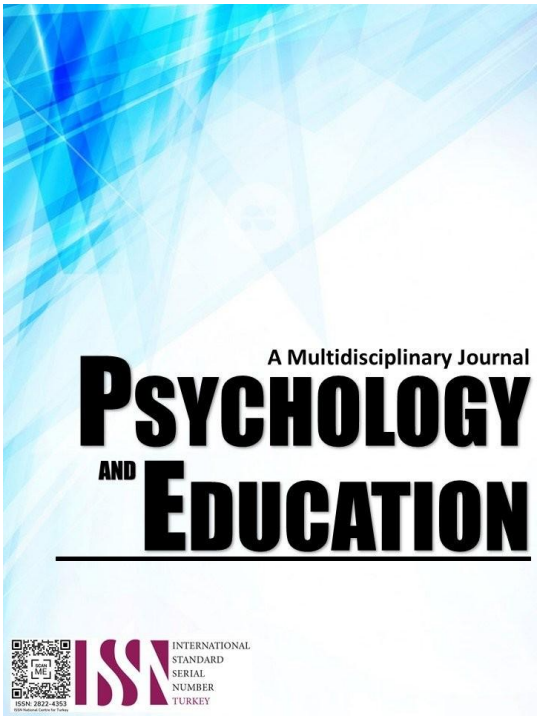
PROJECT BASED LEARNING: STRENGTHENING TECHNICAL VOCATIONAL EDUCATION FOR QUALITY LEARNING AND WORKFORCE READINESS



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Research Article

Project Based Learning: Strengthening Technical Vocational Education for Quality Learning And Workforce Readiness

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Abstract

The study aimed to assess the Project-Based Learning in strengthening technical vocational education for quality learning and workforce readiness in one secondary school in the Division of Dasmariñas, Cavite, during the school year 2025-2026. The respondents of the study were the teachers and students at one secondary school in the Division of Dasmariñas. The respondents evaluated the level of project-based learning in strengthening technical vocational education for quality learning in terms of student engagement and motivation, practical and technical skills, problem-solving and critical thinking abilities, and quality and authenticity of final projects; and the extent of project-based learning in strengthening technical vocational education for workforce readiness in terms of alignment with industry standards and needs, application of knowledge in real-world contexts, development of soft skills and work readiness traits, and post-program employment. The findings revealed that project-based learning improves technical vocational education by increasing student engagement and motivation, practical and technical skills, problem-solving and critical thinking abilities, and the quality and authenticity of finished products. Also, teachers and students have drastically different perspectives on how project-based learning improves technical vocational education for quality learning. Further, project-based learning significantly improves technical vocational education for preparing students for jobs by aligning what they learn with what industries require, allowing them to apply their knowledge in real-world situations, developing soft skills and work traits, and increasing their chances of finding work after the program. Meanwhile, there is a significant discrepancy in the evaluation of PBL's efficacy by teachers and students in Project-Based Learning in Strengthening Technical Vocational Education for Workforce Readiness. Furthermore, project-based learning shows a substantial association between learning quality and workforce preparedness. As an outcome of the findings and the conclusions, the following recommendations were enumerated: Teachers may Provide professional development opportunities focused on effective PBL facilitation, assessment strategies, and integrating soft skills development into technical projects to enhance teaching effectiveness; Students may actively participate in industry partnerships and project collaborations to gain insights into workplace expectations and develop problem-solving, communication, and teamwork skills; and School administrators may allocate resources and infrastructure, such as tools, materials, and technology, necessary for implementing effective PBL activities that simulate real work environments.

Keywords: *Project-Based Learning, Technical Vocational Education, quality learning and workforce readiness, practical and technical skills, problem-solving and critical thinking abilities*

Introduction

Project-Based Learning (PBL) has emerged as a transformative pedagogical approach in the realm of education, particularly in strengthening Technical Vocational Education and Training (TVET). At its core, PBL emphasizes the active engagement of students through real-world projects that foster critical thinking, problem-solving, and collaborative skills. In the context of the Division of Dasmariñas, Cavite, PBL offers a dynamic framework to enhance the quality of vocational education, ensuring that learners are not only theoretically equipped but also practically prepared for the demands of the modern workforce. This approach aligns with the broader goals of the Department of Education to produce competent, industry-ready graduates who can confidently contribute to local and national development.

