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Project-Based Learning on Students' Collaborative Skills and Learning Outcomes in Food and Beverage Service Course

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Abstract

The current study investigated the effect of project-based learning on students' collaboration skills and learning outcomes in food and beverage services, particularly in restaurant customs. A quantitative approach was used in this study by adapting a posttest-only control group design. Eighty students took culinary arts concentration in the Family Welfare Education study program at Universitas Pendidikan Ganesha selected as the research sample. They were selected by using total random sampling. The data were collected through posttest and questionnaire distribution. The posttest was conducted to collect data on students' learning outcomes; meanwhile, questionnaire distribution was purposed to obtain students' collaboration skills. The research instruments were a questionnaire and a test. The data were analyzed quantitatively through descriptive and inferential statistical analysis. The inferential statistic analysis was conducted using the t-test and MANOVA with the assistance of SPSS 25. The results showed that 1) project-based learning significantly affected students' collaboration skills, 2) project-based learning affected students' learning outcomes, and 3) there was a significant simultaneous effect of collaboration skills and learning outcomes in the restaurant food and service course.

Keywords Collaboration Skills; Learning Outcomes; Project-Based Learning

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1. INTRODUCTION

Education has been widely known as a field that has an essential role in increasing the quality of human resources for the industrial fields in every country. It is deliberately perceived as a foundation for improving a nation's development (Faridah et al., 2022). It leads to a situation where educational institutions are demanded to produce graduates with quality, expertise, and broad knowledge, including character and creativity, to compete in real life (Dewi et al., 2020). This demand is along with the emergence of 21st century learning, which frames the educational system emphasizing 21st century skills (Eveline et al., 2019)(Novalinda et al., 2020). It refers to the skills called 6C: creativity, critical thinking, collaboration, communication, citizenship, and character (Suharyat et al., 2022). These skills are regarded as survival skills in this globalization era for competing in the working industry (Zhang et al., 2021). The educational stakeholders are supposed to conduct a learning process building students' 21st-century skills since education plays a significant role in producing qualified graduates or human resources.

Vocational education is one of the educational instances particularly purposed to prepare the graduates who are ready to face the working industry after graduating from schools (Renaningtyas et al., 2021). It is mentioned that vocational education supports students' skills, impacting their readiness to be a professional worker (Nugroho et al., 2020). It is added that it demands for the vocational teachers to provide the students with the stage for mastering the competencies with various characteristics (Yusuf et al., 2020). Indonesia's National Ministry of Education mentions that vocational graduates are supposed to have the skills to achieve a successful career (Inderawati et al., 2021)(E. N. Sari & Zamroni, 2019). Novalinda (Novalinda et al., 2020) argues that vocational students must control and develop in the 21st century to work in a team or individually. Therefore, vocational education is no exception for conducting 21st-century learning to prepare students' readiness as professional workers.

In preparing vocational students as professional workers, collaboration skills are one of the 21st century skills commonly emphasized in the learning process. Collaboration is defined as a skill training students to find a solution for solving problem through group work (Dwi & Sagala, 2019). It is also added that collaboration skill is referred to as an ability to work with two or more people in solving problems by sharing and organizing different thoughts or ideas (Saldo & Walag, 2020). Santoso (Santoso et al., 2021) argues that an individual with collaborative skills tends to have responsibility, tolerance, and respect when solving complex obstacles. Effective collaboration can help an individual avoid miscommunication or misunderstanding since it is also defined as an ability to work respectfully with diverse teams to achieve goals through shared responsibility (Gusta et al., 2020). Nemiro (Nemiro, 2020) states that collaboration allows the students to adjust their learning process and changes. It shows that collaborative skills improve students' soft skills in working in a team or group and gathering information they obtain to solve problems. This skill helps them to work in a real professional industry (Malik & Ubaidilah, 2021).

However, a lack of collaboration skills is regarded as a serious problem. Students with low collaboration skills tend to be unable to conduct group learning and discussion (Nahar et al., 2022). It is also mentioned that the students have low mutual respect in responding to various opinions (Sirait & Amnie, 2023). It shows that a lack of collaboration skills can be a serious problem in which students will face difficulty in connecting their learning comprehension with the real-life problem (Ilma et al., 2021). It is also perceived that this issue indirectly affects students' progress in achieving learning objectives reflecting from their unoptimized learning outcomes (Saldo & Walag, 2020).

