

Analysis of Students' 4C Skills Based on Project Based Learning through Chemo Entrepreneurship Media

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Abstract

This study aims to analyze students' 4C skills by applying a chemistry learning model assisted by chemo entrepreneurship media. 4C skills or 21st century skills include communication, collaboration, critical thinking, and creativity. The subjects of this study were students of the Jambi University Chemical Education Research Program in the psychology of learner development course class B in the 2023/2024 academic year. This research is a quasi-experimental research with a one-group pretest-posttest design. Data on 4C skills were collected using a questionnaire before and after the application of a project-based learning model supported by chemo entrepreneurship media. Data related to 4C skills were then tested using paired sample t-test. The significance test results with paired sample t-test showed a value of 0.00. These results are less than 0.05 so that this study shows the application of project-based learning models assisted by chemo entrepreneurship media.

Keywords: 4C skills, project-based learning, chemo entrepreneurship

1. Introduction

Science and technology that continues to develop makes the delivery of information required to be easier and faster. Education in Indonesia continues to transform to improve the quality of learning that is carried out. The development of science and technology quickly results in an increase in the quality of education (Sanova et al., 2022). One of the quality improvements made in education in Indonesia is the application of varied media and learning models. The application of media in learning is one of the efforts to improve the quality of learning (Fuldiaratman et al., 2023).

Learning media is a tool used in learning activities so that learning materials can be delivered well (Nurrita, 2018). The use of learning media can increase students' activities in learning (Ekaputra & Hasanah, 2021). Learning activities can be made easier with the existence of learning media, because learning can be carried out anytime and anywhere students are. The utilization of various learning media in learning activities can improve students' learning achievement (Ekaputra, 2020).

Based on observations in the field, it shows that students' 4C skills are still relatively low, especially in the ability in the aspects of student communication and collaboration. Factors that cause communication and collaboration skills of Jambi University Chemistry Education Study Program students, especially semester 5 in the psychology of student development class B course because students tend to complete assignments given by lecturers individually, so communication and collaboration between students is lacking. Based on these observations, an effort is needed to improve students' 4C skills, especially the ability of communication skills and student collaboration. In this study, one of the efforts to improve 4C skills is the use of chemo entrepreneurship media.

Chemo entrepreneurship media is chemo edutainment media that incorporates elements of entrepreneurship into the media applied. Chemo edutainment media is a gamified chemistry learning media. The existence of gamification elements makes students interesting because it contains elements of entertainment so that learning does not take place boring. Chemo edutainment learning media makes every learning can be made interesting and fun (Bahriah et al., 2017). The use of various learning media in learning makes student motivation increase, so that learning independence also

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increases (Haryanto et al., 2023). The addition of entrepreneurship elements in this study emphasizes the value of student learning independence and responsibility in completing the assigned tasks. This is in line with research conducted by (Sutrisno et al., 2019) which integrates entrepreneurial values in the form of learning independence and responsibility into learning. One-way learning makes learning activities less meaningful.

Therefore, in this study, the use of chemo entrepreneurship media is strengthened by the application of learning models that can increase student involvement in lectures. One of the learning models that involves students directly in learning activities is the project-based learning model.

The project-based learning model is a learning model that involves students directly in learning activities to carry out and produce a learning project, so as to develop students' ability to solve problems (Apriany et al., 2020). Students become more active in learning activities with the application of the project-based learning model and are able to improve students' critical thinking skills (E. T. Pratiwi & Setyaningtyas, 2020). Therefore, the application of learning models can develop students' ability to solve problems, improve student skills, because students are directly involved in learning activities.

The government's effort to improve the competence of university students is to equip 21st century skills (Hendra et al., 2023). 21st century skills require skills that intergenerate critical thinking, collaborative, communication, and creativity skills or what is called 4C skills. 21st century skills are skills that must be possessed by students to prepare students to face the changes and demands of the times (Ekaputra & Widarwati, 2023). The application of the project-based learning model is considered capable of accommodating 4C skills in learning. Based on this background, the problem in this study is focused on analyzing the 4C skills of students based on project-based learning through chemo entrepreneurship media.

2. Literature Review

2.1. Project-based learning model

The project-based learning model is a learning model that actively involves students to produce a project, so that problem solving skills are improved (R. T. Sari & Angreni, 2018). The steps of the project-based learning model consist of determining the project, planning the steps to complete the project implementation, determining the project implementation schedule, completing and monitoring the project, preparing reports, and evaluating the project (Anggraini & Wulandari, 2021). The application of the project-based learning model makes the ability to solve problems and make decisions of students increase, so that the project-based learning model makes meaningful learning (Prasetyo, 2019). The use of learning models can result in a decrease in potential learning loss and increased student learning outcomes (Ekaputra & Sanova, 2023).

2.2. Chemo entrepreneurship media

Chemo entrepreneurship media is chemo edutainment media that contains the value of entrepreneurship. Chemo edutainment media is a learning media that includes elements of entertainment so as to create a pleasant learning atmosphere (Nugraha, 2020). Entrepreneurship values such as independence, creativity, hard work, leadership, action-oriented, and risk-taking can be implemented in learning activities (Ayuni et al., 2022).