The importance of quality learning in vocational education cannot be overstated, especially as various industries demand a workforce that is skilled, adaptable, and innovative. PBL serves as an effective strategy to bridge the gap between classroom instruction and real-world applications by immersing students in projects that mimic actual industry scenarios. Such experiential learning opportunities foster a deeper understanding of technical competencies while also developing soft skills such as communication, teamwork, and time management. For the Division of Dasmariñas, implementing PBL in its TVET programs signifies a commitment to elevating educational standards and ensuring learners are fully prepared to meet current labor market requirements.

Furthermore, workforce readiness has become a critical measure of effective vocational education. As industries evolve rapidly with technological advancements, traditional teaching methods may fall short in cultivating the skills necessary for employment. PBL encourages learners to work on tangible projects, often involving collaboration with industry partners, which enhances their employability and adaptability. In Dasmariñas, Cavite—a hub of industrial and entrepreneurial activities—such an approach ensures that students graduate with not only technical knowledge but also practical experience that makes them competitive candidates in the job market.

The integration of Project-Based Learning (PBL) in Technical Vocational Education and Training (TVET) has gained significant attention globally and locally as an innovative approach to bridge the gap between theoretical knowledge and industry demands. In the Division of Dasmariñas, Cavite, industries such as manufacturing, information technology, and entrepreneurship increasingly call for a workforce equipped with practical skills, problem-solving abilities, and adaptive competencies. However, despite the emphasis on technical training, many vocational students face challenges related to the lack of experiential learning opportunities that foster real-world application of their skills. This disconnect often results in graduates who are technically competent but inadequately prepared for the dynamic requirements of the labor market, thus highlighting a pressing need for pedagogical reforms that promote critical thinking and industry-relevant skills (Torres et al., 2022).

Several studies conducted from 2022 onwards have underscored the effectiveness of PBL in enhancing learning outcomes and workforce readiness in vocational settings. For instance, Morales (2023) found that integrating PBL in automotive technology programs significantly improved students' technical skills, teamwork, and problem-solving capacities, which translated to higher employability rates. Similarly, Reyes and Santos (2022) revealed that students engaged in PBL activities in the ICT sector demonstrated increased motivation, creativity, and confidence, essential traits valued by employers in a rapidly evolving digital economy. These studies support the premise that PBL is a powerful pedagogical approach that fosters practical skills aligned with industry standards, thus addressing some of the persistent issues faced by vocational education.

Despite its promising benefits, incorporating PBL into the existing vocational curricula in Dasmariñas faces several challenges. Teachers often lack sufficient training or resources to effectively implement project-based strategies, resulting in inconsistent application and limited student engagement. Moreover, institutional policies and assessment methods are frequently still geared toward traditional lecture-based teaching, which hampers the full adoption of PBL methods. The existing literature also indicates a need to examine how to adapt PBL specifically to the context of local industries in Dasmariñas, ensuring that projects are relevant and aligned with the skills demanded by local employers (Valdez et al., 2023).

Implementing Project-Based Learning within the Division's vocational programs also promotes innovation and a learner-centered environment. It shifts the focus from rote memorization to active discovery, fostering motivation and engagement among students. This methodology encourages learners to take ownership of their education, experiment with ideas, and refine their work through feedback and reflection. As a result, students develop a sense of responsibility and self-confidence, essential traits for their future careers. The Division of Dasmariñas recognizes that such qualities are vital for nurturing a competent workforce capable of driving community and economic growth.

