

The Role of Gender in Student Engagement: Insights from a Project-Based Learning Experiment

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Abstrak: This study investigates the influence of Project-Based Learning (PjBL) and gender differences on student engagement in learning activities. The research addresses the challenge of passive student participation in conventional teaching methods, which often fail to foster active and meaningful learning. It aims to evaluate the effectiveness of PjBL in enhancing student activeness and examines the role of gender in shaping engagement levels. A quasi-experimental design with a post-test-only control group was employed, involving 64 tenth-grade students from SMAN 1 Lamongan. The students were divided into an experimental

group taught using the PjBL model and a control group taught with conventional methods. Data were collected through observation using a validated Likert-scale questionnaire, and the hypotheses were tested using ANOVA. The findings indicate that PjBL significantly improves student engagement compared to conventional teaching. Moreover, gender differences were evident, with female students displaying higher engagement levels in the PjBL group than male students. These results highlight the potential of PjBL to transform passive learning environments into dynamic and interactive spaces, promoting both physical and psychological participation. The study concludes that PjBL is an effective learning model to enhance student engagement, particularly in diverse classrooms. Female students, in particular, benefit from the collaborative and interactive elements of PjBL. It is recommended that educators adopt PjBL to create inclusive and active learning experiences. Further research should explore its long-term impact and adaptability across different educational levels and subjects.

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INTRODUCTION

The learning process is greatly influenced by the dual roles of teachers as both educators and facilitators, while students serve as implementers and the primary focus of learning activities. Teachers have a crucial position in the world of education, especially in the learning process, where they act as facilitators and leaders in the classroom (Fuadi et al., 2023). As facilitators, teachers are tasked with providing support that makes it easier for students to undergo learning (Afriani et al., 2024). In addition, active learning is an essential condition to be applied. Active learning encourages students to participate directly and reflect on their actions (Fitri et al., 2024). This learning model encourages students to participate in a range of activities that facilitate their access to information from multiple sources (Thurrodliyah & Munandar, 2023). In this context, the role of teachers is very strategic to motivate students, both male and female, to actively learn. According to modern learning theory, teachers are expected to create an active learning environment, so that they play more of a role as facilitators than mere conveyors of information (Hidayati et al., 2022). Therefore, the selection of effective learning strategies in creating an active learning atmosphere is a must.

Active and participatory behaviour of students is the main goal in the learning process. Teachers ability in creating a learning condition that is able to build student activity are the key to opening up opportunities for creating more meaningful learning, where the learning atmosphere feels very strong and intense. Classrooms that can be

interesting spaces, as well as learning that encourages student interactivity and productivity, is one of the main focuses in active learning based education (Akbar et al., 2024). Thus, the learning process, which initially seems difficult and complicated, can turn into easier and more enjoyable when students are actively involved, so that learning goals can be achieved more effectively. Based on a preliminary study conducted on grade X students of SMAN 1 Lamongan, it was found that more than 50% of students in the class showed passive tendencies, both physically and mentally, regardless of gender. Observations also show that conventional learning methods tend not to involve students in active interaction with learning resources. This shows that the learning carried out emphasizes more on knowledge transfer than building understanding constructively.

If learning activities focus on the teacher, then students only play the role of passive listeners and simply do the assigned tasks. In fact, in the learning process there are various types of activities that can increase student involvement, such as reading, discussing, presenting, asking questions, and doing other learning tasks. Learning activities that involve student activity not only make learning more meaningful and varied, but also help convey the material clearly, improve student understanding, and make students play a more active role as learning subjects. The academic achievement of students is significantly affected by their engagement in the learning process, which is recognized as a crucial determinant of educational success (Rahmawati & Yulianti, 2020). In this context, it has been observed that male students generally exhibit higher levels of classroom participation compared to their female counterparts. Male students generally interact more and show active behaviour, while female students tend to be more reserved and less active (Guo et al., 2023). In addition, both male and female students have different reasons for not participating in learning (Rusandi et al., 2022). However, in the context of learning, this activeness should be directed properly in order to encourage the creation of student centered learning.

