The Relationship Between Learning Motivation and Student Engagement in Project-Based Economics Learning

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Abstract:
Learning motivation plays a crucial role in fostering students' active engagement throughout the instructional process. Economics instruction on the topic of wages in Grade XI at SMAN 2 Mranggen demonstrates low levels of student engagement when learning is conducted solely through theoretical, teacher-centered approaches. Students require an instructional model that is capable of simultaneously enhancing learning motivation and promoting active participation. This study aims to analyze the relationship between learning motivation and students' learning engagement in Project-Based Learning (PjBL). A quantitative approach was employed, utilizing descriptive analysis and canonical correlation analysis. The results of the study indicate a strong and significant relationship between learning motivation and students' learning engagement, as reflected in the first canonical function, with a correlation value of 0.839. Multivariate analysis revealed significant results; however, partial correlations between individual variables did not demonstrate strong statistical significance. The learning motivation indicators showing the strongest relationships were perseverance in completing tasks and the ability to seek and solve problems. The most prominent indicators of learning engagement were listening activities and emotional activities. The results of the descriptive analysis using word count indicate that students' learning experiences tend to be positive, as reflected in several key terms, namely: feeling happy, enjoyable, increased knowledge, and improved public speaking skills. This study contributes to the enrichment of research on the relationship between learning motivation and learning engagement and serves as a foundation for teachers in designing innovative, contextual, and engagement-oriented economics instruction.

Keywords: Learning engagement; Learning motivation; Economics education; Project-Based Learning; Canonical correlation

Introduction

Economics instruction at the secondary school level plays an important role in equipping students with an understanding of economic concepts relevant to everyday life, one of which is the topic of wages. The topic of wages is inherently contextual, as it is directly related to the labor market and workers' welfare. Therefore, this topic should ideally be delivered through instructional approaches that encourage students' active

involvement in analyzing real-world problems in their surroundings. However, in practice, economics instruction is still frequently dominated by conventional, teacher-centered approaches (Sari et al., 2024). Such approaches limit students' opportunities to engage in discussion, think critically, and connect economic concepts with their daily experiences. As a result, students tend to be less actively involved in the learning process, and instructional outcomes become suboptimal in achieving the intended objectives.

The need to implement more innovative instructional approaches in economics education can be addressed through learning models that emphasize interaction and student engagement. This is based on classroom observation results, which indicate that students tend to be less active when learning is conducted passively. In the study by Ester et al. (2024), four forms of educational interaction are identified: interaction between students and teachers, among students, between students and learning resources, and between students and their environment. These forms of interaction indicate that the learning process is not unidirectional but instead involves students' active participation. This perspective aligns with constructivist learning theory, which views learning as an active process undertaken by learners. Accordingly, effective instruction requires students' active involvement in constructing understanding through diverse forms of interaction.

In the instructional process, student engagement plays a crucial role in facilitating the achievement of learning objectives (Nuha et al., 2022). Engagement indicates that students are directly involved in learning, processing information through cognitive activities such as analyzing, synthesizing, and reflecting (Katsarov et al., 2022). From this perspective, learners are viewed as active and constructive individuals. Therefore, teachers must foster and design learning environments that provide opportunities for students to participate actively.

Learning motivation refers to the driving force behind students' learning engagement (Manik et al., 2024). Without encouragement, stimulation, or motivation, the learning process will struggle to achieve its intended goals (Wahyuni et al., 2020). Cognitive Evaluation Theory (Ryan & Deci, 1985) explains that motivation emerges when students engage in learning activities because they experience enjoyment and satisfaction from the activity itself, particularly when they feel competent and are granted autonomy in learning. Based on this perspective, learning motivation in this study is conceptualized as an internal drive that encourages students to remain actively engaged in learning without reliance on external pressure or rewards. Previous studies have shown a positive relationship between learning motivation and student engagement. However, most of these studies have been conducted within conventional instructional settings or have positioned learning motivation as a dependent variable.

Based on observations and interviews conducted on 19 August 2025 with the Grade XI economics teacher at SMAN 2 Mranggen, it was found that economics instruction, particularly on the

topic of wages, still faces several challenges. The topic of wages is perceived by students as abstract and difficult to understand when delivered solely through theoretical explanations. This condition is supported by the findings of (Yasin et al., 2023), who state that contextual materials are less effective when taught using conventional instructional models. Furthermore, instructional practices tend to emphasize rote learning and do not adequately support the development of practical skills, values, and learning attitudes. Precious & Feyisetan (2020) also explain that teacher-centered instruction results in low student engagement and limited development of students' potential.

In line with these conditions, Wicaksono et al. (2024) report that the majority of students at SMAN 2 Mranggen still experience learning-related difficulties. These include challenges in obtaining information about effective and efficient study strategies (57.3%), preparing for tests or examinations (55.3%), and declining learning enthusiasm (58.4%). These findings indicate that students continue to face obstacles in managing their own learning processes, which in turn affects their level of engagement in classroom instruction.

Additionally, classroom observations revealed that students' enthusiasm increased when economics instruction involved activity-based tasks, such as group discussions, outdoor learning activities, the creation of micro, small, and medium enterprise (MSME) products, interview activities, and direct field practice. Ideal instructional processes create creative conditions in which students are required to be active while teachers act as facilitators (Mackatiani et al., 2018). Students' involvement in these activities suggests that more participatory instructional models have the potential to address the issue of low engagement in economics learning.