This context-specific focus is essential for maximizing the impact of PBL on workforce readiness. A significant research gap remains regarding the specific impacts and best practices of PBL within the Filipino vocational education system, especially in the context of Dasmariñas, Cavite. While global and national studies suggest the potential of PBL, there is limited localized research that evaluates its implementation, challenges, and outcomes at the regional or institutional level. Additionally, there is insufficient empirical data on how PBL influences learners' soft skills development, their readiness for jobs in local industries, and the sustainability of PBL initiatives over time (Ramos & Cruz, 2023). Addressing this gap can inform policymakers and educators on tailored strategies for effective PBL integration in vocational institutions.

Therefore, Project-Based Learning stands as a pivotal strategy in reinforcing the quality of Technical Vocational Education in Dasmariñas, Cavite. By integrating real-world projects into the curriculum, the Division aims to produce graduates who are not only skilled but also innovative, adaptable, and workforce-ready. This approach aligns with national development goals and responds to the evolving needs of industry sectors, positioning Dasmariñas as a leader in producing competent vocational learners. Thus, Project-Based Learning catalyzes transforming vocational education into a powerful vehicle for sustainable development and economic progress in the region.

Research Questions

This study aimed to assess the effectiveness of Project-Based Learning in strengthening technical vocational education for quality learning and workforce readiness in one secondary school in the Division of Dasmariñas, Cavite, during the school year 2025-2026. Specifically, this study sought to answer the following sub-problems:

1. What is the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of:
    1.1. student engagement and motivation;
    1.2. practical and technical skills;
    1.3. problem-solving and critical thinking abilities; and
    1.4. quality and authenticity of final projects?
2. Is there a significant difference in the assessment of the two groups of respondents on the level of project-based learning in strengthening technical vocational education for quality learning?
3. What is the extent of project-based learning in strengthening technical vocational education for workforce readiness as assessed by the two groups of respondents in terms of:

3.1. alignment with industry standards and needs;
3.2. application of knowledge in real-world contexts;
3.3. development of soft skills and work readiness traits; and
3.4. post-program employment?

4. Is there a significant difference in the assessment of the two groups of respondents on the extent of project-based learning in strengthening technical vocational education for workforce readiness?
5. Is there a significant relationship between Project-Based Learning in strengthening technical vocational education for quality learning and workforce readiness?
6. Based on the findings of the study, what instructional plan may be considered?

Methodology

Research Design

The study employed descriptive correlational research designs to assess the significant relationship between Project-Based Learning and the strengthening of technical vocational education for quality learning and workforce readiness. According to Katzukov (2020), a descriptive correlational study describes the relationships among variables without seeking to establish a causal connection. Also, correlational research helps in comparing two or more entities or variables. Furthermore, descriptive correlational research design is crucial for evaluating Project-Based Learning's impact on strengthening technical vocational education, thereby enhancing quality learning and workforce readiness in a single secondary school within the Division of Dasmariñas, Cavite, without influencing any other factors. This way, practical data about Project-Based Learning in strengthening technical vocational education for quality learning and workforce readiness can be obtained through surveys. The value of such a design lies in its ability to uncover patterns and relationships that help stakeholders understand the current state of project-based learning and its efficiency.

Respondents

The respondents of the study were the 30 teachers and 120 students in one secondary school in the Division of Dasmariñas, Cavite during the school year 2025-2026. A total of one hundred fifty (150) respondents. The respondents evaluated the level of project-based learning in strengthening technical vocational education for quality learning in terms of student engagement and motivation, practical and technical skills, problem-solving and critical thinking abilities, and quality and authenticity of final projects; and the extent of project-based learning in strengthening technical vocational education for workforce readiness in terms of alignment with industry standards and needs, application of knowledge in real-world contexts, development of soft skills and work readiness traits, and post-program employment.

Instrument

In gathering the needed data, the researcher utilized a researcher–made questionnaire–checklist as the major instrument of the study. Part 1 – This section determined the demographic profile of the respondents. Part 2 – This part determined the level of project-based learning in strengthening technical vocational education for quality learning in terms of student engagement and motivation, practical and technical skills, problem-solving and critical thinking abilities, and quality and authenticity of final projects; Part 3 determined the extent of project-based learning in strengthening technical vocational education for workforce readiness in terms of alignment with industry standards and needs, application of knowledge in real-world contexts, development of soft skills and work readiness traits, and post-program employment.