Unoptimized learning outcomes are a serious problem, considering that learning outcomes reflect students' complex cognitive, psychomotor, and affection processes. (Mugenyi & Chang, 2016) Learning outcome is a construction of learning satisfaction, learning performance, motivation, skills, and knowledge of the students. It is also added that learning outcomes are widely perceived as the specifications of the things learned by the students and how those were demonstrated as a successful completion of the course (Kumar, 2016). Another view indicates that learning outcomes are the desire for a learning process in the form of knowledge and skills acquisition (Aslam et al., 2021). Learning outcomes are commonly manifested in the form of numbers, which it is regarded as the reflection of how the learning process is conducted (Charbi & Hartoto, 2017). Wahyuni even views learning outcomes as an inseparable component used to measure the quality of the learning process. The high and low learning outcomes are also determined by the method used in the learning process. (Wahyuni, 2020) Briefly, learning outcomes are the result of the learning process that can be used to determine whether the learning process has been conducted successfully.

The preliminary observation conducted in Family Welfare Education at Universitas Pendidikan Ganesha found a relevant problem to the current issue. It has been found that students who join culinary programs or cooking restaurant courses tend to have low collaboration skills. This is proven by the questionnaire distributed to 80 students who joined the course. There, 82.1% of students prefer to study individually and do individual projects instead of having group projects. This was also found due to their lack of social interaction. Only 16.9% of students tend to study in a group. In addition, it is also

found that there are only 44 students who can reach the passing grade in the food and beverage service course, and there are 36 students who have low scores and do not reach the passing grade. It indicates that they have low collaboration skills and learning outcomes. It can be a serious problem since they are prepared as competent and potential graduates ready to work in the tourism industry.

Teachers have a significant role in avoiding or solving problems related to the lack of collaboration skills and learning outcomes by implementing an appropriate learning method. Along with the demands of 21st century learning, many innovative teaching methods are proposed to build and develop students' 21st century skills. Project-based learning is an innovative method underlined by a student-centered approach (Gunawan et al., 2017). It is argued that project-based learning innovatively trains students' collaboration skills through the project. It can be conducted through group work or group discussion, where students still have their roles and tasks in finishing the project (Dwi & Sagala, 2019). Students' ability to explore, assess, interpret, and synthesize is also trained through the working project in which those are trained through the way they share and synthesize many perspectives (Fadillah et al., 2021). (Mahasneh & Alwan, 2018) state that project-based learning also influences students' practical skills through their involvement in managing and deciding their actions to finish the project. As the learning method or strategy underlined by student-centered learning, project-based learning provides students a wide chance to explore the information by working collaboratively with their working team in which they can share their thoughts and ideas rationally (Samsudin et al., 2020). Those are perceived as benefits that make many teachers implement this method to build student collaboration.

Many researchers explore the implementation of project-based learning and investigate its effect on students, particularly in vocational education. (F. N. I. Sari et al., 2023) Project-based learning improves students' skills in making four petit in culinary courses. It is continued by the study showing that project-based learning contributes a significant impact on students' psychomotor related to seasoning materials (Putri et al., 2023). Recently, they (Siregar et al., 2024) discover that project-based learning positively improves the creativity of culinary students. Those previous studies show that project-based learning is effective in culinary programs. However, no current study discusses how project-based learning affects students' collaboration skills in culinary programs. It has also been found that the effect of project-based learning on students' learning outcomes in food and beverage service has not been investigated by many researchers. Therefore, the current study intends to investigate the effect of project-based learning on students' collaboration ability and learning outcomes in the restaurant food and service course, particularly in restaurant customs.

2. METHODS

This study adopted a quantitative approach, particularly using a quasi-experimental with a posttest-only control group design. This study's population was second-semester students with a culinary arts concentration in the Family Welfare Education program at Universitas Pendidikan Ganesha, Singaraja, Bali. Eighty students took culinary arts as their concentration. They were selected as the population and research sample at the same time. They were selected using total random sampling, considering the population was less than 100. This meant that total sampling was allowed to select the research sample. The research sample was divided into two main groups: control and experimental, each consisting of 40 students. The data were collected through posttest and questionnaire distribution.