To address issues related to student engagement, SMAN 2 Mranggen has implemented Project-Based Learning (PjBL). Nevertheless, the implementation of PjBL still faces several challenges, including the limited active participation of some students in group work, which affects initiative and leads to unequal contributions. In addition, inadequate time management has resulted in delays in project completion, compounded by students' lack of confidence when presenting project outcomes due to perceptions that their work was not optimal. Moreover, the diversity of students' skills means that PjBL has not yet fully engaged all students according to their respective abilities and potentials.

Previous research has also identified challenges associated with PjBL. Awad & Elhassan (2025) note that difficulties in implementing PjBL include teachers' challenges in applying the model, variations in students' motivation levels, differences in learning readiness, and limited resources such as adequate infrastructure. Similarly, Warman et al. (2024) explain that the main issues in PjBL include unequal student contributions in group work, limited time for task completion, student engagement and motivation challenges, and classroom management difficulties due to the open-ended nature of project tasks.

Project-Based Learning has the potential to enhance student engagement; however, its implementation often encounters several obstacles. One challenge is that not all students possess equal skills or readiness for collaborative project tasks, which can hinder coordination among group members and time management, thereby affecting the quality of project outcomes (Hussein, 2021). This variation in students' abilities within the context of PjBL refers to differences in levels of knowledge, motivation, skills, interests, learning styles, and experiential backgrounds that influence how students understand, process, and complete projects (Vidergor, 2022). Within project-based learning, the issues described above provide the foundation for this study to design tasks with flexible roles, encourage student motivation, enhance engagement and self-confidence, and provide opportunities for each student to contribute according to their abilities and potential.

Based on these considerations, a more in-depth examination of the relationship between learning motivation and student engagement in Project-Based Learning (PjBL) is needed. Studies that specifically investigate the relationship between learning motivation and student engagement within the context of PjBL, particularly in economics education, remain limited. Although numerous studies have explored PjBL, most have primarily focused on learning outcomes, academic achievement, or critical thinking skills, and have not sufficiently examined how internal factors, such as learning motivation, contribute to fostering student engagement during the learning process. In addition, many existing studies have been conducted in subjects other than economics and have not specifically addressed contextual topics such as wages, despite their close relevance to students' everyday lives. Furthermore, the integration of instructional media, such as video, within the PjBL framework as a means to strengthen the relationship between learning motivation and student engagement has rarely been examined. Therefore, this study aims to analyze the relationship between learning motivation and student engagement in video-assisted Project-Based Learning in economics instruction on the topic of wages.

In response to this research gap, this study not only seeks to determine whether a relationship exists between learning motivation and student engagement but also to identify the level of students' learning motivation within this instructional context. The study seeks to explore how students' learning motivation emerges within the project-based learning process and how such motivation relates to their engagement during instruction. This study aims to analyze the relationship between learning motivation and student engagement in video-assisted Project-Based Learning in economics instruction on the topic of wages, which has not previously been examined. Theoretically, this research is expected to enrich the body of knowledge regarding the role of learning motivation in project-based economics instruction. Practically, the findings are anticipated to serve as a foundation for teachers in designing more innovative, contextual, and engagement-oriented economics instruction, particularly for Grade XI at SMAN 2 Mranggen.

Literature Review

Learning engagement refers to a condition in which students consciously involve all aspects of themselves—physically, emotionally, and cognitively—during the learning process (Wong & Liem, 2022). Students are considered engaged when behavioral characteristics are observed, such as frequently asking questions to teachers or peers, willingly completing assigned tasks, being able to answer questions, demonstrating enthusiasm when given learning tasks, and similar behaviors. Numerous studies have shown that the implementation of Project-Based Learning (PjBL) has a positive impact on student engagement. For example, Wicaksono et al. (2024) concluded that classes employing the PjBL model demonstrated increased student engagement compared to conventional instructional methods, as reflected in higher levels of oral, mental, and emotional activities during learning. This concept aligns with constructivist theory, which emphasizes that effective learning occurs when students actively construct knowledge through social interaction and direct experience.

Paul B. Diedrich, as cited in Sardiman A.M. (2014), identifies the following indicators of student engagement: (1) visual activities, (2) oral activities, (3) listening activities, (4) writing activities, (5) emotional activities, (6) motor activities, and (7) mental activities. These indicators demonstrate that learning engagement is measured through students' physical involvement as well as interconnected cognitive, affective, and psychomotor dimensions.

Learning motivation refers to internal and external drives within an individual that encourage, direct, and sustain the desire to learn in order to achieve specific educational goals (Manik et al., 2024). Cognitive Evaluation Theory (Ryan & Deci, 1985) explains intrinsic motivation as the drive to engage in activities due to the satisfaction derived from the activity itself, particularly when individuals feel competent and are granted autonomy in learning. In the instructional context, intrinsic motivation is reflected in perseverance in completing tasks, resilience in facing difficulties, interest in learning-related problems, enjoyment of working independently, the ability to defend one's opinions, and enjoyment in seeking and solving problems.

Gan et al. (2023) describe intrinsic motivation as a learning drive originating from within the individual, such as interest, curiosity, and personal satisfaction in understanding instructional material. In contrast, extrinsic motivation refers to learning drives influenced by external factors, such as academic grades, rewards, praise, social demands, or expectations from the surrounding environment (Xu, 2025). Although extrinsic motivation may not always be long-lasting, it still plays a role in encouraging learning, particularly within formal educational contexts. The greater the feedback individuals receive, the stronger their motivation to learn becomes (Ridhuan et al., 2025). In Line with this, Sardiman A.M (2011), classifies motivation into intrinsic and extrinsic types, with the following indicators: (1) perseverance in completing tasks, (2) resilience in facing difficulties, (3) demonstrating

interest in various learning problems, (4) enjoyment of working independently, (5) ability to defend one's opinions, and (6) enjoyment in seeking and solving problems.