Procedure

The researcher obtained permission from the administrator's office of one secondary school in the Division of Dasmariñas, Cavite to administer the questionnaire to the study participants. After receiving approval, the researcher sought permission from the school administrators by distributing a consent letter to the respondents, who then signed it and returned it to the researcher. The researcher explained the purpose of the study and provided instructions on how the respondents should answer the survey items. Next, the researcher administered the survey and allowed the respondents ample time to complete it.

After completing the survey, the researcher collected the questionnaires from the respondents. The researcher gathered, tallied, and processed the data using the SPSS Statistical Package for Social Science. The processed data were interpreted and analyzed, and the results were used to develop an instructional plan to improve further the technical vocational education for quality learning and workforce readiness. The researcher formulated a summary of findings, conclusions, and recommendations. Then, the researcher prepared for the final oral defense. After the oral defense, the manuscript was revised based on the comments and suggestions of the Oral Examination Committee. The Office of Graduate Studies Program and other offices received hardbound copies of the manuscript after the final editing and revision.

Data Analysis

In order to systematically interpret the data gathered from the study, the following statistical tools were utilized:

To assess the impact of project-based learning on strengthening technical vocational education, focusing on student engagement and motivation, practical and technical skills, problem-solving and critical thinking abilities, and the quality and authenticity of final projects, a weighted mean was employed.

To determine if there is a significant difference in the assessment of the two groups of respondents regarding the level of project-based learning in strengthening technical vocational education for quality learning, a paired t-test was applied.

To assess the impact of project-based learning on strengthening technical vocational education for workforce readiness, a weighted mean was applied to evaluate alignment with industry standards, application of knowledge in real-world contexts, development of soft skills and work readiness traits, and post-program employment.

To determine if there is a significant difference in the assessment of the two groups of respondents regarding the extent of project-based learning in strengthening technical vocational education for workforce readiness, a paired t-test was applied.

To determine if there is a significant relationship between Project-Based Learning and the strengthening of technical vocational education for quality learning and workforce readiness, Pearson's r correlation was employed.

Ethical Considerations

The following ethical considerations need to be considered during the study in determining methods for assessing the effectiveness of sustainable ICT practices in equipment lifecycle management at one secondary schools in the Division of Dasmariñas, Cavite.

Firstly, the study involved teacher-respondents, so the researcher gave voluntary and informed consent, meaning they need to be aware of why the study was being conducted, what process was followed, possible risks associated with participation, and their right to withdraw from the study at any time with no consequences.

Also, careful attention to confidentiality and anonymity was properly kept, preserving the respondents' and their relatives' data, which was necessary to receive truthful information. It was also important for researchers to be conscious of the existence of power relations and relations of power at the school and within participants' communities, to reduce any influences on the participants' responses they might bring.

In addition, since the participants in the study were of different cultures, the research should be culturally sensitive, which enables one to respect their culture and avoid making wrong conclusions. According to these principles of ethical conduct, the research was able to maintain high ethical standards on all stakeholders.

Results and Discussion

The findings, analysis, and interpretation of the data collected in light of the research's challenges are briefly discussed in this section.

Problem No. 1: What is the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of student engagement and motivation, practical and technical skills, problem-solving and critical thinking abilities, and quality and authenticity of final projects?

Table 1.1 illustrates the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of student engagement and motivation.

