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The effectiveness of the project-based learning model in improving students' collaboration skills on creative economic materials

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Abstract
The current learning model emphasizes student involvement, which aims to enable them to participate actively in implementing learning. Collaboration skills are considered one of the critical abilities of the 21st century. These skills are considered to encourage active student participation both in the classroom and in group projects. This research aims to determine the effectiveness of the project-based learning model in improving students' collaboration skills. The research methodology used is quantitative, using a quasi-experimental type. The sample used in this research consisted of 58 students, 29 students in class IX A and 29 in class IX E at MTs Negeri 2 Malang City. The data collection technique uses a research instrument in the form of a questionnaire, while the data analysis technique uses the independent sample t-test. The research results show that applying the project-based learning model significantly influences students' collaborative skills. Implementing a project-based learning model fosters greater student involvement in communication and greater responsibility for the tasks or problems given. The limitations of this research lie in the research respondents. Research respondents were less responsive when filling out the research sample determination questionnaire. This research suggests that the project-based learning model can be an alternative learning model to improve students' collaborative skills. Additionally, further studies might investigate project-based learning models while considering additional characteristics relevant to the 21st century.

Keywords: *21st century; project-based learning; collaboration skills.*

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INTRODUCTION

Learning in the 21st century is designed to prepare students for facing the problems of the 21st century. Curriculum development is expected to be able to face challenges in order to form a generation that is productive, innovative, active, and creative (Amri & Muhajir, 2022). Schools are expected to facilitate this and prepare students to compete and adapt. Schools are expected to provide provisions in the form of knowledge and life skills suitable for application in the 21st century (Hamdani, 2022). 21st-century learning skills are needed to form a productive, innovative, active, and creative generation. These skills consist of 4C: communication, collaboration, critical thinking, and creative and innovative skills (Rosnaeni, 2021). 21st-era learning has several main principles, namely 1) learning must focus on students, 2) learning is collaborative, 3) learning must have a clear context, and 4) schools must be integrated with society (Taufiqurrahman, 2023). Based on these principles, one of them is that 21st-century learning must be collaborative.

Collaboration skills are cooperating with others in a team or group. Collaborative skills can help students socialize and prevent individualistic living (Agustanti et al., 2024). Meanwhile, according to Taufiqurrahman (2023), collaborative skills can increase work productivity and reduce group disagreements (Taufiqurrahman, 2023). Collaboration skills require students to be more active in groups under constructivist learning theory, which emphasizes student activity and building an understanding of the problems they face (Masgumelar & Mustafa, 2021).

Collaboration skills have several indicators that serve as benchmarks for determining the level of collaboration skills. Indicators of collaboration skills include 1) effective and efficient collaboration within groups. 2) flexibility, actively contributing, and adapting to the group. 3) responsibility, having responsibility for the work or tasks given. 4) compromise, holding discussions, and exchanging opinions between group members. 5) Communication, which is communicating actively with other group members (Najaah, 2021).

In 2024, creative economy learning in class IX Mts Negeri 2 Malang City will still use the conventional model, which is relatively faster. Implementing teacher-centered learning tends to show teacher activity in teaching and student passivity in learning (Firmansyah & Jiwandono, 2022). Meanwhile, in 21st-century learning, the next generation is challenged to become more active, innovative, creative, and productive. Forming an active, innovative, and creative generation can be applied to the Merdeka curriculum, which tends to focus on soft skills and student character.

One learning model that can develop student activity is the project-based learning model. Project-based learning is a relatively time-consuming process focusing on problems and integrating concepts from various aspects, such as knowledge, scientific disciplines, and the field (Azizah & Widjajanti, 2019). Applying the project-based learning aims to enable students to face the 21st century. In research on the effectiveness of project-based learning in improving student learning achievement, it is known that it is effective in improving learning achievement.

However, in reality, project-based learning does not only improve learning achievement. This research gap is what researchers use, namely whether project-based learning is only effective for improving learning achievement or can also improve students' soft skills such as collaboration skills.

According to research, Azizah and Widjajanti (2019) stated that the model of Effective project-based learning is carried out to improve student learning achievement, critical thinking skills, and self-confidence. Project-based learning also improves students' social skills (Sa'diyah et al., 2023). The social skills in question are students' interaction and collaboration skills. According to the research results, the project-based learning model is suitable for improving students' collaboration skills (Lilis & Irianto, 2023). Based on previous research there has been no previous research that has examined students' collaboration skills using the project-based learning model. This is the background for researchers researching improving students' collaboration skills using the project-based learning model.