As an instructional model, PjBL can strengthen student engagement in economics learning and facilitate the development of 21st-century skills such as critical thinking, collaboration, and creativity, all of which are closely associated with learning motivation and engagement. This finding is particularly relevant when applied to complex economic topics such as wages, which require analytical skills and deep conceptual understanding, while rendering learning more applicable and contextual (Julita & Armiati, 2025). The indicators of successful implementation of the PjBL model include increased learning motivation, the application of theory into real-world (contextual) practice, and students' readiness to face the workforce with holistic competencies. However, improvements in learning engagement within PjBL do not occur automatically; rather, they are influenced by students' internal factors, particularly learning motivation.

Constructivist learning theory developed by Jean Piaget, learning is viewed as an active process undertaken by students. Therefore, effective instruction requires students' active involvement in constructing understanding through various forms of interaction (Erawati & Adnyana, 2024). Thus, effective learning requires students to be actively engaged in constructing understanding through various forms of interaction. Pratiwi et al. (2023), through a review of 36 articles, found that PjBL effectively enhances learning motivation and student engagement in the context of secondary-level economics education. These findings support the use of PjBL as an effective pedagogical approach for improving the quality of the learning process in economics.

In addition, inconsistent findings reported by Rizki et al. (2025) indicates that the implementation of Project-Based Learning (PjBL) was categorized as high, and students' learning motivation was also classified as high. However, the results of the Pearson correlation test revealed a weak and non-significant positive relationship between the two variables ($r = 0.359$; $p > 0.05$). These findings suggest that the implementation of PjBL does not directly enhance students' learning motivation, implying that other factors beyond the instructional model may exert a stronger influence and therefore require further investigation. Therefore, a more critical examination is needed to understand how learning motivation contributes to fostering students' learning engagement within the context of PjBL, so that the relationship between these variables can be explained more comprehensively.

Research Hypotesis

The Relationship Between Learning Motivation and Student Engagement

From a constructivist perspective, students' active engagement is the result of an internal drive to explore and construct knowledge. Intan & Gunawan (2018), through quantitative research,

demonstrated that learning motivation has a positive and significant effect on student engagement. This finding is consistent with Nuha et al. (2022), who reported that learning motivation and the learning environment simultaneously play a role in stimulating student engagement. From the perspective of model effectiveness, Zhang & Ma (2023) showed that the PjBL model specifically enhances student engagement through project activities, discussions, and presentations.

Furthermore, the relationship between motivation and engagement is supported by Srichinda et al. (2026), who stated that active learning not only increases motivation but also enhances student engagement from emotional, behavioral, and cognitive perspectives. This finding is reinforced by Alavian (2026), who found that the implementation of active learning significantly increases active participation and reflective discussion. Quantitatively, (Kamal & Khaidzir, 2026) further strengthened this foundation by demonstrating a strong and significant positive relationship between motivation and classroom engagement. The consistency of these findings indicates that learning motivation plays a significant role in fostering student engagement, although the strength of the relationship may vary depending on the learning context employed.

Learning motivation does not merely generate the desire to learn but also serves as a catalyst for individuals to become actively and consistently involved in the learning process (Fakhri et al., 2023). Moreover, the relationship between learning motivation and student engagement has been supported by several studies. Research by (Fakhri et al., 2023) demonstrated a positive and significant relationship between learning motivation and student engagement, indicating that students with higher motivation tend to be more active in learning activities. This finding is further reinforced by (Gusti & Ning, 2025), who reported that learning motivation has a strong relationship with student engagement in participating in instruction, particularly in terms of participation and involvement during the teaching and learning process.

H_1: There is a significant relationship between learning motivation and student engagement in the implementation of the Project-Based Learning (PjBL) model in economics instruction on the topic of wages at the senior high school level.

Based on the theoretical foundations and previous research findings, this study proposes the following conceptual framework:

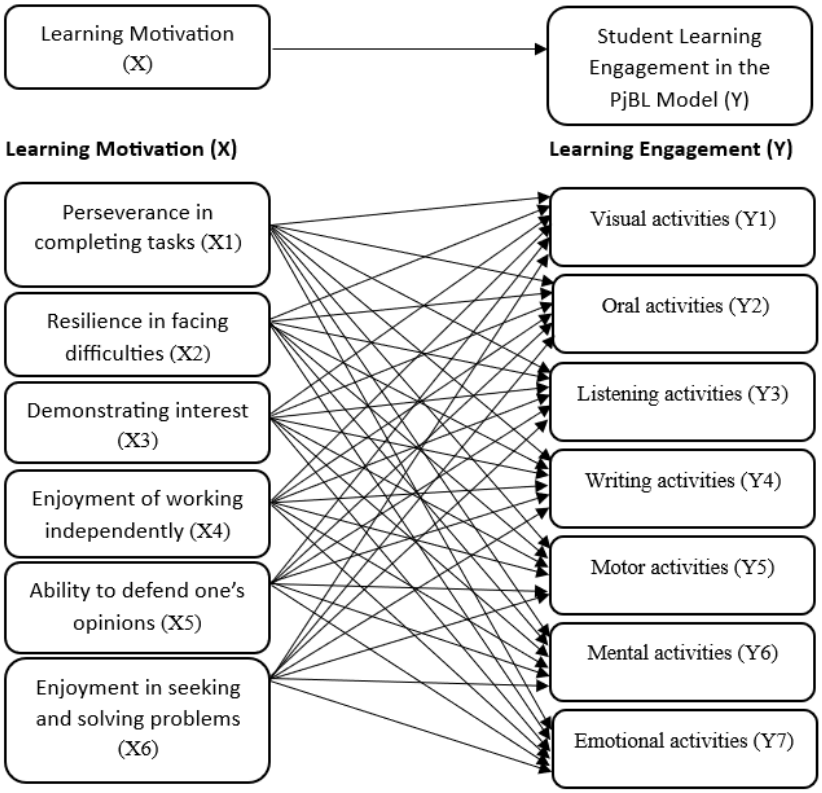

Figure 1. Research Framework Canonical Correlation between Learning Motivation and Learning Engagement

Research Methodology

This study employs a quantitative approach with descriptive analysis. Quantitative data are collected and analyzed in numerical form, and the results are then interpreted to achieve the research objectives. According to Creswell & Creswell. (2017), quantitative methods allow researchers to make objective assessments without being influenced by personal judgments or biases. In addition, this study utilizes a descriptive analytical method using word count to summarize students' perceptions without applying any treatment or manipulation to the research variables.

The types of data used are primary and secondary data. To obtain primary data for this study, the author employed a questionnaire as the main instrument, along with interviews, observations, and documentation such as modules and student worksheets as supporting data to gather information related to students' learning motivation and engagement. The data used is cross-sectional data, as it was collected from many respondents at the same period of time. All respondents completed a questionnaire using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), which was developed based on the indicators of the research variables. The learning motivation variable was constructed based on the concept of intrinsic motivation adapted from Sardiman A.M (2011), while the learning engagement variable referred to the indicators proposed by Diedrich as cited in Sardiman

A.M. (2014). Prior to its use, the instrument underwent validity and reliability testing to ensure its appropriateness for this study.

The population in this study consisted of all 11th grade students at SMAN 2 Mranggen who took economics classes on wages, comprising 176 students divided into five classes, namely 11-4, 11-8, 11-9, 11-10, and 11-11. From this population, 65 students were selected as respondents using simple random sampling so that each student had an equal chance of becoming a respondent.

After the data was collected, all respondents' answers were summarized and processed using STATA software version 17. Data analysis was conducted quantitatively using Canonical Correlation Analysis (CCA) to determine the pattern of the relationship between learning motivation and student learning engagement. The use of Canonical Correlation Analysis (CCA) was selected because this study involves more than one indicator for each variable, allowing for the simultaneous analysis of relationships between two sets of variables. In addition to statistical analysis, this study also employs a descriptive analysis in the form of word count on students' responses. This analysis is conducted to identify frequently occurring words and to support the interpretation of the statistical findings.

In this study, the learning process was conducted using a Project-Based Learning (PjBL) model supported by video on the topic of wages. The implementation of PjBL followed several stages: (1) defining the fundamental question through the presentation of an interview video related to wages and workers, (2) students planning the project, (3) developing a project schedule, (4) implementing and monitoring the project, (5) presenting the project outcomes, and (6) evaluating both the process and the learning outcomes. The use of video in the initial stage of learning aimed to provide a contextual stimulus and to help students understand the problem more concretely, thereby enhancing their motivation and engagement in the learning process.

Results and Discussions

Descriptive Analysis Results

Table 1. Descriptive Statistics Results

	N	Minimum	Maximum	Mean	Std. Deviation
X	65	42	70	56,43	6,21
Y	65	39	65	52,29	6,82
Valid N (listwise)	65				

Based on the results of descriptive statistical analysis in Table 1, it is known that student learning motivation (X), measured through the total questionnaire score, has an average value of 56.43 with a standard deviation of 6.22. The minimum score obtained by students is 42, while the maximum score reaches 70, indicating a variation in the level of student learning motivation in participating in

economics lessons on wages. This score range indicates that student learning motivation is in the moderate category, although there are differences in motivation levels among students. Meanwhile, student learning engagement (Y) showed an average value of 52.29 with a standard deviation of 6.82, as well as a minimum value of 39 and a maximum of 65. These results illustrate that student learning engagement tends to be in the moderate to high category, with variations in student participation levels during the learning process. The variation in engagement scores shows that not all students show the same level of engagement in video-assisted Project-Based Learning. In general, the results of this descriptive statistical analysis provide an initial overview of the motivation and learning engagement of students in video-based Project-Based Learning on wages, making it worthy of further analysis.