Table 1.1 *Mean of the Respondents' Assessment on the Level of Project-Based Learning in Strengthening Technical Vocational Education for Quality Learning in terms of Student Engagement and Motivation*

	Indicators	*Teachers*		*Students*	
		Mean	*VI*	*Mean*	*VI*
1.	The use of project-based learning significantly increases students' active participation in technical vocational classes.	3.97	HE	3.78	HE
2.	Students show higher enthusiasm and curiosity when engaged in project-based learning activities.	3.97	HE	3.66	HE
3.	Project-based learning helps students develop stronger teamwork and collaboration skills.	3.93	HE	3.71	HE
4.	Students are more likely to stay focused and attentive during project-based learning sessions.	3.93	HE	3.80	HE
5.	The integration of project-based learning enhances students' practical understanding of technical skills.	3.93	HE	3.80	HE
	Mean	3.95	HE	3.74	HE

****Legend: 3.26-4.00-Highly Evident; 2.51-3.25- Evident; 1.76-2.50 –Slightly Evident; 1.00-1.75 – Not Evident*

Table 1.1 illustrates the assessment of the two groups of respondents on the level of project-based learning in strengthening technical vocational education for quality learning in terms of student engagement and motivation. The findings show that the respondents assessed the level of project-based learning in strengthening technical vocational education for quality learning in terms of student engagement and motivation as highly evident as supported by the combined category means of both participants which is 3.84.

The findings indicated that the implementation of project-based learning (PBL) significantly enhances student engagement and

motivation in technical vocational education, which are critical factors in fostering quality learning outcomes. With a combined category mean of 3.84, the data implies that respondents perceive PBL as a highly effective instructional strategy in creating an active learning environment that encourages students to apply practical skills and collaborate with peers. This emphasis on experiential learning aligns with the goal of technical vocational education to produce competent and motivated graduates who are better prepared to meet industry demands. Consequently, educational institutions should consider integrating PBL more systematically into their curricula to promote sustained student interest, deeper understanding of technical concepts, and increased motivation to excel in their chosen fields.

Recent research supports these implications, highlighting the positive impact of project-based learning on vocational education. A study by Lee et al. (2022) found that PBL not only improved technical skills but also significantly increased learners' engagement and intrinsic motivation, leading to higher achievement levels. The authors argue that such active learning strategies are essential for developing practical competencies and fostering lifelong learning attitudes among vocational students. This evidence underscores the necessity for educators to adopt and refine PBL approaches to ensure that technical education remains relevant, engaging, and capable of producing skilled and motivated workforce-ready graduates.

Table 1.2 exhibits the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of practical and technical skills.

Table 1.2 *Mean of the Respondents' Assessment on the Level of Project-Based Learning in Strengthening Technical Vocational Education for Quality Learning in terms of Practical and Technical Skills*

	Indicators	*Teachers*		*Students*	
		Mean	*VI*	*Mean*	*VI*
1.	Students demonstrate improved technical competence through engaging in project-based learning activities.	3.83	HE	3.83	HE
2.	The integration of PBL provides students with real-world experience that strengthens their technical skillset.	3.93	HE	3.73	HE
3.	Project-based learning effectively develops students' problem-solving and technical troubleshooting abilities.	3.93	HE	3.78	HE
4.	Students acquire better technical skills when they work on projects that simulate actual industry tasks.	3.97	HE	3.88	HE
5.	The use of PBL in the curriculum increases students' confidence in performing technical procedures independently.	3.93	HE	3.88	HE
	Mean	3.92	HE	3.80	HE

****Legend: 3.26-4.00-Highly Evident; 2.51-3.25- Evident; 1.76-2.50 –Slightly Evident; 1.00-1.75 – Not Evident*

Table 1.2 exhibits the assessment of the two groups of respondents on the level of project-based learning in strengthening technical vocational education for quality learning in terms of practical and technical skills. The findings show that the respondents assessed the level of project-based learning in strengthening technical vocational education for quality learning in terms of practical and technical skills as highly evident as supported by the combined category means of both participants which is 3.86.

