

Developing a WebQuest-Assisted Problem-Based Learning Model to Enhance Learning Motivation and Outcomes: The Moderating Role of Self-Concept

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Article History: Received on 4 May 2026, Revised on 23 July 2026,
Published on 24 July 2026

Abstract: This study aimed to develop and evaluate a WebQuest-assisted Problem-Based Learning (PBL) model to enhance vocational high school students' learning motivation and learning outcomes, with self-concept serving as a moderating variable. A Research and Development (R&D) approach employing the Four-D (4D) model was adopted, involving 72 tenth-grade students from SMK Sinar Husni 1, Indonesia, assigned to experimental and control groups. Feasibility was evaluated through expert validation (material, media, and instructional design), practicality via teacher and student questionnaires, and effectiveness using Multivariate Analysis of Variance (MANOVA), with the moderating effect of self-concept examined through two-way ANOVA. Validation confirmed model feasibility (material: 77.5%; media: 75.0%; instructional design: 73.33%) and high practicality (student responses: 86.68%; teacher responses: 90%). MANOVA revealed significant improvements in learning motivation and outcomes ($F = 290.084$; $p < .001$), while two-way ANOVA demonstrated a significant interaction between self-concept and the model ($F = 15.671$; $p < .001$). This study uniquely integrates WebQuest technology with PBL and examines self-concept as a moderating variable in vocational education, an underexplored combination in existing literature. The model offers a replicable instructional framework for vocational teachers to enhance student engagement and achievement through technology-supported, problem-based strategies. This research contributes empirical evidence that the WebQuest-assisted PBL model effectively enhances vocational students' motivation and academic outcomes, with self-concept strengthening its effectiveness, providing actionable insights for curriculum developers and educators.

Keywords: Learning Motivation, Learning Outcomes, Problem-Based Learning, Self-Concept, WebQuest Application

A. Introduction

In the era of globalization and the rapid advancement of information technology, education is expected to produce vocational high school graduates who possess competencies, creativity, critical thinking skills, and abilities that meet the demands

of the workforce through the effective integration of technology into the learning process (Skarpaas, 2024; Gupta et al., 2024). However, based on interviews conducted at SMK Sinar Husni 1, classroom instruction remains predominantly teacher-centered, relying heavily on lecture-based teaching and note-taking activities. This conventional approach provides limited variation in learning, resulting in students experiencing boredom, reduced learning motivation, and underutilization of technology as a learning resource (Zidi et al., 2024). Previous studies have demonstrated that active learning models emphasizing experiential learning and problem-solving effectively enhance student engagement (Ruijuan et al., 2023). Likewise, the use of WebQuest as a web-based instructional medium enriches learning experiences by providing students with broader access to relevant information. Improving learning motivation is a crucial aspect of education, as it encourages students' engagement, persistence, and academic achievement (Kusurkar et al., 2023), which ultimately contributes to improved learning outcomes as indicators of students' mastery of cognitive, affective, and psychomotor competencies following the learning process (Li et al., 2024). The economics learning outcomes of tenth-grade students at SMK Sinar Husni 1 are presented in the following table.

Table 1. Students' Learning Outcomes in Economics Among Tenth-Grade Students at SMK Sinar Husni 1

No	Class	Number of Students	Score ≥ 70	Score < 70
1	X AKL	22	7	15
2	X OTKP 1	36	10	26
3	X OTKP 2	36	11	25
	Total	94	28	66
	Percentage		29%	71%

Source: Economics learning outcomes data of tenth-grade students at SMK Sinar Husni 1

Based on Table 1, it can be concluded that the students' learning outcomes in economics remain relatively low. Of the 22 students in Class X AKL, 15 scored below the Minimum Mastery Criterion (MMC). Similarly, in Class X OTKP 1, 26 out of 36 students obtained scores below the MMC, while in Class X OTKP 2, 25 of the 36 students also failed to meet the required standard. Overall, 66 out of 94 students (71%) scored below the Minimum Mastery Criterion, which was set at 70 for the economics subject. In practice, economics instruction in vocational high schools continues to face several challenges. Learning activities are generally confined to classroom settings, with limited opportunities to connect theoretical concepts to real-world economic situations. In fact, economics is inherently holistic, encompassing various aspects of everyday life (Retnam & Razak, 2023) (Astuti & Purnamasari, 2025). Therefore, a learning model supported by interactive instructional media is required to facilitate a more comprehensive and meaningful learning experience.