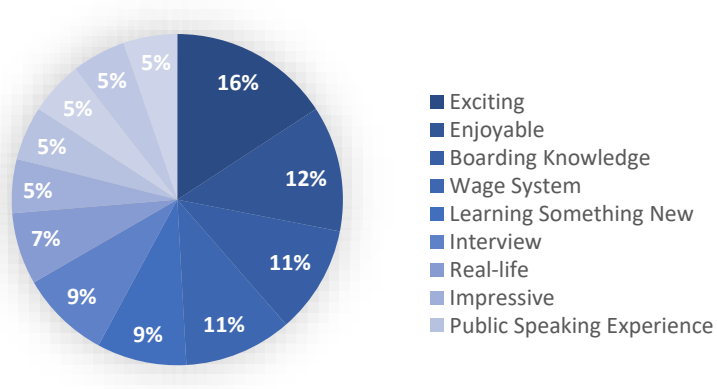

Figure 2. Word Count of Student Perceptions

Furthermore, descriptive analysis using word count aims to describe students' impressions and perceptions of the application of learning during the PjBL process. This data was collected in the form of open-ended answers from students that reflected their learning experiences, understanding of the material, and feelings during the learning activities. Students' answers were then analyzed by identifying the words or phrases that appeared most frequently in their responses. The dominant keywords were used to represent the aspects of learning that students felt most strongly about, particularly those related to learning motivation, such as enjoyment, interest, and encouragement to learn, as well as learning engagement, such as involvement in interviews, courage to communicate, and participation in making interview vlog videos.

Based on the word count results, the keywords “exciting” (16%), “enjoyable (12%), and “Impressive” (5%) were the most dominant words that appeared in the students' responses. These keywords indicate that Project-Based Learning (PjBL) economics learning through vlog video assignments provides a positive learning experience. This condition indicates that the students' affective aspects are well developed, which contributes to increased learning motivation and student engagement during the learning process. In addition, the keywords “*boarding knowledge*” (11%) and

"*learned something new*" (9%) also frequently appeared in the students' answers. This shows that students felt an increase in their understanding of the wage system material, especially through the experience of direct interviews with informants. This contextual learning helps students relate economic concepts to real-life situations, thereby encouraging student activity in understanding the material.

The keywords "real life" (5%) accompanied by 'courage' and "public speaking experience" (5%) indicate that the vlog video project successfully engaged students actively in the learning process. Students felt that they were able to practice their public speaking and courage skills, thereby addressing the PjBL issue of students' lack of confidence. These findings show that PjBL-based economic learning is able to create student motivation and engagement through in-depth learning experiences.

Validity and Reliability Test

Table 2. Results of the Validity and Reliability Test for Learning Motivation (X) and Learning Engagement (Y)

(X)	r-calculated	r-table	alpha	(Y)	r-calculated	r-table	alpha
X1	0.6782	0.2441	0.9000	Y1	0.5634	0.2441	0.8521
X2	0.7497	0.2441	0.8966	Y2	0.7033	0.2441	0.8435
X3	0.6737	0.2441	0.9010	Y3	0.3882	0.2441	0.8607
X4	0.6526	0.2441	0.9011	Y4	0.4312	0.2441	0.8586
X5	0.6826	0.2441	0.9001	Y5	0.7468	0.2441	0.8421
X6	0.7635	0.2441	0.8964	Y6	0.5189	0.2441	0.8543
X7	0.5394	0.2441	0.9056	Y7	0.5880	0.2441	0.8511
X8	0.5201	0.2441	0.9065	Y8	0.7223	0.2441	0.8422
X9	0.7682	0.2441	0.8957	Y9	0.5117	0.2441	0.8559
X10	0.7134	0.2441	0.8994	Y10	0.5254	0.2441	0.8542
X11	0.6985	0.2441	0.8994	Y11	0.7096	0.2441	0.8435
X12	0.6768	0.2441	0.9004	Y12	0.6456	0.2441	0.8482
X13	0.8090	0.2441	0.8933	Y13	0.5867	0.2441	0.8559
				Y14	0.6859	0.2441	0.8448

Based on the results of the validity test using the Corrected Item–Total Correlation method, all items in both the learning motivation (X) and learning engagement (Y) variables obtained calculated r-values exceeding the critical r-table value (0.2441). Therefore, all items for both variables were deemed valid and appropriate for use as research instruments.

Furthermore, the reliability test results indicate that the Cronbach's Alpha coefficient for the learning motivation variable is 0.8599, while the coefficient for the learning engagement variable is

0.9068. Both values exceed the minimum threshold of 0.70, indicating that the instruments for both variables are reliable and demonstrate a very high level of internal consistency.

Multivariate Normality Test

Table 3. Multivariate Normality Test

Multivariate Normality Test	Correlation Coefficient	Sig.
Mahalanobis Distance - Qi	0.992	0.000

In the procedure for conducting Canonical Correlation Analysis (CCA), a multivariate normality test was first performed to ensure that the data were normally distributed. In this test, multivariate normality was represented by the relationship between the Mahalanobis Distance and the Chi-Square quantiles, reflecting all variables simultaneously.

The results indicated a Pearson correlation coefficient of 0.992 with a significance level of 0.000, demonstrating a very strong and statistically significant relationship. Visual inspection further confirmed these findings, as illustrated in Figure 2, where the red plot points align along the diagonal line, indicating that the assumption of multivariate normality was satisfied.