This research aims to analyze the effectiveness of the project-based learning model in improving students' collaboration skills on creative economy material at MTs Negeri 2 Malang City. It also informs readers that the project-based learning model improves students' collaboration skills. It also provides input to teachers or prospective teachers regarding effective learning models for improving collaboration skills.

METHOD

This research uses quantitative methods with quasi-experimental research to determine causal relationships between variables and uses a static group comparison design. Static group comparison is a design that measures variables with two different types of treatment, namely treatment in the experimental class (Project-based Learning) and treatment in the control class (Cooperative) and measures these variables using a post-test (Campbell & Stanley, 2015). The research design is according to Table 1.

Table 1. Research design

Class	Treatment	Posttest
Experiment	X	Y1
Control	---------	Y2

The variables used in this research are independent variables and dependent variables. This variable analyzes the relationship between variables, namely the dependent variable influencing the independent variable. Meanwhile, the research variables in this study are the project-based learning model as the independent variable and collaboration skills as the dependent variable. This research was carried out at MTs Negeri 2 Malang City using two classes, namely class IX A and class IX E, each consisting of 29 students selected using a purposive sampling technique. The two classes will be given different treatments; namely, class

IA, as the control class, will receive treatment using a cooperative learning model, while class IX E, as the experimental class, will receive treatment using a project-based learning model.

This research uses collaboration skills questionnaire instruments and observation sheets as data collection techniques. Collaborative skills questionnaires are given to students after receiving treatment. Meanwhile, the observation sheet is an instrument that includes various indicators of collaboration skills, including cooperation, flexibility, responsibility, compromise, and communication (Najaah, 2021). The researcher fills in the observation sheet to observe the learning process. Before the instrument is used in research, the instrument is tested using validity and reliability tests assisted by SPSS software. Instrument testing is carried out outside the class to be studied. Items that do not meet the requirements of the validity test and reliability test will be removed. The observation sheet uses indicators of collaboration skills as a benchmark. On the observation sheet, each indicator has a maximum score of 20 in the high category, a score of 10 in the medium category, and a score of 5 in the low category. The preparation of these categories uses the formula according to (Arikunto et al., 2021), namely by using the mean and standard deviation according to Table 2.

Table 2. Assessment categories

Category	Formula	Score Percentage
High	M + 1SD ≤ X	76% - 100%
Medium	M – 1SD ≤ Xthan + 1SD	51% - 75%
Low	than – 1SD	≤ 50%

The data obtained will be analyzed using 1) pre-requisite tests, namely the normality test and homogeneity test, with the help of SPSS. Normality test and test Homogeneity have the same decision-making criteria. Based on this criterion, the research data is usually distributed if the p-value exceeds the alpha level. Conversely, if the significance value is smaller or equal to the alpha level, then the data is not normally distributed; this shows that the data does not follow normal distribution. The homogeneity test uses the same criteria, namely, if the significance value is above the alpha value, then the variable is considered homogeneous, and vice versa; 2) test the hypothesis using a different test, namely the independent sample t-test, because it compares two classes with different treatments.

The research hypothesis is as follows:

H0 : The application of the project-based learning model has no significant effect on increasing students' collaboration skills on creative economy material at MTs Negeri 2 Malang City.

H1 : The project-based learning model significantly improves students' collaboration skills on creative economy material at MTs Negeri 2 Malang City.

RESULTS AND DISCUSSION

Results

Before the research was carried out, the research instrument, a collaboration skills questionnaire, was tested using validity and reliability tests. The validity test is carried out to determine the validity of each statement item in the questionnaire. In contrast, the reliability test is carried out to determine how well the instrument produces the same data with different subjects and at different times (Paramita, 2021). After the instrument is declared valid and reliable, it will be distributed to research subjects, namely students. This instrument was given to the control class and experimental class after the treatment was carried out. The results of the research data validity test showed that the observation sheet with five indicators of collaboration skills is considered valid. To determine whether the data is valid, compare the Pearson correlation with the correlation. If the Pearson correlation value is greater than the correlation, then the data is said to be valid. In this study, the validity of the data is shown in Table 3.

Table 3. Data validity test results

No	Indicator	*Pearson correlation*	*Correlation*	Information
1	Indicator 1	0,376	0,3610	Valid
2	Indicator 2	0,380	0,3610	Valid
3	Indicator 3	0,516	0,3610	Valid
4	Indicator 4	0,451	0,3610	Valid
5	Indicator 5	0,387	0,3610	Valid

After the data is declared valid, reliability testing is continued. Reliability testing was conducted to evaluate the questionnaire instrument's ability to produce consistent responses among many participants and in different periods (Paramita, 2021). The results of the reliability test are shown in Table 4.