The posttest was conducted for both groups, but the treatment was given differently. The control group was taught by using conventional learning; meanwhile, the experimental group was given a treatment in which the treatment was in the form of project-based learning implementation. The questionnaire was distributed after the test so both groups could learn about their collaboration skills. The research instruments were a questionnaire and a test. The obtained data were analyzed quantitatively through descriptive and inferential statistics. The t-test was conducted as an inferential

statistic with the assistance of SPSS 25. It was conducted to answer the hypotheses of this study, such as 1) there is a significant effect contributed by project-based learning on students' collaboration skills in foods and beverage service, 2) there is a significant effect contributed by project-based learning on students' learning outcomes in foods and beverage service. Meanwhile, a MANOVA analysis was also conducted as an inferential statistic analysis to answer the following hypothesis: 3) project-based learning simultaneously affects students' collaboration skills and learning outcomes in food and beverage service. The prerequisite test was first conducted before the inferential statistics analysis. The prerequisite test was purposed to determine the normality and homogeneity of the obtained data. The normality was obtained from the normality test in which the data were normally distributed when the significant value was more than .05. It also happened for the homogeneity test in which the data were categorized homogeneous when the significant value was .05. The obtained data can be analyzed inferentially when the data had fulfilled the criterion of the prerequisite test.

3. FINDINGS AND DISCUSSIONS

The result of the study reveals three main comparisons, namely 1) the effect of project-based learning and conventional learning model on students' collaboration skills in the restaurant food and service course; 2) the effect of project-based learning and conventional learning model on students' learning outcomes in the restaurant food and service course; and 3) simultaneous effect of project-based learning and conventional learning model on students' collaboration skills and learning outcomes in the restaurant food and service course. The detailed explanations of the findings can be seen in the following description.

Findings

The descriptive statistic is revealed to compare the results between the experimental and control groups, as presented in Table 1.

Table 1. Descriptive Statistic Result

Variable Statistics	Experimental Group		Control Group	
	Collaboration Skills	Learning Outcomes	Collaboration Skills	Learning Outcomes
N	21	21	21	21
Mean	81.62	79.19	74.67	65.71
Median	80.55	77.00	73.76	65.16
Mode	81.21	77.60	74.12	64.80
Standard Deviation	3.83	6.42	4.06	7.41
Minimum	74.00	70.00	67.00	50.00
Maximum	88.00	93	81	80

Table 1 shows the result of the descriptive statistics. The experimental group's mean score for collaboration skills is 81.62, whereas the control group's score is 74.67. Besides, the mean score of the learning outcomes of the experimental group is 79.19, whereas the mean score of the learning outcomes of the control group is 65.71. These mean scores indicate that the experimental group outperforms the control group. This different score was further analyzed for the inferential statistics.

After obtaining the results of descriptive statistics, prerequisite tests are conducted covering normality, homogeneity, and correlation tests between variable bounds. The result of the normality test is presented in Table 2.

Table 2. Data Distribution Normality Test

Variable	Kolmogorov-Smirnov			Information
	Statistics	df	Sig	
Students' collaboration in restaurant food and beverage service course with project-based learning.	0.161	21	0.165	Normal distribution
Student's learning outcomes in restaurant food and beverage service course with project-based learning.	0.118	21	0.200	Normal distribution
Students collaborate in restaurant food and beverage service courses with conventional learning models.	0.126	21	0.200	Normal distribution
Students learning outcomes in restaurant food and beverage service courses with conventional learning models.	0.139	21	0.200	Normal distribution

Table 2 shows the result of K*olmogorov-Smirnov* statistics, namely students' collaboration with project-based learning about 0.165, students' learning outcomes with project-based learning about 0.200, students' collaboration with conventional learning model about 0.200, and student's learning outcomes with conventional learning model about 0.200. These results are over 0.05, indicating all data is normally distributed.

Then, the homogeneity variance test is done as presented in the following Tables 3 and 4.

Table 3. Box'M Test Analysis Results

Box's Test of Equality of Covariance Matrices	
Box's M	0.413
F	0.130
df1	3
df2	288000000
Sig.	0.942

Table 4. Levene's Test Analysis Results

Variable	F	df1	df2	Sig.
Collaboration	0.000	1	40	0.989
Learning outcomes	0.314	1	40	0.578

Table 3 shows that the Sig. of the box's test is 0.942. Next, Table 4 shows that Levene's test is 0.989 for collaboration and 0.578 for learning outcomes. These values from Tables 4 and 5 are over 0.05, indicating the data were homogenous. Furthermore, a correlation test was done to see the correlation between variables, as presented in Table 5 and Table 6.