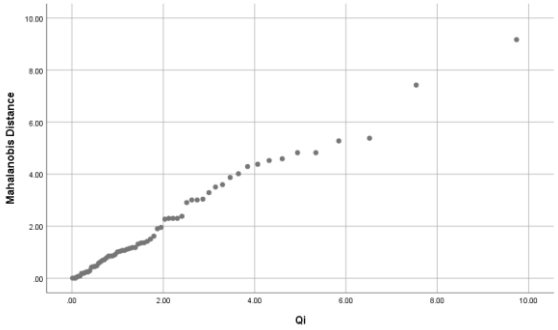

Figure 3. Normality Test Scatter Plot Results

Linearity Test

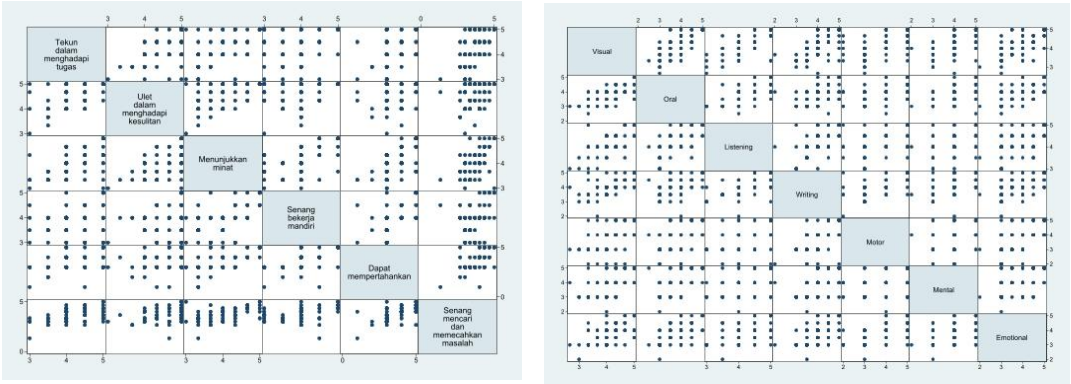

Figure 4. Linearity Test Scatter Plot Results

The linearity test was conducted using a scatterplot between the learning motivation and learning engagement variables, with the addition of a trend line (fit line). The resulting graph indicates

that the distribution of data points follows a linear pattern and does not form any specific curvilinear shape. Therefore, the relationship between the variables satisfies the assumption of linearity, and the Canonical Correlation Analysis can be appropriately continued.

Statistical Analysis

Eigenvalue Test and Canonical Correlation

Subsequently, Canonical Correlation Analysis (CCA) was conducted. The canonical functions formed from the six dimensions of learning motivation and the seven dimensions of student learning engagement resulted in six canonical functions. These six functions can be identified from the eigenvalues and canonical correlation coefficients, as presented in Table 4 below.

Table 4. Eigenvalues and Canonical Correlations

Function	Eigenvalue	Persentage (%)	Canonical Correlation
1	2,37735	0,704	0,83899
2	0,66368	0,399	0,63160
3	0,25074	0,200	0,44774
4	0,08572	0,079	0,28098
5	0,01512	0,015	0,12206
6	0,01056	0,010	0,10224

Source: Processed data, 2026

Based on Table 4, six canonical functions were generated. The first function explains 70.4% of the canonical relationship, the second function 39.9%, the third function 20.0%, the fourth function 7.9%, the fifth function 1.5%, and the sixth function 1.0%. The largest contribution is demonstrated by the first function, whereas the subsequent functions contribute relatively small proportions.

The canonical correlation value for the first function is 0.839, indicating a very strong relationship between the learning motivation and learning engagement variables. Because this function has the highest canonical correlation compared to the other functions, the interpretation of the analysis is therefore focused on the first canonical function.

Significance Test of Canonical Correlation

The next procedure involved testing the significance of the Canonical Correlation Analysis (CCA). In canonical correlation analysis, the hypothesis is considered significant if the p-value is less than 0.05 ($p < 0.05$). The significance test of canonical correlation consists of two procedures: the simultaneous canonical correlation test and the partial canonical correlation test.

Simultaneous Canonical Correlation Test

The following results were obtained from the simultaneous canonical correlation test:

Table 5. Pillai's Trace, Hotelling's Trace, and Wilks' Lambda Tests

Test Name	Value	Sig. of F
Pillais Trace	1,4076	0,000

Hotellings Trace	3,4032	0,000
Wilks' Lambda	0,1278	0,000
Roy's Largest Root	2,3773	0,000

Source: Processed data, 2026

Based on Table 5, the simultaneous canonical correlation test yielded a significance value of 0.000, indicating that $p < 0.05$. Therefore, the first, second, third, fourth, fifth, and sixth canonical functions are jointly significant, and the analysis can be continued. Accordingly, the research hypothesis stating that there is a significant relationship between learning motivation and student engagement in the implementation of the Project-Based Learning (PjBL) model is accepted.

Partial Canonical Correlation Test

The results of the partial canonical correlation test are presented as follows:

Table 6. Wilks' Lambda Test

Roots	Wilks L.	Sig. of F
1 TO 6	0,12776	0,000
2 TO 6	0,43148	0,021
3 TO 6	0,71785	0,530
4 TO 6	0,89784	0,909
5 TO 6	0,97480	0,962
6 TO 6	0,98955	0,741

Source: Processed data, 2026

Based on Table 6, the significance value obtained for the first canonical function indicates $p < 0.05$, whereas the second, third, fourth, fifth, and sixth functions show p-values greater than 0.05. Thus, partially, only the first canonical function is statistically significant, while the second through sixth canonical functions are not significant. This finding implies that only the first canonical function between the independent and dependent variable sets demonstrates a statistically meaningful relationship, whereas the linear combinations represented by the subsequent canonical functions do not contribute significantly to the relationship. Based on the partial Wilks' Lambda test, interpretation of the canonical relationship is therefore focused solely on the first canonical function.