Reliability Test Result

Reliability testing was conducted to evaluate the questionnaire instrument's ability to produce consistent responses among many participants and in different periods (Paramita, 2021). The reliability test results are in Table 4.

Table 4. Reliability test results

Cronbach's Alpha	N of Items
0,559	5

The results of the reliability test show that Cronbach's Alpha observation sheet data coefficient is 0.559 and alpha = 0.05 with n five and r table = 0.3610. A comparison of Cronbach's Alpha results with the r table shows that Cronbach's Alpha is more incredible than the r table, which means the observation sheet data is reliable. After passing the validity and

reliability tests, the researcher conducted the research by implementing project-based learning in the experimental class and applying the cooperative learning model in the control class. The learning objectives of the control and experimental classes can be seen in Table 5. Meanwhile, the learning syntax for project-based learning and the cooperative model can be seen in Table 6.

Table 5. Learning objectives

No.	Learning objectives
1	It is hoped that students will understand the creative economy sector properly by explaining strategies for developing and improving it.
2	Students can correctly differentiate between the creative economy and the creative industry by linking the relationship between the creative economy and the creative industry.
3	By analyzing the development of the creative economy, students can understand the various types of creative economy well.
4	Students can learn about the various creative economy subsectors and their examples by creating a project based on the creative economy subsector.
5	Students can practice collaboration between group members by presenting project results related to the creative economy sub-sector.

Table 6. Project-based learning

No	Syntax	Activity	Learning Indicators
Meeting 1			
1	Introduction	a. The teacher conveys learning objectives and learning motivation b. The teacher explains creative economy material c. The teacher randomly forms students into several groups.	a. Students can state the learning objectives that have been conveyed again. b. Students can explain the creative economy material c. again. l d. Students join predetermined groups.
2	Core activities		
	a. Defining Projects	a. The teacher provides four creative economy sub-sector themes to students b. Students determine and look for projects that match the sub-sector theme obtained.	a. Students can search for products according to the specified subsector
	b. Arranging a Schedule	a. Students prepare a project implementation schedule according to the format on the LKPD. b. Students are asked to prepare a project schedule according to the deadline.	a. Students can prepare a project schedule according to the LKPD format
	c. Implementing Projects	a. Students can discuss the job descriptions of group members during project implementation with the group.	a. Students can discuss and determine job descriptions for group members during project implementation.
3	Closing	a. The teacher conveys conclusions related to learning at meeting 1. b. The teacher verbally evaluates students' understanding of the material and projects.	a. Students can conclude the material they have studied b. Students can answer evaluation questions given by the teacher.
Meeting 2			
1	Introduction	a. The teacher conveys learning motivation and learning objectives. b. The teacher asks students to prepare progress reports and documentation during project implementation.	a. Students can state the learning objectives that have been conveyed again. b. Students can prepare progress reports according to the format in the LKPD
2.	Core activities:		
	a. Monitoring	a. Students prepare a progress report according to the format on the LKPD	a. Students can show the progress of project implementation to the teacher

No	Syntax	Activity	Learning Indicators
		b. The teacher goes around to each group to see the progress made on implementing the project the students have carried out.	
	b. Finishing the project	a. Students are asked to complete the project that is being created.	a. Students can complete the project according to the given deadline.
3	Closing	a. The teacher conveys conclusions regarding the progress report that the students have made. b. The teacher provides an evaluation regarding obstacles during project implementation.	a. Students can explain the conclusions conveyed by the teacher again. b. Students can identify obstacles experienced during project implementation.
Meeting 3			
1	Introduction	a. The teacher conveys learning objectives and learning motivation. b. The teacher asks students to collect project results.	a. Students can state the learning objectives that have been conveyed again. b. Students can submit project results on time.
2	Core Activities		
	a. Publication of project results	a. Students upload project results to the YouTube or Instagram application and include the link on the LKPD.	a. Students can upload project results on YouTube or Instagram and include a link to the LKPD.
	b. Evaluation	a. The teacher displays the results of the projects that have been carried out. b. Students are asked to respond to the project. c. The teacher assesses the results of student projects.	a. Students can respond to projects presented by the teacher and provide assessments of the projects created.
3	Closing	a. The teacher appreciates students for the results of the projects they have worked on. b. The teacher provides an evaluation of the project publication process.	a. Students feel valued and motivated for their next project. b. Students can identify things that need to be improved in the project publication process.