One innovative instructional approach that effectively bridges classroom learning with authentic real-world problems is Problem-Based Learning (PBL). This model has been shown to stimulate students' intrinsic motivation to learn (Wijnia et al., 2024). By engaging students in solving authentic problems, PBL encourages them to become more challenged and motivated to seek appropriate solutions. Their curiosity drives them to explore information from various sources, including textbooks, online resources, and experimental activities. Furthermore, successfully solving problems provides students with a sense of accomplishment, thereby enhancing their self-confidence (Wijnia et al., 2024). Previous studies have demonstrated that Problem-Based Learning significantly improves students' learning motivation, critical thinking, and learning outcomes.

Problem-Based Learning is recognized as an effective instructional approach for enhancing student engagement, developing critical thinking skills, and facilitating the application of knowledge in authentic contexts (Purwanto & Santoso, 2023). Conventional instructional approaches are generally teacher-centered, where students passively receive information from instructors. In contrast, WebQuest is specifically designed to actively engage students in learning through exploration, inquiry, and collaboration. The integration of WebQuest into the PBL model promotes a project-based learning environment in which students actively participate in solving complex problems or completing authentic tasks. Such an approach encourages critical thinking, collaboration, and the development of research skills, all of which are essential competencies for twenty-first-century education.

A study conducted by Ambar, as reported by Lestari et al. (2016), found that the implementation of a WebQuest-assisted Problem-Based Learning model significantly improved students' economics learning outcomes. These findings suggest that integrating WebQuest into the PBL model is an effective strategy for enhancing students' academic achievement. The integration of WebQuest within the Problem-Based Learning model creates a more engaging and interactive learning experience. WebQuest provides students with a structured framework for investigating and solving problems, while the PBL approach actively involves them throughout the learning process, thereby fostering meaningful and student-centered learning experiences.

Self-concept is an essential psychological construct that explains how individuals perceive themselves and how these perceptions influence their behavior, emotions, and social interactions. It encompasses various dimensions, including identity, self-esteem, and self-image (Steinberg et al., 2024). A positive and well-developed self-concept contributes to stronger learning motivation, as previous studies have consistently reported a significant positive relationship between students' self-concept and their achievement motivation (Nabilla & Rahma, 2024). Accordingly, the development of a WebQuest-assisted Problem-Based Learning model moderated by self-concept is expected to provide deeper insights into how technology integration

and active learning approaches can effectively improve students' learning motivation and academic achievement. This expectation is supported by evidence indicating that student-centered learning approaches, including Problem-Based Learning, strengthen students' confidence, self-beliefs, and academic performance by encouraging active participation and independent problem-solving (Basileo et al., 2024). Based on the foregoing discussion, it is necessary to develop innovative instructional media for economics education. Therefore, this study is entitled "Developing a WebQuest-Assisted Problem-Based Learning Model to Enhance Learning Motivation and Outcomes: The Moderating Role of Self-Concept".

B. Methods

This study employed a Research and Development (R&D) approach using the Four-D (4D) development model (Define, Design, Develop, and Disseminate) proposed by Thiagarajan (1974) (Nilsook et al., 2021). The research was conducted at SMK Sinar Husni 1 during the first semester of the 2025/2026 academic year. The target population consisted of tenth-grade vocational high school students. The sample comprised 72 students selected from two intact classes, with 36 students from Class X AKL assigned as the experimental group and 36 students from Class X OTKP assigned as the control group. The use of intact classes was intended to preserve the natural classroom setting and ensure the feasibility of implementing the instructional intervention within the existing school schedule. The development process followed the four sequential stages of the 4D model. During the Define stage, a needs assessment was conducted through classroom observations and interviews with teachers to identify instructional problems, analyze student characteristics, examine curriculum requirements, and formulate learning objectives. The Design stage involved preparing the instructional framework, developing the WebQuest-assisted Problem-Based Learning model, designing learning materials on the topic of market equilibrium, and preparing the research instruments. During the Develop stage, the prototype was evaluated through expert validation, revised based on expert recommendations, and subsequently tested in classroom trials to determine its feasibility and practicality. Finally, the Disseminate stage involved implementing the finalized instructional model in the experimental class to evaluate its effectiveness in improving students' learning motivation and learning outcomes.