Utilizing the correct learning strategies can stimulate active learning among students, facilitating engagement for both genders. This strategy plays a role in helping students learn more effectively (Kim et al., 2024). Therefore, appropriate teaching methods are needed to support the process of knowledge transfer (Xu et al., 2024). Student activeness in learning is not only reflected in psychological activities, but also in physical activities. Project Based Learning (PjBL) is recognized as an effective learning model that enhances student participation, and it has been widely implemented in Vocational High Schools (SMK). The PjBL model is often chosen because it is considered effective in supporting practicum learning in vocational schools, which emphasizes communication and collaborative skills. These skills aim to increase students activeness in the learning process (Harvey & Uren, 2019). As is known, learning at vocational schools does not only focus on theory, but also involves practicum activities. This practicum provides potential opportunities for students to actively participate in learning.

Not only male students, female students at the vocational school level also showed active involvement in practicum activities (Vu et al., 2024). Recognizing the substantial potential of the project-based learning model (PjBL) to enhance learning engagement, this aspect serves as the primary rationale for its adoption at the high school level, with the expectation of replicating its beneficial effects on students. This research seeks to investigate the impact of PjBL and gender disparities on student learning engagement. Consequently, the implementation of PjBL at SMAN 1 Lamongan represents a crucial initiative aimed at facilitating and augmenting student learning activity. It is anticipated that through PjBL, students who were previously passive participants in learning will be motivated to engage more actively, both physically and psychologically, thereby enhancing the overall effectiveness of the learning process.

METHOD

This research is a type of quantitative research with a pseudo-experimental method. The experimental design used is a post-test only control group design, where the experimental group is given a specific treatment, and then both groups (experimental and control) are measured through post-test (Martins et al., 2022). The subject of this study involved 64 grade X students at SMAN 1 Lamongan, which were divided into two study groups. The experimental group is students who learn with the Project-Based Learning (PjBL) model, while the control group uses conventional learning methods. Data collection was carried out through a learning activity observation questionnaire with the Likert scale as a measurement instrument. The data analysis technique applied is ANOVA. Indicators of learning activity refer to ten aspects proposed by (Sutrisno, 2023) and (Kanza et al., 2020), including: (1) student activities; (2) student participation; (3) concrete actions in the classroom; (4) student behaviour; (5) the process of knowledge construction; (6) collaboration; (7) group work; (8) learning outcomes; (9) providing feedback; and (10) reflection and thought.

The design of this study uses a 2x2 factorial design (Febriani et al., 2021). There are three variables analyzed in this study, namely the independent variable, the dependent variable, and the moderator variable (Lestari, 2021). The independent variable consists of two learning models (Y), namely the problem-based learning model (Y₁) and the conventional learning model (Y₂). The dependent variable in this study is learning activeness, while the moderator variable is gender (X), namely male (X₁) and female (X₂). In detail, the design of this study can be seen in table 1.

Table 1. Research Design

Gender (X)	Learning Model (Y)	
	Project Based Learning (Y ₁)	Conventional Learning (Y ₂)
Male (X ₁)	T (X ₁ Y ₁)	T (X ₁ Y ₂)
Female (X ₂)	T (X ₂ Y ₁)	T (X ₂ Y ₂)
Σ	T (X ₁ Y ₁) + T (X ₂ Y ₁)	T (X ₁ Y ₂) + T (X ₂ Y ₂)

This data analysis test is based on the following research hypotheses:

Hypothesis 1:

Ho₁ : there is no influence of the PjBL learning model on student activeness learning.

Ha₁ : there is an influence of the PjBL learning model on student activeness learning.

Hypothesis 2:

Ho₂ : there was no effect of gender differences on student activeness learning.

Ha₂ : there is an influence of gender differences on student activeness learning.

Hypothesis 3:

Ho₃ : there is no influence of the PjBL learning model on student activeness learning from the perspective of gender differences.

Ha₃ : there is an influence of the PjBL learning model on student activeness learning from the perspective of gender differences.

RESULT AND DISCUSSION

The data collection technique in this study uses test instruments. Test techniques are used to determine the achievement of learning activeness. The test instrument prepared is in the form of a written description test with a total of 5 questions. The test of the test instruments in this study includes tests of validity, reliability, difficulty of questions, and question differentiation. The results of the validity test can be seen in Table 2.