The findings indicated that project-based learning (PBL) plays a vital role in enhancing the practical and technical skills of students in technical vocational education. With a combined category mean of 3.86, the respondents strongly perceive PBL as an effective instructional strategy for developing core competencies required in technical fields. This aligns with the broader objective of vocational education to produce graduates who are not only knowledgeable but also proficient in applying their skills in real-world scenarios. The emphasis on hands-on, project-centered learning encourages students to bridge the gap between theory and practice, thereby fostering a more competent and industry-ready workforce. These implications highlight the importance of integrating PBL into curricula to ensure that students acquire relevant skills that meet current technological and occupational standards.

According to Kumar and Sharma (2022) found that PBL significantly improved students' technical competencies and problem-solving abilities, which are essential for success in technical careers. The active engagement involved in project work compels learners to confront real-life challenges, promoting deeper understanding and skill mastery. Such evidence underscores the value of adopting PBL as a standard pedagogical approach to enhance the practical and technical skillset of vocational students, ultimately improving their employability and contribution to industry development.

Table 1.3 presents the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of problem-solving and critical thinking abilities.

Table 1.3 presents the assessment of the two groups of respondents on the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of problem-solving and critical thinking abilities. The findings indicate that respondents evaluated the impact of project-based learning on strengthening technical vocational education for quality learning, as perceived by both groups, in terms of problem-solving and critical thinking abilities. This perception is highly evident, as supported by the combined category means of both participants, which is 3.80.

Table 1.3 *Mean of the Respondents' Assessment on the Level of Project-Based Learning in Strengthening Technical Vocational Education for Quality Learning in terms of Problem-Solving and Critical Thinking Abilities*

	Indicators	*Teachers*		*Students*	
		Mean	*VI*	*Mean*	*VI*
1.	Students demonstrate improved critical thinking when engaged in project-based learning activities.	3.83	HE	3.69	HE
2.	Project-based learning encourages students to approach technical tasks with increased creativity and innovation.	3.80	HE	3.72	HE
3.	Students are more capable of identifying problems and generating solutions as a result of participating in PBL.	3.80	HE	3.68	HE
4.	Project-based learning fosters independent thinking and decision-making skills among students.	4.00	HE	3.85	HE
5.	Students demonstrate an increased capacity for innovative thinking when working on technical projects.	3.83	HE	3.69	HE
	Mean	3.86	HE	3.73	HE

****Legend: 3.26-4.00-Highly Evident; 2.51-3.25- Evident; 1.76-2.50 –Slightly Evident; 1.00-1.75 – Not Evident*

The findings indicated that project-based learning (PBL) is perceived as a highly effective approach in strengthening technical vocational education by significantly enhancing students' problem-solving and critical thinking abilities. With a combined category means of 3.80, the respondents from both groups recognize PBL's role in fostering these essential higher-order thinking skills, which are crucial for adapting to the rapidly evolving technological landscape and industry demands. This underscores the importance of integrating PBL into vocational curricula to promote active learning environments where students are encouraged to analyze real-world problems, develop creative solutions, and critically evaluate their work. The development of these cognitive skills not only improves students' academic outcomes but also prepares them to become more adaptable and innovative in their future careers.

This aligns with the findings of Nguyen and Pham (2022), who found that PBL activities fostered higher levels of analytical thinking and strategic problem-solving, which are vital for technical proficiency and workplace success. This evidence suggests that incorporating PBL into vocational training programs can lead to more competent, adaptable graduates capable of addressing complex industry issues.

Table 1.4 manifests the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of quality and authenticity of final projects.

Table 1.4 *Mean of the Respondents' Assessment on the Level of Project-Based Learning in Strengthening Technical Vocational Education for Quality Learning in terms of Quality and Authenticity of Final Projects*

	Indicators	*Teachers*		*Students*	
		Mean	*VI*	*Mean*	*VI*
1.	Project-based learning significantly improves the overall quality of students' final technical vocational projects.	3.90	HE	3.78	HE
2.	Students' final projects demonstrate a high level of creativity and innovation due to project-based learning.	3.90	HE	3.78	HE
3.	The authenticity of students' final projects increases when they engage in real-life problem-solving through PBL.	3.87	HE	3.83	HE
4.	Final projects from PBL activities are of higher technical precision and craftsmanship compared to traditional methods.	4.00	HE	3.95	HE
5.	The final outputs of project-based learning are more relevant to current industry needs and technological advances.	3.93	HE	3.89	HE
	Mean	3.92	HE	3.84	HE