The research instruments consisted of expert validation sheets, teacher and student response questionnaires, a self-concept questionnaire, a learning motivation questionnaire, and a learning achievement test. The validation sheets were completed by subject matter experts, instructional design experts, and educational media experts to evaluate the appropriateness of the instructional content, media design, language, and learning procedures. Suggestions provided during the validation process were incorporated into the revision of the instructional model before field implementation. All questionnaire instruments employed a five-point Likert scale and were developed based on the theoretical constructs underlying Problem-Based Learning, WebQuest,

learning motivation, and self-concept. The learning achievement test was evaluated through item validity, reliability, item difficulty, and discrimination index analyses to ensure that it produced valid and reliable measurements of students' learning outcomes (Boateng et al., 2018).

Data were analyzed using both descriptive and inferential statistical techniques. Descriptive analysis was employed to evaluate the feasibility and practicality of the developed instructional model by calculating the mean scores obtained from expert validation and questionnaire responses and converting them into predetermined assessment categories (Widoyoko, 2016). Prior to hypothesis testing, the data were examined for normality and homogeneity to ensure that the assumptions required for parametric statistical analyses were satisfied. The effectiveness of the WebQuest-assisted Problem-Based Learning model was analyzed using Multivariate Analysis of Variance (MANOVA) with SPSS version 25 to simultaneously examine differences in students' learning motivation and learning outcomes between the experimental and control groups. Furthermore, a two-way Analysis of Variance (ANOVA) was conducted to examine the interaction effect between the instructional model and students' self-concept. These analyses were performed to determine the feasibility, practicality, effectiveness, and moderating role of self-concept in the implementation of the WebQuest-assisted Problem-Based Learning model (Sugiyono, 2015; Aisyah & Adistana, 2020; Yustira & Yefterson, 2021; Sudjana, 2009; Widoyoko, 2016).

C. Results and Discussion

1. Results

The instructional model developed in this study was a WebQuest-assisted Problem-Based Learning (PBL) model designed for the topic of market equilibrium with the objective of improving students' learning motivation and learning outcomes, moderated by self-concept. The define stage began with a needs analysis conducted through interviews at SMK Sinar Husni 1 BM, which revealed that students' learning motivation and academic achievement remained low because classroom instruction was predominantly lecture-based. Consequently, a WebQuest-assisted Problem-Based Learning model was selected as an appropriate instructional solution. During the design stage, the WebQuest was developed using the Padlet platform and organized according to the syntax of the Problem-Based Learning model. The learning activities were enriched with authentic case studies related to market equilibrium. Subsequently, during the develop stage, the WebQuest-assisted instructional model was implemented, enabling students to access learning materials conveniently, collaborate in groups by following the WebQuest guidelines, while teachers acted primarily as facilitators who guided the learning process.

Validation Results

The validation results indicated that the WebQuest-assisted Problem-Based Learning model met the required criteria for instructional feasibility. The material expert evaluation produced a mean score of 3.875 (77.5%), categorized as feasible, covering the aspects of content appropriateness, instructional presentation, language and readability, and compatibility with the WebQuest. The media expert evaluation yielded a mean score of 3.75 (75%), also categorized as feasible, indicating that the visual appearance, functionality, and overall media quality satisfied the required standards. Furthermore, the instructional design expert evaluation resulted in a mean score of 3.67 (73.33%), likewise classified as feasible. These findings demonstrate that the developed instructional model possesses appropriate learning objectives, effectively incorporates the syntax of Problem-Based Learning, successfully integrates WebQuest technology, and provides an instructional design that is suitable for classroom implementation.

Product Revision Following the Initial Trial

Based on the findings of the preliminary field trial, the WebQuest-assisted Problem-Based Learning model was revised according to recommendations provided by the material expert, media expert, and instructional design expert. The revisions included the addition of authentic case-based instructional videos, reinforcement of the market equilibrium concepts, enhancement of the WebQuest interface through the incorporation of additional colors and animated GIFs, refinement of text typeface, font size, and color, as well as improvements to the Lesson Plan (Rencana Pelaksanaan Pembelajaran; RPP). Following these revisions, the validation conducted by the economics teacher produced a mean score of 4.30 (86%), categorized as feasible, indicating that no further revisions were required. This evaluation was based on the aspects of ease of use, learning motivation, learning outcomes, self-concept, and product acceptability, resulting in an overall mean score of 4.26 (85.20%). These results confirm that the developed instructional model is appropriate for implementation in classroom learning.