Interpretation of Canonical Correlation

After conducting a canonical correlation test, the next step is to interpret the canonical correlation function. The interpretation of canonical variables consists of three coefficients, namely canonical weights, canonical loadings, and canonical cross loadings. The results for the three canonical correlation coefficients are as follows:

Table 7. Canonical correlation coefficient values

Variables	Canonical Weights	Canonical Loading	Canonical Cross Loadings
Visual Activities (Y1)	0,1924	0,7926	0,6650
Oral Activities (Y2)	0,1054	0,7384	0,6195
Listening Activities (Y3)	0,8735	0,8701	0,7300
Writing Activities (Y4)	0,0474	0,7211	0,6050
Motor Activities (Y5)	0,2014	0,7113	0,5968
Mental Activities (Y6)	-0,0195	0,5732	0,4809
Emotional Activities (Y7)	0,4936	0,8362	0,7015
Perseverance in completing tasks (X1)	1,0864	0,9241	0,7753
Resilience in facing difficulties (X2)	0,2350	0,6335	0,5315
Demonstrating interest (X3)	-0,0115	0,6521	0,5471
Enjoyment of working independently (X4)	0,3266	0,4652	0,3903
Ability to defend one's opinions (X5)	-0,0730	0,4920	0,4128
Enjoyment in seeking and solving problems (X6)	0,5278	0,7629	0,6400

Source: Processed data, 2026

Based on Table 7, the interpretation of the canonical correlation coefficient can be explained as follows:

Canonical Weights

Canonical weights explain the magnitude of contribution of the original variables to their respective canonical variates within each set. The larger the coefficient value of an original variable, the greater its influence on the canonical variate. Based on the first canonical function, the ranking of contributions to the independent canonical variate from highest to lowest is as follows: Perseverance in completing tasks (X1), Enjoyment in seeking and solving problems (X6), Enjoyment of working independently (X4), Resilience in facing difficulties (X2), Ability to defend one's opinions (X5), and Demonstrating interest (X3).

Meanwhile, the ranking of contributions to the dependent canonical variate from highest to lowest is: Listening Activities (Y3), Emotional Activities (Y7), Motor Activities (Y5), Visual Activities (Y1), Oral Activities (Y2), Writing Activities (Y4), and Mental Activities (Y6). This indicates that Perseverance in completing tasks (X1) is the variable with the strongest influence on the independent canonical variate, with a coefficient value of 1.086, while Listening Activities (Y3) is the most influential variable on the dependent canonical variate, with a coefficient value of 0.874.

Canonical Loadings

Canonical loadings aim to measure the relationship between the original variables and each of their canonical variables. The original variables can be said to have a significant role in their canonical variable set if they have a loading value > 0.5. The results indicate that the canonical loading values for

all indicators of variable Y exceed 0.5. For variable X, the indicators Perseverance in completing tasks (X1), Resilience in facing difficulties (X2), Demonstrating interest (X3), and Enjoyment in seeking and solving problems (X6) also have loading values greater than 0.5. This suggests a strong relationship between the independent variable factors and the dependent variable set. In contrast, the indicators Enjoyment of working independently (X4) and Ability to defend one's opinions (X5) have relatively lower contributions, as their loading values are below 0.50, indicating that their influence on the canonical relationship is weaker compared to the other indicators.

The ranking based on canonical loading values from highest to lowest for the independent variables is: Perseverance in completing tasks (X1), Enjoyment in solving problems (X6), Demonstrating interest (X3), Resilience in facing difficulties (X2), Enjoyment of working independently (X4), and Ability to defend one's opinions (X5). For the dependent variables, the ranking from highest to lowest is: Listening Activities (Y3), Emotional Activities (Y7), Visual Activities (Y1), Oral Activities (Y2), Writing Activities (Y4), Motor Activities (Y5), and Mental Activities (Y6).

From the canonical loading calculations, the independent variable Perseverance in completing tasks (X1) and the dependent variable Listening Activities (Y3) have the highest loading values, namely 0.924 and 0.870, respectively. This indicates that the strongest relationship occurs between perseverance in completing tasks and listening activities compared to the other variable combinations.

Canonical Cross Loadings

Canonical cross loadings are used to examine the correlation between original variables in one set and the canonical variate of the other set. The larger the value obtained, the stronger the relationship between the two sets. Based on the cross-loading values, several indicators of learning motivation demonstrate stronger relationships with learning engagement. The indicators Perseverance in completing tasks (X1) and Problem-solving (X6) show the most dominant contributions, followed by Demonstrating interest (X3) and Resilience in facing difficulties (X2). This indicates that students who are persistent, capable of solving problems, interested in learning, and not easily discouraged tend to be more actively engaged in the learning process. Meanwhile, Enjoyment of working independently (X4) and Ability to defend one's opinions (X5) show relatively lower contributions.

Within the learning engagement variable set, Listening (Y3) and Emotional activities (Y7) exhibit the strongest relationships with learning motivation. Visual, oral, writing, and motor activities fall within a moderately strong category, whereas Mental activities (Y6) show the lowest contribution due to coefficient values below 0.5.

Overall, these findings indicate that higher levels of learning motivation—particularly in terms of perseverance and problem-solving ability—are associated with higher levels of student engagement in the learning process.

Redundancy Index

The redundancy index is used to determine the percentage of a set of variables that explains the variation of another set of variables in a practical sense in canonical correlation analysis.

Rumus: Redundancy = (mean loading²) × Rc^2

Set X	40%
Set Y	37%

Source: Processed data, 2026

Based on the redundancy index values, 40% of the variance in learning engagement can be explained by the learning motivation variable set, while 37% of the variance in learning motivation can be explained by the learning engagement variable set. These results indicate a reasonably strong relationship between the two sets of variables, with approximately 37–40% of the variance being mutually explained through the canonical function formed.