Table 5. Correlation Test Results Between Bound Variables of Experimental Group

		Learning Outcomes	Collaboration
Learning Outcomes	Pearson Correlation	1	.254
	Sig. (2-tailed)		.267
	N	21	21
Collaboration	Pearson Correlation	.254	1
	Sig. (2-tailed)	.267	
	N	21	21

Table 6. Correlation Test Results Between Bound Variables of Control Group

		Learning Outcomes	Collaboration
Learning Outcomes	Pearson Correlation	1	.312
	Sig. (2-tailed)		.169
	N	21	21
Collaboration	Pearson Correlation	.312	1
	Sig. (2-tailed)	.169	
	N	21	21

Tables 5 and 6 show that the Sig. The value of the experimental group is 0.276, whereas the Sig. The value of the control group is 0.169. These values are over 0.05, indicating no significant correlation between the two bound variables.

After the prerequisite test, a hypothesis test was conducted, as presented in Tables 7 and 8.

Table 7. Pairwise Comparisons

Dependent Variable	(I) MP	(J) MP	Mean Difference (I-J)	t	Hypothesis df	Std. Error	Sig.[b]	95% Confidence Interval for Difference	
								Lower Bound	Upper Bound
Collaboration Skills	Project Based Learning	Conventional Learning	7.600*	2.643	2.000	1.004	.000	5.570	9.629
	Conventional Learning	Project Based Learning	-7.600*	-2.643	2.000	1.004	.000	-9.629	-5.570
Learning Outcomes	Project Based Learning	Conventional Learning	5.316*	4.475	2.000	.862	000	3.573	7.059
	Conventional Learning	Project Based Learning	-5.316*	-4.475	2.000	.862	.000	-7.059	-3.573

Table 7 shows the result of pairwise comparisons. The mean is compared with two different learning models: project-based learning and conventional learning. From the table, the sig. The value is 0.000, which is lower than 0.050. It indicates that the comparison of the mean is significant. It shows that

students taught by project-based learning and those taught by conventional learning significantly differ in mean scores.

Table 8. Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.644	26.616	2.000	39.000	.000
Wilks' lamda	.356	26.616	2.000	39.000	.000
Hotelling's trace	1.806	26.616	2.000	39.000	.000
Roy's largest root	1.806	26.616	2.000	39.000	.000

Table 8 shows the result of the multivariate test. It shows that the F value is 26.616, and the sig value is lower than 0.05. The F values for Pillai's Trace, Wilks' Lamba, Hotelling's Trace, and Roy's Largest Root are significant. It indicates a significant simultaneous effect of collaboration skills and learning outcomes in the restaurant food and service course between students taught by project-based learning and students taught by conventional learning methods.

Discussion

The current study reveals that project-based learning significantly impacts students' collaboration skills. Collaboration skills deal with the ability to work effectively in teams to reach the goal considering each own responsibilities (Sagala et al., 2020). It shows that the mean score of the experimental group is higher than the control group. It indicates that students taught by project-based project learning outperform students taught by conventional learning. This happens due to the characteristics of project-based learning itself. Considering the characteristics, (Farida et al., 2017) add that project-based learning supports the students' collaboration in understanding concepts. It indicates that students can work with their friends to share information, which leads to collaboration among students. In line with this condition, (Sagala et al., 2020) argue that the learning model stage requires students to collaborate in solving problems and reaching the desired goals. It refers to the collaboration during the learning process to find solutions to problems and how to achieve the goals. It is also supported by (Apriliani & Listyani, 2021) The learning model can be designed for group work, allowing students to collaborate in finishing the project. Therefore, project-based learning can improve students' collaboration since they can collaborate in the learning process.