Main Product Field Testing

The field trial was conducted with tenth-grade students of SMKS Sinar Husni 1 BM, involving two classes with a total of 72 students. The primary objective of this trial was to evaluate both the feasibility of the developed instructional model and its practical benefits in the learning process. After being declared feasible through expert validation and field testing, the WebQuest-assisted Problem-Based Learning model proceeded to the dissemination stage. The model was implemented on a limited basis for tenth-grade students enrolled in the Accounting and Financial Institution (AKL) and Office Management and Business Services (OTKP) programs at SMKS Sinar Husni 1. Dissemination was carried out by distributing the WebQuest access link,

allowing students to utilize the instructional model directly through the WebQuest platform.

Product Effectiveness Testing

Analysis of Learning Motivation

Table 2. Students' Learning Motivation Scores

Description	Experimental Class	Control Class
Mean	89.28	58.53
Maximum	100	77
Minimum	79	43
Standard Deviation	5.854	7.934

Source: Results of the learning motivation questionnaire analysis

The analysis revealed that students in the experimental class achieved a mean learning motivation score of 89.28, with a maximum score of 100, a minimum score of 79, and a standard deviation of 5.854. These findings indicate that students who participated in the WebQuest-assisted Problem-Based Learning model demonstrated a high level of learning motivation compared with those in the control class.

Table 3. Students' Pre-Test Scores

Description	Experimental Class	Control Class
Mean	53.39	43.39
Maximum	76	72
Minimum	16	16
Standard Deviation	17.037	16.787

Based on Table 3, the experimental class achieved a higher average pre-test score than the control class. The experimental class obtained a mean score of 53.39, with the highest score of 76, the lowest score of 16, and a standard deviation of 17.037. These findings indicate that the experimental group demonstrated slightly better initial academic performance than the control group prior to the instructional intervention.

Table 4. Students' Post-Test Scores

Description	Experimental Class	Control Class
Mean	80.22	58.89
Maximum	92	82
Minimum	60	36
Standard Deviation	7.279	12.698

As presented in Table 4, the experimental class achieved a substantially higher post-test performance than the control class. The experimental group obtained a mean score

of 80.22, with a maximum score of 92, a minimum score of 60, and a standard deviation of 7.279. In comparison, the control class recorded a mean score of 58.89, with a highest score of 82, a lowest score of 36, and a standard deviation of 12.698. These results indicate that students who participated in the WebQuest-assisted Problem-Based Learning model demonstrated superior learning outcomes compared with those who received conventional instruction.

Table 5. Normality Test Results for Students' Pre-Test and Post-Test Scores

Data	Significance (Sig.)	Normality Criterion	Conclusion
Experimental Class Pre-Test	0.200	> 0.05	Normally Distributed
Experimental Class Post-Test	0.200	> 0.05	Normally Distributed
Control Class Pre-Test	0.200	> 0.05	Normally Distributed
Control Class Post-Test	0.200	> 0.05	Normally Distributed

Based on Table 5, the normality test results indicate that both the pre-test and post-test data in the experimental class were normally distributed, with significance values of 0.200, which exceeded the significance threshold of **0.05**. Similarly, the pre-test and post-test scores in the control class also yielded significance values of **0.200**, indicating that the data followed a normal distribution. Therefore, all datasets satisfied the normality assumption required for subsequent statistical analyses.

Table 6. Homogeneity Test Results for Post-Test Scores and Learning Motivation

Data	Class	Sig. Based on Mean	Criterion	Conclusion
Post-Test	Experimental	0.057	0.057 > 0.05	Homogeneous
	Control			
Learning Motivation	Experimental	0.126	0.126 > 0.05	Homogeneous
	Control			

The homogeneity test results demonstrated that both the post-test scores and learning motivation data satisfied the assumption of homogeneity. The significance value for the post-test data was 0.057, while the learning motivation data produced a significance value of 0.126. Since both values were greater than 0.05, the variances of the experimental and control groups were considered homogeneous.