Discussion

The Relationship between Learning Motivation and Learning Engagement

Based on the results of the Canonical Correlation Analysis, several key points can be discussed as follows.

The indicators of the learning motivation variable show a moderately strong relationship with the indicators of students' learning engagement in the first canonical function, which is statistically significant. This relationship is reflected in the canonical loadings and cross-canonical loadings, the majority of which exceed 0.5. This indicates that the higher the students' learning motivation, particularly in terms of persistence and problem-solving ability, the higher their level of engagement in participating in Project-Based Learning (PjBL) in economics on the topic of wages.

The learning motivation indicators that exert the greatest influence on the independent canonical variate are perseverance in completing tasks (X1) and enjoyment in seeking and solving problems (X6). Meanwhile, the learning engagement indicators that contribute most strongly to the dependent canonical variate are listening activities (Y3) and emotional activities (Y7). These findings suggest that students who demonstrate perseverance and strong problem-solving abilities tend to be more actively engaged in listening to instructional explanations and in participating emotionally, such as showing enthusiasm and interest in the learning material. Perseverance and problem-solving skills encourage students to be more participatory in project activities, consistent with the principles of PjBL, which emphasize active involvement, contextual experiences, and task-based learning.

Other motivation indicators—such as demonstrating interest, resilience in facing difficulties, enjoyment of working independently, and the ability to defend one's opinions—contribute to a lesser extent compared to the primary indicators. Nevertheless, these indicators continue to support student engagement in learning activities, for example during discussions, report writing, or participation in

video vlog production. This indicates that within the context of PjBL, various motivation indicators continue to contribute to learning engagement, although with varying levels of strength.

The strongest relationship among the indicators is observed between perseverance in completing tasks (X1) within the learning motivation variable and listening activities (Y3) within the learning engagement variable. This indicates that the greater the students' perseverance in completing tasks, the higher their level of listening activity during instruction, enabling them to follow the material effectively and engage actively in PjBL-based economics learning on the topic of wages. Listening skills assist students in understanding teacher instructions and information obtained throughout the project, while emotional involvement—such as interest, enjoyment, and enthusiasm—creates a positive learning atmosphere. These findings are further supported by the word count analysis, which reveals the dominance of positive terms such as enjoyable, exciting, and broadening knowledge, reflecting contextual learning experiences. Overall, the findings of this study indicate that high levels of learning motivation, particularly in terms of persistence and problem-solving, are associated with increased student engagement across various forms of learning activities in PjBL-based economics instruction.

The Word Count analysis further indicates that the most dominant keywords appearing in students' responses include exciting, enjoyable, impressive, broadening knowledge, learning new things, real-life relevance, courage, and public speaking. These keywords reflect positive learning experiences, high levels of interest, and active engagement in the video vlog interview project tasks. Moreover, the analysis demonstrates that the PjBL model implemented through video vlog projects successfully created contextual learning experiences, enabling students to connect economic concepts with real-life situations, communicate actively, and demonstrate confidence in presenting their interview findings.

Thus, the results of the canonical correlation analysis indicate a strong relationship between learning motivation and student engagement in Project-Based Learning (PjBL) in economics instruction on the topic of wages. The findings are consistent with Xiong (2025), who argues that student engagement can be enhanced through the teacher's role, varied instructional methods, the creation of a conducive learning environment, and the provision of motivation. The most influential learning motivation indicators identified in this study are perseverance in completing tasks and the ability to seek and solve problems. These findings support Zaccone & Pedrini (2019), who reported that students with high intrinsic motivation exhibit greater perseverance, resilience, and initiative in problem-solving.

The effective implementation of the PjBL model can foster high learning motivation and enhance student engagement throughout the learning process, making instruction more engaging, relevant, and meaningful (Putri Wiladati, 2025). In economics instruction, particularly on contextual

topics such as wages, an appropriate instructional model can cultivate learning motivation, enabling students to understand concepts more deeply, connect learning materials with everyday life, and actively participate in completing project tasks. Students reported that learning through projects was more enjoyable compared to other curriculum components.

Conclusion

The study shows that there is a significant relationship between learning motivation and students' learning engagement in the implementation of the Project-Based Learning (PjBL) model in economics learning on the topic of wages, as indicated by the first canonical function as the most dominant function. This relationship is contributed by indicators such as persistence in completing tasks and problem-solving ability, and is reflected in students' listening activities and emotional engagement during the learning process. These factors encourage students to be more actively involved in the stages of PjBL. Meanwhile, students' learning engagement is most strongly reflected in listening activities and emotional involvement throughout the learning process. These findings are further supported by students' descriptive data, which indicate that their learning experiences are enjoyable, positive, and contextual.

Based on the research findings, the implications of this study are as follows. For teachers, it is recommended to continue developing and implementing instructional models that emphasize students' active involvement in project completion Such efforts are expected to enhance students' learning motivation, particularly in terms of perseverance, thereby increasing student engagement during economics instruction on the topic of wages. Teachers are also advised to provide equitable guidance to ensure that all students are actively involved at each stage of the project.

For future researchers, it is recommended to examine other variables that are presumed to have a strong relationship with learning engagement beyond learning motivation. The limitation of this study lies in its use of a cross-sectional survey design conducted at a single point in time. Consequently, the findings reflect students' motivation and engagement only during the period in which the study was conducted.

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