Table 2. Test of Validity

Item	Test	Result	Conclusion
Q1	Pearson Correlation	,557**	Valid
	Sig. (2-tailed)	,002	
	N	64	
Q2	Pearson Correlation	,637**	Valid
	Sig. (2-tailed)	,000	
	N	64	
Q3	Pearson Correlation	,762**	Valid
	Sig. (2-tailed)	,001	
	N	64	
Q4	Pearson Correlation	,468**	Valid
	Sig. (2-tailed)	,002	
	N	64	
Q5	Pearson Correlation	,598**	Valid
	Sig. (2-tailed)	,000	
	N	64	

Based on the validity test, the five question instruments were declared valid with a value greater than T table (0,204). Furthermore, the results of the question reliability test can be seen in Table 3.

Table 3. Test of Reliability

Cronbachs Alpha	N of Items	Conclusion
,739	5	Reliable

The results of the reliability test showed that the five questions were declared reliable with a value of 0,739. Then, the results of the difficulty test can be seen in Table 4.

Table 4. Test of Difficulty Level

Item	Q1	Q2	Q3	Q4	Q5
Valid	64	64	64	64	64
Missing	0	0	0	0	0
Mean	0,57	0,11	0,82	0,90	0,78
Category	Medium	High	Low	Low	Low

The results of the discriminating difficulty test showed that the 3 questions had low differentiation at numbers 3, 4, and 5. Meanwhile, question number 2 is categorized as high, and question number 1 is categorized as sufficient. Furthermore, the results of the question power differentiation test can be seen in Table 5.

Table 5. Test of Differentiated

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item Total Correlation	Category
Q1	9,78	10,47	,579	Good
Q2	9,69	10,28	,446	Good
Q3	10,11	10,53	,558	Good
Q4	10,83	9,97	,422	Good
Q5	10,13	9,85	,687	Good

Based on the results of the differentiating power test, the five questions are categorized in the good category. This indicates that each question has an adequate ability to distinguish between students who have a high understanding or ability and students who have a low understanding or ability of the material being tested. These results reinforce the reliability of the questions in providing accurate and valid evaluation results.

After being given different treatment to the two groups, this study compared the use of the Project-Based Learning (PjBL) learning model in the experimental group with conventional learning in the control group can be seen in Table 6 and Figure 1. Data analysis was carried out using ANOVA, but previously a prerequisite test was carried out which included normality and homogeneity tests.

Table 6. Student Activeness Learning

Expeiremental Group				Control Group			
No.	Male	No.	Female	No.	Male	No.	Female
1.	86	1.	87	1.	81	1.	75
2.	84	2.	75	2.	85	2.	76
3.	72	3.	89	3.	81	3.	78
4.	87	4.	91	4.	67	4.	75
5.	73	5.	81	5.	85	5.	78
6.	76	6.	78	6.	86	6.	74
7.	73	7.	86	7.	74	7.	74
8.	71	8.	84	8.	76	8.	80
9.	91	9.	88	9.	77	9.	76
10.	87	10.	85	10.	68	10.	76
11.	79	11.	72	11.	88	11.	80
12.	79	12.	90	12.	84	12.	79
13.	85	13.	69	13.	76	13.	76
14.	87	14.	93	14.	69	14.	79
15.	72	15.	94	15.	81	15.	74
16.	84			16.	68		
17.	82			17.	81		
\bar{x}	80,47	\bar{x}	84,13	\bar{x}	78,05	\bar{x}	76,67