The result of the current study is similar to the previous studies in which project-based learning effectively improves students' collaboration skills. In 2019, (Kurniawati et al., 2019) and (Saenab et al., 2019) reported that project-based learning could improve students' collaboration skills through the project given. The current finding is relevant to the earlier study (Dwi & Sagala, 2019), which found a positive direction between project-based learning implementation and students' collaboration skills. Two years later, researchers (Rasyid & Khoirunnisa, 2021) also reported that collaboration skills are improved by project-based learning. They reported that students were actively involved in working on group assignments, problem-solving, and sharing opinions of other group members. These conditions lead to better collaboration skills for students. Then, in the next year, (Alfaeni et al., 2022) and (Ibrahim & Rashid, 2022) reported a similar result in which project-based learning is effective on students' collaboration skills. This learning method involves students working in groups to build trust with the group members and work collaboratively.

The next findings of the study deal with the effect of project-based learning on students' learning outcomes. There is a difference in the mean score of the experimental and control groups. The experimental group's score outperforms the control group's, indicating that students taught by project-based learning get higher learning outcomes than those taught by conventional learning. The reason

behind better learning outcomes is that project-based learning provides a meaningful experience (Younis et al., 2021). Students are given real-life projects that are familiar to them in real-world situations. Familiarization with real-world problems enables students to solve their daily problems. In addition, it keeps their focus on finishing the project given. It is supported by (Azmi et al., 2022) This learning model provides space for discussion and finding innovative ideas so that the product is new and different from the previous one. Besides, this learning model provides a chance for students to find a solution to the given project (Trisdiono et al., 2019). Students elaborate on their ideas to solve the project given. They enrich themselves with a lot of needed information. In addition, this learning model covers activities to exercise students' thinking processes that (Husna et al., 2019). When students have more time to think about the project, they have some alternatives to be offered to finish their project. They have various options to be used for their projects. In short, project-based learning improves students' learning outcomes due to its provision of meaningful experience, real context learning, and greater opportunity for students to elaborate themselves.

The effect of project-based learning on students' learning outcomes is similar to the previous studies. (Husna et al., 2019) reported that using the learning model gave better learning outcomes than the conventional one. In addition, (Rozal et al., 2021) add that the learning model significantly affects students' learning outcomes regarding their cognitive domain. In the next year, (Prastiya et al., 2023) and (Rafiqa et al., 2023) reported that the learning model had a significant effect on students' learning outcomes. The outcomes are higher after the implementation of project-based learning. The results of the current and previous studies show that the learning model effectively improves students' learning outcomes.

Furthermore, the present study also reveals that providing project-based learning improves collaboration skills and learning outcomes. This result is similar to the study done by (Nuhaa et al., 2020), (Mulyadi et al., 2023), (Mursalim et al., 2023), and (Suaidiah et al., 2024) In which project-based learning significantly affects students' collaborative skills and learning outcomes. It indicates that students can collaborate actively with friends and follow meaningful activities to boost learning outcomes. Their collaboration with their partners or work teams allows them to process and analyze the information they gain from many different perspectives or points of view. It leads them to have collaborative skills, helping them to adjust their learning process and solve the problem (Gusta et al., 2020); (Nemiro, 2020). On the other side, the result of the study is different from a study done by (Sagala et al., 2020) In which project-based learning boots students' collaboration and communication skills. It is revealed that students can improve their collaboration and communication at the same time by the provision of the learning model. When they can collaborate well, they can also increase their communication skills.

4. CONCLUSION

The current study concludes that 1) project-based learning significantly impacts students' collaboration skills; 2) project-based learning significantly impacts students' learning outcomes; and 3) there is a significant simultaneous effect of collaboration skills and learning outcomes in the restaurant food and service course. It shows that the learning model effectively increases students' skills and achievement in culinary arts study programs, particularly in the food and beverage learning process. The results of the present study implicate education in terms of the learning model. Choosing an appropriate learning model positively impacts both skills and achievement. Theoretically, the results also strengthen project-based learning implementation in vocational education, particularly in food and beverage service courses. The current study suggests implementing project-based learning in the learning process to maximize the achievement of learning goals. This study is limited to one of the 6C's of the 21st century skills, so a study of the rest of the skills is highly recommended to be conducted to see the effectiveness of project-based learning in 21st century learning in vocational education. Another

suggestion is also given to the teachers. It is suggested that vocational teachers be more innovative in implementing project-based learning. The innovation can be conducted by assisting the implementation of project-based learning with any other teaching or learning materials and media. The teachers are also able to integrate technology. Therefore, further research is required to understand project-based learning implementation better.

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