2.3. 4C Skills

The implementation of the MBKM curriculum is an effort to improve the skills possessed by students (Ekaputra, 2023). In the 21st century, 4C skills consisting of communication skills, creativity, collaboration and critical thinking skills are very important skills for students to master (Sari & Trisnawati, 2019). Instilling 4C skills can be a provision in living life to adapt to the environment (Maulidah, 2021).

3. Research Method and Materials

This research is a quasi-experimental research. The experimental sample used in this study were students of the Jambi University Chemical Education Study Program in the psychology of learner development course class B academic year 2023/2024. The independent variable in this study is the application of the project-based learning model assisted by

chemo entrepreneurship media. The dependent variable used in this study is the 4C skills which consist of collaboration, creativity, critical thinking, and communication skills. Data on 4C skills were obtained using a questionnaire before and after the application of the project-based learning model assisted by chemo entrepreneurship media. The results of the 4C skills questionnaire before the application of the project-based learning model of chemo entrepreneurship media were tested for normality. The normality test is intended to test students in the psychology of learner development course class B have the same initial 4C skills or not. After the application of the project-based learning model of chemo entrepreneurship media, students filled out the final 4C skills questionnaire again. Hypothesis testing was carried out on the initial and final 4C skills data with the paired samples t test. If the significance result is greater than 0.05, then this study shows an increase in students' 4C skills by applying a chemistry learning model assisted by chemo entrepreneurship media.

4. Results and Discussion

Before applying the chemistry learning model assisted by chemo entrepreneurship media to learning activities, students who took the psychology of learner development class B lecture first filled out a questionnaire to find out the initial 4C skills. The 4C skills questionnaire consists of indicators including communication, collaboration, critical thinking, and creativity. The results of the initial 4C skills are shown in Table 1.

Table 1. Initial 4C Skills

Indicator	Value
Communication	68.10
Collaboration	69.29
Critical Thinking	66.86
Creativity	68.76
Average	68.25

Based on the questionnaire results regarding students' 4C skills in Table 1, it shows that the initial 4C skill value has an average of 68.25. The results of the initial 4C skills which have an average of 68.25 require an effort to improve the 4C skills of Chemistry Education Study Program students who take the psychology of learner development class B academic year 2023/2024. In this study, a chemistry learning model assisted by chemo entrepreneurship media was applied as an effort to improve students' 4C skills.

The results of the 4C skills obtained then carried out a normality test to test students in the psychology of the development of class B students have the same initial 4C skills or not. The normality test results show a significance value of 0.133. The normality test results obtained are greater than 0.05, so the data obtained in this study are normally distributed.

After learning with the application of the chemistry learning model assisted by chemo entrepreneurship media, students again filled out the 4C skills questionnaire. The results of students' overall 4C skills are shown in Table 2.

Table 2. Results of Students' 4C Skills

Indicator	Initial Value	Final Value	Gain Score
Communication	68.10	84.76	16.67
Collaboration	69.29	85.48	16.19
Critical Thinking	66.86	83.43	16.57
Creativity	68.76	81.14	12.38
Average	68.25	83.70	15.45

Based on Table 2, there was an increase in the average 4C skills of 15.45. The initial and final 4C skills data were then subjected to paired samples t test to determine whether or not there was a significant increase after the application of the project-based learning model assisted by chemo entrepreneurship media. The increase in students' 4C skills after applying the project-based learning model is in line with research (Darmuki et al., 2022) which found that there was an increase in 4C skills after applying the project-based learning model in the lecture process. The application of the 4C-based project-based learning model makes students active in learning activities, so that students' ability to understand the projects given and the ability to manage time increases (Ekawati et al., 2019). The project-based learning model provides opportunities for students to improve their ability to solve problems and collaboration between students

(Niswara & Untari, 2019). The application of the project-based learning model facilitates students to work together, express opinions, think creatively to complete projects (Hartono & Asiyah, 2019).

The application of the project-based learning model assisted by chemo entrepreneurship media makes learning more interesting and meaningful. The use of learning media in applying the project-based learning model makes learning activities increase (Pratiwi et al., 2018). The activity of students in learning, including in discussion activities, shows that students are directly involved in the learning activities carried out (Ekaputra, 2022). The project-based learning model assisted by learning media can increase students' curiosity, sense of responsibility, and concern (Kusuma & Japa, 2018). Based on this, the use of chemo entrepreneurship media which is a chemical learning media that incorporates entrepreneurial values can increase students' sense of responsibility. In this study, it can be concluded that the project-based learning model assisted by chemo entrepreneurship media is effective in improving students' 4C skills, especially for students of the Jambi University Chemistry Education Research Program in the psychology of student development class B course in the 2023/2024 academic year.

5. Conclusion

The results of the paired samples t test significance test showed a value of 0.00. These results are smaller than 0.05, so that this study shows a significant increase in 4C skills after the application of the project-based learning model assisted by chemo entrepreneurship media. The project-based learning model assisted by chemo entrepreneurship media is an appropriate learning model to be applied in learning, especially for Jambi University Chemistry Education Research Program students in the Chemistry of Natural Products course in the psychology of the development of class B students in the 2023/2024 academic year to improve 4C skills.

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