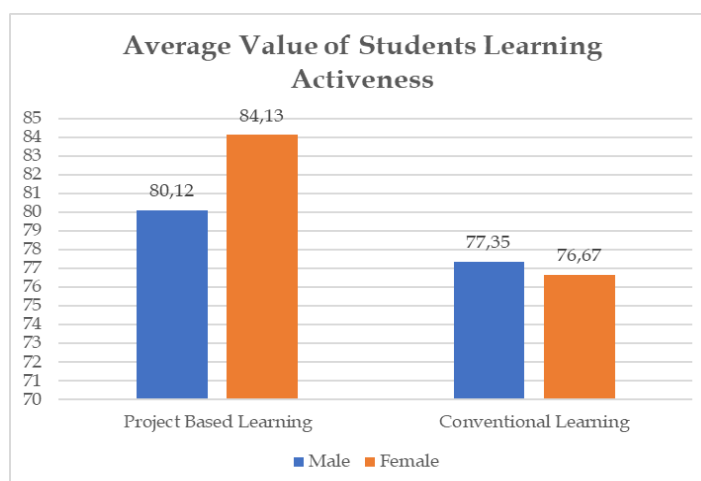


Figure 1. Average Value of Students Learning Activeness

The normality test aims to ensure that the data is normally distributed, while the homogeneity test aims to check the uniformity of variance between data groups (Hasan et al., 2023). The normality test was carried out using Kolmogorov-Smirnov, with the data criteria declared normal if the Sig. > value was 0,05. Meanwhile, the homogeneity test uses the Levene test, with the data criteria declared homogeneous if the value of Sig. > 0,05. The results of the normality test are presented in Table 7, and the results of the homogeneity test are shown in Table 8.

Table 7. Normality Test Result

Kolmogorov-Smirnov			
Learning Model	Statistic	df	Sig.
Project Based Learning	0,133	32	0,157
Conventional Learning	0,132	32	0,171

Table 8. Homogeneity Test Result

F	df1	df2	Sig.
,724	1	62	,398

Based on the results of the normality test in Table 7, the group that learned with PjBL showed a Sig. value of 0,157 > 0,050 in the Kolmogorov-Smirnov test and the group that learned by conventional methods obtained Sig. values of 0,171 > 0,050 on the Kolmogorov-Smirnov test. The results of the homogeneity test (Table 8) show that the Levene test value is 0,398, which means that the data is normally distributed and homogeneous. After that, hypothesis tests were carried out using ANOVA, with the results presented in Table 11.

Table 9. Mean Score by Learning Model

Learning Model	Mean	Std. Error	95% Confidence Interval Mean	
			Lower Bound	Upper Bound
Project Based Learning	82,12	0,960	80,20	84,04
Conventional Learning	77,36	0,960	75,44	79,28

The results of the calculation in Table 9 show the average student learning activity based on each learning strategy. The PjBL group obtained an average activity score of 82,12, while the conventional group obtained an average score of 77,36. These results show that students who learn with PjBL have a higher learning drive compared to students who learn with conventional methods.

Table 10. Mean Score by Gender

Learning Model	Gender	Mean	Std. Deviation	N
Project Based Learning	Male	80,12	2,759	17
	Female	84,13	7,633	15
	Total	82,00	5,864	32
Conventional Learning	Male	78,06	6,896	17
	Female	76,67	2,160	15
	Total	77,41	5,211	32
Total	Male	79,09	5,276	34
	Female	80,40	6,693	30
	Total	79,70	5,970	64

In Table 10, the calculation results show a comparison of students learning activity based on gender. The group of male students who studied with PjBL had an average score of 80,12, while the group of female students had an average score of 84,13. For the group that is studied conventionally, the average activity score of male students is 78,06, while female students are 76,67. These results show that in conventional learning, male students are more active than female students, but in the application of PjBL, female students have a higher learning drive than male students.

Table 11. Two-Way ANOVA Test Results

Source	Type III Sum of Square	df	Mean Square	F	Sig.
Corrected Model	481,587 ^a	3	160,529	5,461	,002
Intercept	405394,174	1	405394,174	13790,696	,000
Learning Model	361,522	1	361,522	12,298	,001
Gender	27,424	1	27,424	,933	,038
Learning Model * Gender	116,522	1	116,522	3,964	,026
Error	1763,773	60	29,396		
Total	408811,000	64			
Corrected Total	2245,359	63			

Based on the results of hypothesis test using ANOVA shown in Table 11, the analysis of the effect of project-based learning (PjBL) model on students learning activeness shows a significance value of $0,001 < 0,05$. This means that H_{a1} is accepted and H_{o1} is rejected, which indicates that the PjBL model has an effect on student learning activeness. Furthermore, the analysis of the effect of gender on student learning activeness resulted in a significance value of $0,038 < 0,05$, which indicates H_{a2} is accepted and H_{o2} is rejected. This indicates that there is an effect of gender on student learning activeness. For the effect of the PjBL model on student learning activeness by considering gender differences, the significance value is $0,026 < 0,05$, which indicates H_{a3} is accepted and H_{o3} is rejected. This means that there is an effect of the PjBL model on student learning activeness in the context of gender differences.