Table 7. Project-based learning

No	Syntax	Activity	Learning Indicators
Meeting 1			
1	Introduction	a. The teacher conveys learning objectives and learning motivation.	a. Students can state again the learning objectives that have been conveyed.
2	Core Activities		
	a. Delivering material	a. The teacher delivers material related to the creative economy.	a. Students can listen and note important points from the material presented
	b. Form groups and do assignments	a. The teacher forms students into small groups randomly. b. Students are asked to work on the assignments given in groups.	a. Students can work together with group members in carrying out assigned tasks.
3.	Closing	a. The teacher conveys conclusions during the lesson. b. The teacher provides an evaluation regarding the material that has been presented.	a. Students can summarize the material they have learned during the lesson. b. Students can answer the evaluation questions given.
Meeting 2			
1	Introduction	a. The teacher conveys learning objectives and learning motivation b. The teacher instructs students to go to their respective groups.	a. Students can state again the learning objectives that have been conveyed b. Students can go to their respective groups in an orderly manner.
2	Core Activities		
	a. Group evaluation	a. Students are given questions in the form of a quiz by the teacher in groups.	a. Students can answer quiz questions as a group correctly.
	b. Individual evaluation	a. Students are given questions by the teacher regarding individual understanding of the material.	a. Students can answer questions given by the teacher regarding individual understanding of the material.

No	Syntax	Activity	Learning Indicators
	c. Reflection and appreciation	a. The teacher gives appreciation for the performance of students or groups. b. Students together with the teacher reflect on the learning that has been carried out.	a. Students can reflect with the teacher regarding the learning carried out.
3.	Closing	a. The teacher provides conclusions regarding the learning that has taken place.	a. Students can summarize and explain themselves regarding the learning that has taken place.

Normality Test Results

After the treatment was carried out in the control and experimental classes, students in the control and experimental classes were given a collaboration skills questionnaire to measure the extent of the student's level of collaboration skills after the treatment was applied. The data obtained from the observation sheet will be tested using prerequisite tests, namely the normality test and homogeneity test, with the help of SPSS software, which can be seen in Table 8.

Table 8. Prerequisite test

Prerequisite Test	Test used	Results	Conclusion
Normality test	One-Sample Kolmogorov-Smirnov Test	Asymp. Sig. (2-tailed) = 0,200	Data is normally distributed
Homogeneity Test	Levene Statistic	Sig. control class and experimental class value = 0.381	Data homogeny

The normality test results show that Asymp. Signature. (2-tailed) value of 0.200 exceeds the significance level of 0.05. Therefore, based on the decision-making principle of the normality test, we can conclude that the data follows a normal distribution. Meanwhile, the results of the homogeneity test show that the p-value of the collaboration skills variable in the control and experimental groups is 0.381, which is above the threshold value of 0.05. Based on the homogeneity test, it can be seen that the variable ability to collaborate in both the control group and the experimental group is homogeneous according to the decision-making criteria. A comparison of the results of collaboration skills after treatment in the experimental class and control class after treatment can be seen in Table 9.

Table 9. The percentage of collaboration skills results in the experimental class and control class

No	Indicator	Experiments Categories	Control Categories
1	Cooperation	High	Medium
2	Flexibility	High	Medium
3	Responsibility	High	Medium
4	Compromise	High	Medium
5	Communication	High	Medium

Based on the table above, it is known that collaboration skills in the experimental class are higher than those in the control class, which shows that the model used in the experimental class is more effective in improving students' collaboration skills. The model used in the

experimental class is the project-based learning model. After conducting research and obtaining data, the researcher conducted an independent sample t-test hypothesis to determine the difference between the control class that did not receive treatment and the experimental class that received treatment. The results of the hypothesis test can be seen in Table 10.

Table 10. Hypothesis Test Results

Test used	Result	Conclusion
Independent sample t-test	Sig. The value of the control class and experimental class is 0.000	H1 is accepted = the experimental class has a significant difference. H0 is rejected = the control class does not have a significant difference.

The table above shows that the two-sided significance level is 0.000, which indicates a significance level lower than 0.05. Thus, based on the decision-making criteria in the independent sample t-test hypothesis test, we can conclude that the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. This shows a striking difference in collaboration skills between the control and experimental groups.

Discussion

The research results show that the project-based learning model has a significant impact and can be more efficiently used to improve students' collaborative skills. This research shows that applying the project-based learning model meets more indicators for improving collaboration skills. The indicators in question include students discussing and communicating more with groups, and students can learn to be responsible in solving problems. Meanwhile, classes that use a cooperative learning model will make students passive in groups and not work together to complete the tasks given.