Hypothesis 1

The feasibility evaluation of the developed WebQuest-assisted Problem-Based Learning model demonstrated favorable results. Material experts assigned a feasibility score of 77.5%, media experts provided 75.0%, and instructional design experts reported 73.3%, all of which were categorized as feasible. These findings indicate that the developed instructional model is appropriate for implementation in classroom learning.

Hypothesis 2

The second hypothesis examined the practicality of implementing the WebQuest-assisted Problem-Based Learning model. Practicality was assessed using questionnaires administered to students in the experimental class, where the instructional model was implemented throughout the research.

Table 7. Practicality Evaluation of the WebQuest-Assisted Problem-Based Learning Model (Student Responses)

No	Statement	Mean Score	Category
1	I can easily understand the learning procedures of the WebQuest-assisted PBL model.	4.25	Good
2	The WebQuest instructions are clear and easy to follow.	4.19	Good
3	I experienced few difficulties while using WebQuest.	4.16	Good
4	The WebQuest interface is attractive and easy to use.	4.30	Good
5	Learning through WebQuest does not make it difficult to manage my study time.	4.22	Good
6	WebQuest helps me concentrate better while completing assignments.	4.47	Good
7	Learning through WebQuest is more time-efficient than conventional learning.	4.33	Good
8	The learning materials presented through WebQuest are appropriate for my abilities.	4.36	Good
9	WebQuest is accessible using the available devices (smartphone/laptop).	4.50	Good
10	I am able to participate in WebQuest-based learning without significant difficulties.	4.45	Good
11	WebQuest increases my enthusiasm for learning.	4.50	Good
12	The activities in WebQuest stimulate my curiosity to learn more.	4.45	Good
13	I become more active during learning by using WebQuest.	4.33	Good
14	WebQuest increases my confidence in completing assignments.	4.45	Good
15	I can easily follow the learning procedures in the WebQuest-assisted PBL model.	4.19	Good
16	I actively participate in group work while using WebQuest.	4.38	Good
17	The WebQuest-assisted PBL model helps me understand the learning materials better.	4.27	Good
18	WebQuest facilitates my understanding of the subject matter.	4.30	Good
19	WebQuest makes it easier for me to solve problems and complete assignments.	4.27	Good
20	My learning motivation has improved after participating in the WebQuest-assisted PBL model.	4.31	Good

Source: Student practicality questionnaire

The mean scores for each questionnaire item are summarized below.

Table 8. Average Score for Each Practicality Item

Item	Mean Score
1	4.25
2	4.19
3	4.16
4	4.30
5	4.22
6	4.47
7	4.33
8	4.36
9	4.50
10	4.45
11	4.50
12	4.45
13	4.33
14	4.45
15	4.19
16	4.38
17	4.27
18	4.30
19	4.27
20	4.31
Overall Mean	4.334
Percentage	86.68%
Category	Highly Practical

Based on Table 8, the practicality of the WebQuest-assisted Problem-Based **Learning** model obtained an overall mean score of 4.334, corresponding to 86.68%, which falls within the highly feasible category.

Table 9. Practicality Evaluation of the WebQuest-Assisted Problem-Based Learning Model (Teacher Responses)

No	Statement	Score
1	The implementation procedures of the WebQuest-assisted PBL model are easy to understand.	4
2	The WebQuest instructions are clear and easy for students to follow.	4
3	WebQuest presents minimal technical difficulties during instruction.	5
4	WebQuest has a simple interface that supports smooth learning activities.	5
5	The WebQuest-assisted PBL model can be implemented within the allocated instructional time.	4
6	WebQuest facilitates the delivery of instructional materials.	5
7	WebQuest improves classroom time management.	5
8	WebQuest is appropriate for students' characteristics and abilities.	4

No	Statement	Score
9	Students can access WebQuest using the available devices.	4
10	Students are able to participate in WebQuest-based learning without major difficulties.	4
11	WebQuest enhances students' learning motivation.	5
12	WebQuest encourages students' curiosity and learning initiative.	5
13	The WebQuest-assisted PBL model promotes active student participation.	5
14	The WebQuest-assisted PBL model can be effectively implemented in my classroom.	4
15	Students can easily follow the learning sequence presented through WebQuest.	4
16	The model facilitates classroom activity management.	5
17	WebQuest helps students understand the learning materials more effectively.	4
18	Students become more independent in solving problems and completing assignments.	4
19	The WebQuest-assisted PBL model improves students' critical thinking skills.	5
20	Students' learning outcomes improve following the implementation of this model.	5
Total Score	90	
Mean Score	4.50	
Percentage	90%	
Category	Very Practical	