According on the teaching modules that have been created, the ideal goal to be achieved is to create a learning atmosphere that is able to encourage student involvement and active participation in the learning process. However, practice in SMAN 1 Lamongan especially in grade X, learning still faces the fact that students tend to be passive. This shows that the level of student learning activity is still low, so that learning effectiveness is difficult to achieve. One of the factors that plays a role in this situation is a learning strategy that does not suit the needs of students. The lack of student activity in learning reflects the existence of this discrepancy (Akbar et al., 2024). Therefore, the research was carried out by applying a project-based learning model Project-Based Learning (PjBL) to meet the learning needs of students. This study involved two groups, namely the experimental group that was given learning using PjBL, and the control group that continued to receive conventional learning. The conventional learning method here refers to a common approach that is often applied in related institutions, where teachers deliver the material, while students listen, take notes, and do assignments as usual (Kanza et al., 2020).

Different from conventional methods, the Project Based Learning (PjBL) learning model puts students at the center of the learning process. In this approach, students are faced with a problem or topic that they must study and solve collaboratively with their classmates. Through PjBL, collaboration between students can be developed and improved (Farrow et al., 2024). Each group of students is tasked with producing collaborative work as a result of the learning process. This learning lasted for four meetings.

At the first meeting, students are introduced to the topic or problem, form a team, and begin to design a problem-solving strategy. In the second meeting, each team begins to search and gather the necessary materials and information to work on the project. Furthermore, in the third meeting, students begin to work on the project collaboratively until the final product is produced. At the last meeting, the resulting work was presented, followed by assessment and feedback. Research shows that the

implementation of PjBL significantly increases students learning activity compared to traditional learning methods. In addition, the average learning activity of female students is higher than that of male students, in line with the findings Athifah & Khusna (2022) which shows that in terms of motivation, emotional intelligence, and interest in learning, female students show better performance than male students.

Another study by Febrianti et al. (2023) also found that in terms of literacy, female students have better abilities than male students. Further hypothesis tests indicate that there is an influence between the application of PjBL and gender on students learning activity. This is in line with the results of research by Azzahra, Arsih, & Alberida (2023), which show that PjBL has a positive impact on student learning activity. Project-based learning is a significant collaborative form in supporting student capacity development (Susanti et al., 2022). This model encourages students to be actively involved in group assignments, contribute to discussions, participate in the presentation of group results, and be open to ideas from other groups (Prajoko et al., 2023).

CONCLUSION

This study demonstrates that the Project-Based Learning (PjBL) model effectively enhances student activeness compared to conventional teaching methods. A distinctive finding is the interaction between gender and learning models: female students exhibited higher levels of activeness under the PjBL approach, whereas male students were more active in conventional settings. This unique insight into gender-specific tendencies contributes to understanding how tailored learning strategies can optimize student engagement.

The research makes valuable contributions to education by confirming the effectiveness of PjBL in fostering active learning. Beyond its pedagogical benefits, the study underscores the importance of gender-sensitive approaches in designing learning strategies. By highlighting the role of collaboration and problem-solving in enhancing engagement, it offers practical guidance for educators aiming to create dynamic and inclusive learning environments.

Despite these contributions, the study is limited by its focus on a single school and relatively small sample size, potentially affecting the generalizability of its findings. Future research should involve larger and more diverse populations, as well as explore PjBL's applicability across various educational levels and disciplines. Additionally, examining the integration of PjBL with digital tools or its long-term effects on critical thinking and self-efficacy could provide deeper insights. Addressing these aspects will further validate and expand upon the study's results, paving the way for more impactful educational practices.

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