The project-based learning model is where students are given learning material and assigned to achieve educational goals effectively and efficiently. The project-based learning model prioritizes student involvement and understanding in problem-solving activities. This phenomenon is visible in group discussion sessions when all members contribute ideas and solutions to overcome difficulties and foster a collaborative environment that encourages student teamwork. This is supported by Sufajar & Qosyim (2022) that an active attitude of collaboration is an activity that can be seen from the outside, such as communication, group formation, work, and problem-solving, and can be seen from the way groups are organized in engaging in discussions and problem-solving in the learning process (Sufajar & Qosyim, 2022).

When project-based learning occurs, students form several groups and are given different problems in each group. Assigning assignments to each group helps foster student collaboration in problem solving. Giving problems to groups can train several indicators of students' collaboration skills, namely 1) working together to solve a problem, 2) flexibility, contributing fully to the team, 3) being responsible for tasks, 4) making compromises to achieve common goals, 5) communicate actively and effectively in groups. The first indicator of collaboration

skills is working together. Project-based learning requires cooperation between groups to solve a given problem/project. Hal is supported by research by Monalisa et al. (2020), which states that students are said to be able to work together when they fulfill aspects of cooperation such as togetherness of students in completing projects, discussing project planning, exchanging opinions, and being united in completing projects.

The next indicator of collaboration skills is flexibility. In the flexibility indicator, students can contribute fully to the group at any time to solve problems/projects. Flexibility can also be interpreted as freedom in carrying out tasks/projects, both from time and place (Mustakim et al., 2021). Based on this statement, students can practice work flexibility by giving projects to students. Being responsible is an indicator of collaboration skills that is no less important. Students need a responsible attitude toward the problems/projects in group learning activities. Completing projects on time is a form of responsibility for learners. Collecting assignments on time is part of an attitude of responsibility. Students who demonstrate a responsible attitude usually demonstrate discipline, autonomy, and the capacity to ensure their academic achievement (Rostyanta et al., 2020).

The fourth indicator of collaboration skills is compromise. Discussing and exchanging opinions is a form of compromise in collaboration skills. During educational activities, students engage in discussions, delegate tasks to each other, and seek information or ideas to solve problems or complete projects, thereby encouraging the development of compromise skills (Ilmiyatni et al., 2019). The final indicator of collaboration skills is communication. Communication is vital to improve. One form of communication in project-based learning is that students can communicate actively in groups and express opinions to solve the problem/project. Good communication skills are essential to have children to facilitate their involvement in academic and extracurricular activities (Anderha & Maskar, 2020).

This statement shows that the indicators align with the research results that show a strong correlation between collaboration skills and student learning outcomes. Specifically, this implies that when collaboration skills are low, learning outcomes tend to be poor (Najaah, 2021). In conventional classes, students are asked to listen to the teacher explaining material that will shape students to be more passive in learning. Improving collaborative skills in education can foster a sense of belonging and teamwork among students, leading to improved group performance. The research results of Sulastri & Pertiwi (2020) show that quality group performance can positively impact the quality of education. Quality education equips individuals with problem-solving skills.

Project-based learning and conventional models in class IX, especially in Creative Economy. The results of this research are in line with previous research, which shows the effectiveness of project-based learning methods in improving students' ability to collaborate, think critically, and develop social skills by emphasizing teamwork and group work (Sa'diyah et al., 2023). Other researchers show that implementing a project-based learning model in teaching mathematics can increase students' ability to collaborate productively (Lilis & Irianto,

2023). Thus, based on previous research, it can be concluded that the project-based learning approach can improve students' collaborative skills.

CONCLUSION

The results of quantitative research conducted in class IX of MTs Negeri 2 Malang City on creative economy material show that the project-based learning model is more effective in improving students' collaborative skills than the cooperative model. The results from data collected through questionnaires show that project-based classes receive higher ratings than cooperative learning models. Following the known results of the hypothesis test using the Independent Sample t-test, the sig value is 0.000, which is lower than the predetermined sig value, namely 0.05. From these data, it can be concluded that H0 is rejected and H1 is accepted, which means that collaboration skills in the experimental class have a significant influence compared to the control class. This research only discusses collaboration skills, whereas, in the 21st century, four skills must be mastered. Limited time and energy are why researchers only take one skill in the 21st century: collaboration skills. This research recommends using a project-based learning model as an alternative that focuses on improving collaboration skills. Future research could investigate the effectiveness of the project-based learning model by considering other 21st-century skills, such as communication skills, critical thinking, and creative thinking.

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