] F. (2024). Dewi, F., Afrida, & Ekaputra, "Implementation of Whimsical Application Using Project Based Learning Model Integrated Flipped Classroom in Improving Student Self Efficacy.," *J. Appl. Sci. Eng. Technol. Educ. 6(1), 88–95.https//doi.org/10.35877/454RI.asci302 6*, 2024.

[6] S. S. (2021). Anggraini, P. D., & Wulandari, "Analisis Penggunaan Model Pembelajaran Project Based Learning Dalam Peningkatan Keaktifan Siswa.," *J. Pendidik. Adm. Perkantoran (JPAP), 9(2), 292299.https//journal.unesa.ac.id/index.p hp/jpap*, 2021.

[7] F. (2024). Ekaputra, "Increasing Student Creativity and Collaboration in Biochemistry Practicum through the Application of Project Based Learning Model.," *EduLine J. Educ. Learn. Innov. 4(1),105109.https//doi.org/10.35877/454 RI.eduline2428*, 2024.

[8] R. (2024). Ekaputra, F., Fuldiaratman, F.,

Rusdi, M., Dewi, F., & Theis, "Pelatihan Pengembangan Keterampilan Guru SMA Melalui Pembuatan Flipbook Sebagai Sumber Belajar Mandiri.," *I-Com Indones. Community Journal, 4(3), 1843–1850.https//doi.org/10.33379/icom.v4i3.5 095*, 2024.

[9] F. (2023). Huda, R. F., & Ekaputra, "Peningkatan motivasi dan prestasi belajar mahasiswa melalui model Project Based Learning pada mata kuliah Pendidikan Agama Islam.," *Indones. J. Islam. Relig. Educ. 1(1), 111–122. https//injire.org*, 2023.

[10] M. F. A. (2019). Niswara, R., & Untari, "Pengaruh Model Project Based Learning Terhadap High Order Thinking Skill.," *Mimb. PGSD Undiksha, 7(2), 85–90.*, 2019.

[11] D. (2023). Fitriani, R., & Sarkity, "Persepsi Mahasiswa Terhadap Penerapan Project Based Learning Dengan Penugasan Video Tutorial Pada Mata Kuliah Statistika Pendidikan.," *Tanjak J. Educ. Teaching, 4(2), 105–114. https//doi.org/10.35961/jg.v4i2.963*,2023.

[12] & A. (2023). Sari, R. N., "Implementasi Project Based Learning Untuk Meningkatkan Keterampilan Kolaborasi Siswa Pada Materi Tata Surya.," *LAMBDA J. Ilm. Pendidik. MIPA Dan Apl. 3(1), 22–28. https//doi.org/10.58218/lambda.v3i1.550*, 2023.

[13] P. (2023). Muqtada, Moh. R., & Pradanti, "Perspektif Mahasiswa Terhadap Pelaksanaan Project Based Learning Pada Mata Kuliah Perencanaan Pembelajaran Matematika.," *Asimetris J. Pendidik. Mat. Dan Sains, 04(02), 66–75. http//journal.umuslim.ac.id/index.php/as m/*, 2023.