Source: Teacher practicality questionnaire

Based on Table 9, teachers rated the practicality of the WebQuest-assisted Problem-Based Learning model with an average score of 4.50 (90%), categorized as practical. Considering both student and teacher evaluations, the developed instructional model can be regarded as practical for classroom implementation, particularly in teaching the topic of market equilibrium.

Hypothesis 3

Table 10. MANOVA Results

Effect	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Learning Model						
Pillai's Trace	.894	290.084	2	69	.000	.894
Wilks' Lambda	.106	290.084	2	69	.000	.894
Hotelling's Trace	8.408	290.084	2	69	.000	.894
Roy's Largest Root	8.408	290.084	2	69	.000	.894

As shown in Table 10, the Wilks' Lambda statistic yielded an F-value of 290.084 with a significance level of 0.000 (< 0.05). Since the significance value was below the predetermined alpha level ($\alpha = 0.05$), the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted. These findings indicate significant

differences in students' learning motivation and learning outcomes between those taught using the WebQuest-assisted Problem-Based Learning model and those who received conventional instruction.

Hypothesis 4

Table 11. Two-Way ANOVA Results

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	19429.583 ^a	3	6476.528	38.875	.000
Intercept	186252.083	1	186252.083	1117.970	.000
Self-Concept	16800.083	1	16800.083	100.842	.000
PBL	18.750	1	18.750	.113	.039
Self-Concept × PBL Model	2610.750	3	2610.750	15.671	.000
Error	7330.333	44	166.598		
Total	213012.000	48			
Corrected Total	26759.917	47			

Table 11 shows that the interaction between self-concept and the WebQuest-assisted Problem-Based Learning model produced an F-value of 15,671 with a significance level of 0.000, which is lower than the significance criterion ($\alpha = 0.05$). Therefore, the null hypothesis (H_0) was rejected, while the alternative hypothesis (H_1) was accepted. These findings indicate a significant interaction effect between students' self-concept and the WebQuest-assisted Problem-Based Learning model on students' learning motivation and learning outcomes. The interaction effect is illustrated in the following figure.

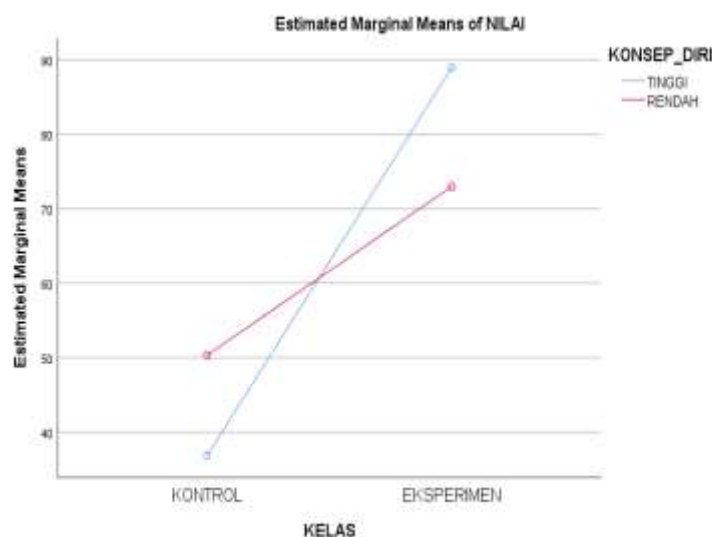


Figure 1. Interaction between Self-Concept and the Learning Model on Students' Learning Motivation and Learning Outcomes

Findings

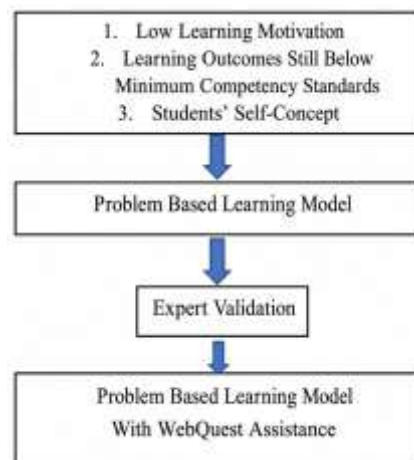


Figure 2. Research Findings

Previous studies have reported the development of various Problem-Based Learning (PBL) models supported by different instructional media. One of these studies was conducted by Nst and Syahputra (2023), entitled “Development of an Interactive Macromedia Flash-Assisted Problem-Based Learning Model to Improve Problem-Solving Skills and Learning Independence of Students at SMA Negeri 1 Binjai.” The present study differs from their research in terms of the supporting technology employed, namely WebQuest instead of Macromedia Flash, as well as the dependent variables investigated. While the previous study focused on problem-solving skills and learning independence, the present study examined students’ learning motivation and learning outcomes. Similarly, Nur (2017) developed a Problem-Based Learning and Blended Learning model in the study entitled “Development of Problem-Based Learning and Blended Learning Models for Professional Competency Development among University Students.” Unlike the present research, the study focused on developing university students’ professional competencies and involved only material and media experts during the validation process.

Another related study was conducted by Sutinah et al. (2021), entitled “Development of an Audio-Visual-Assisted Problem-Based Learning Model to Improve Cognitive Learning Outcomes.” The primary differences between that study and the present research lie in the development model and instructional media employed. Sutinah et al. utilized the ADDIE development model with audio-visual media, whereas the present study adopted the Four-D (4D) development model and integrated WebQuest as the primary instructional medium. Overall, these comparisons demonstrate that the WebQuest-assisted Problem-Based Learning model developed in the present study possesses distinctive characteristics compared with previous instructional models. This finding suggests that WebQuest can serve as a relevant and effective learning resource. When implemented appropriately, it has the potential to improve students’

conceptual understanding, learning motivation, and academic achievement, particularly in learning the topic of market equilibrium.

Discussion

Feasibility of the WebQuest-Assisted Problem-Based Learning Model

The primary outcome of this research was the development of a WebQuest-assisted Problem-Based Learning (PBL) model. The instructional materials focused on the topic of market equilibrium, and the development process considered both content and media aspects as the foundation for designing classroom instruction. This research and development study aimed to produce an instructional model for teaching market equilibrium in economics to tenth-grade students at SMK Sinar Husni 1.

The validation results demonstrated that the developed instructional model achieved a material expert score of 77.5%, a media expert score of 75.0%, and an instructional design expert score of 73.33%, all of which were categorized as feasible. Furthermore, teacher validation produced a score of 86%, indicating that the model was suitable for classroom implementation. These findings are consistent with previous studies demonstrating that technology-enhanced Problem-Based Learning models are valid, feasible, and appropriate for classroom implementation after undergoing expert validation and iterative revisions (Yanto et al., 2022; Husaeni et al., 2025). Similar findings have also been reported in recent studies indicating that web-based instructional media provide valid learning resources that effectively support interactive and student-centered learning environments (Sukmawati et al., 2025).

Practicality of the WebQuest-Assisted Problem-Based Learning Model

The practicality of the developed instructional model was evaluated through questionnaires administered to both students and teachers. Student responses yielded an average score of 4.334, equivalent to 86.68%, indicating that the instructional model was highly practical for classroom implementation. Teacher evaluations produced an average score of 4.50 (90%), further supporting its practicality. Therefore, it can be concluded that the WebQuest-assisted Problem-Based Learning model is practical and suitable for use in teaching market equilibrium.

The high practicality scores indicate that both teachers and students perceived the WebQuest-assisted Problem-Based Learning model as easy to understand, implement, and integrate into classroom activities. This finding suggests that the instructional model successfully accommodated users' needs while providing a structured learning environment that supported active participation and collaborative problem-solving. The practicality of an instructional model is an important indicator of its potential for sustainable implementation because a learning innovation can only

be adopted effectively when it is considered accessible and manageable by its users (Yanto et al., 2022).

Effectiveness of the Learning Model

Students' learning motivation and learning outcomes were analyzed using Multivariate Analysis of Variance (MANOVA) with SPSS version 25, since this study involved two dependent variables: learning motivation (Y_1) and learning outcomes (Y_2). Prior to the implementation of the developed instructional model, students achieved an average score of 53.39. Following the implementation of the WebQuest-assisted Problem-Based Learning model, the average score increased to 80.22, representing an improvement of 26.83 points. Furthermore, the experimental class achieved a substantially higher post-test mean score (80.22) than the control class (58.89). A total of 35 students (97.22%) in the experimental class achieved the Minimum Mastery Criterion (MMC), whereas only 5 students (approximately 15%) in the control class met the same criterion. The MANOVA results revealed a significance value of 0.000 (< 0.05). Accordingly, the null hypothesis (H_0) was rejected, and the alternative hypothesis (H_1) was accepted. These findings indicate significant differences in students' learning motivation and learning outcomes between those taught using the WebQuest-assisted Problem-Based Learning model and those receiving conventional instruction.

Interaction Between Self-Concept and the WebQuest-Assisted Problem-Based Learning Model on Learning Motivation and Learning Outcomes

The findings revealed a significant interaction between self-concept and the WebQuest-assisted Problem-Based Learning model in influencing the learning motivation and learning outcomes of tenth-grade students at SMK Sinar Husni 1. These results suggest that improvements in students' motivation and academic achievement are jointly influenced by their self-concept and the implementation of the WebQuest-assisted Problem-Based Learning model. This finding is consistent with previous studies demonstrating that positive self-beliefs strengthen students' motivation, engagement, and academic performance, particularly when learning environments encourage active participation and autonomy (Basileo et al., 2024).

The findings further indicate that the effectiveness of the WebQuest-assisted Problem-Based Learning model depends not only on the instructional strategy itself but also on students' confidence in their own abilities and perceived control over their learning environment. This has important implications for the successful integration of educational technology into classroom instruction. Consequently, the effectiveness of technology-supported learning is influenced not only by individual psychological factors, such as self-concept, but also by instructional design and social interaction throughout the teaching and learning process. These findings support Social Cognitive Theory, which emphasizes that learners with stronger self-beliefs are more

likely to regulate their learning, persist when facing challenges, and achieve higher academic performance. Likewise, Self-Determination Theory suggests that instructional environments supporting students' autonomy, competence, and relatedness strengthen motivation and improve learning outcomes

D. Conclusions

Based on the research and development process, this study conclusively establishes that the WebQuest-assisted Problem-Based Learning (PBL) model for teaching market equilibrium in economics is feasible, practical, and effective in enhancing both learning motivation and academic achievement among tenth-grade students. The model underwent rigorous validation by subject matter, instructional design, and media experts, as well as economics teachers and students, with all recommendations incorporated into revisions, resulting in a final product categorized as feasible for classroom implementation. Small-group and field trials confirmed strong performance and suitability for teaching and learning. Critically, implementation of the model yielded substantial improvements in learning motivation, as evidenced by questionnaire responses, alongside significant gains in learning outcomes measured through pre-test and post-test score comparisons. Furthermore, a significant interaction was identified between self-concept and the WebQuest-assisted PBL model in influencing both motivation and outcomes, confirmed by two-way ANOVA analysis ($p < 0.05$). This finding demonstrates that the model's effectiveness is significantly strengthened when students possess a positive self-concept, highlighting the complementary roles of instructional design and psychological factors in improving educational outcomes. Practically, economics teachers are encouraged to adopt the WebQuest-assisted PBL model as an innovative strategy to engage students in authentic problem-solving while leveraging digital resources. Schools should support implementation through adequate technology infrastructure, teacher training in WebQuest design, and integration of self-concept enhancement activities such as goal-setting, reflective practices, and positive feedback to maximize instructional effectiveness. Curriculum developers should consider embedding this model within broader economics curricula to promote active, student-centered learning. For future research, it is recommended to test the model across different subjects, grade levels, and school contexts to establish broader generalizability. Longitudinal studies would track the sustainability of motivation and achievement gains over time, while investigating additional moderating variables—such as prior knowledge, digital literacy, or teacher facilitation style—could deepen theoretical understanding. Comparative studies with other instructional models would clarify the unique contributions of the WebQuest and PBL components, and qualitative research exploring student experiences could yield richer insights into the mechanisms driving engagement and learning.

E. Acknowledgement

We would like to express our thanks to 72 tenth-grade students from SMK Sinar Husni 1 and Universitas Negeri Medan for the support in this project.

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