****Legend: 3.26-4.00-Highly Evident; 2.51-3.25- Evident; 1.76-2.50 –Slightly Evident; 1.00-1.75 – Not Evident*

Table 1.4 manifests the assessment of the two groups of respondents on the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of quality and authenticity of final projects. The findings indicate that respondents perceived the impact of project-based learning on strengthening technical vocational education for quality learning as highly evident, as evidenced by the combined category means of 3.88 from both participants. The findings indicated that project-based learning (PBL) is perceived as highly effective in enhancing the quality and authenticity of final projects in technical vocational education. With a combined category means of 3.88 from both respondent groups, it implies that PBL facilitates the creation of more meaningful, real-world-worthy outputs that reflect actual industry standards and practices. This highlights the importance of integrating PBL into vocational curricula to promote deeper engagement with authentic tasks that mirror real challenges faced in the workplace. By emphasizing genuine, high-quality project outputs, educators can better prepare students for the demands of the industry and ensure that their skills and knowledge are practically applicable, thereby elevating the overall quality of technical vocational education.

The study of Lopez and Garcia (2022) found that the authenticity of student projects significantly increased engagement, motivation, and perceived relevance, leading to a higher quality of learning outcomes. These projects serve as practical demonstrations of students'

skills and understanding, providing both learners and educators with valuable insights into the students' readiness for professional practice. Encouraging the development of authentic and high-quality final projects through PBL thus holds critical implications for improving the credibility and industry-readiness of technical vocational education, emphasizing the need for curriculum designs that prioritize real-world relevance and skill application.

Table 1.5 presents a summary of the level of project-based learning in strengthening technical vocational education for quality learning, as assessed by the two groups of respondents.

Table 1.5 *Summary of the Mean of the Respondents' Assessment on the Level of Project-Based Learning in Strengthening Technical Vocational Education for Quality Learning*

Indicators	*Teachers*		*Students*	
	Mean	*VI*	*Mean*	*VI*
Student Engagement and Motivation	3.95	HE	3.74	HE
Practical and Technical Skills	3.92	HE	3.80	HE
Problem-Solving and Critical Thinking Abilities	3.86	HE	3.73	HE
Quality and Authenticity of Final Projects	3.92	HE	3.84	HE
Composite Mean	3.91	HE	3.78	HE

****Legend: 3.26-4.00-Highly Evident; 2.51-3.25- Evident; 1.76-2.50 –Slightly Evident; 1.00-1.75 – Not Evident*

Table 1.5 shows the assessment of the two groups of respondents on the summary of the level of project-based learning in strengthening technical vocational education for quality learning. The findings show that the summary of the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents as highly evident as supported by the combined category means of both participants, which is 3.84.

The findings indicated that project-based learning (PBL) significantly contributes to strengthening technical vocational education, leading to higher quality learning outcomes, as evidenced by the combined category mean of 3.84. This high rating from both respondent groups indicates widespread recognition of PBL's effectiveness in fostering practical skills, critical thinking, and real-world competence among vocational students. These implications emphasize the importance of embedding PBL into curricula to promote experiential learning, which aligns with industry needs and prepares students more effectively for employment. By prioritizing PBL strategies, educational institutions can enhance student engagement, improve skill acquisition, and ensure that graduates possess the competencies necessary to succeed in dynamic technological environments.

Recent research further supports these implications, highlighting that PBL approaches not only improve technical skills but also cultivate essential soft skills such as teamwork, communication, and adaptability, which are critical for workplace success. For instance, Zhang and Lee (2022) found that students engaged in project-based activities demonstrated higher levels of motivation and a deeper understanding of their technical subjects, leading to more comprehensive learning outcomes. These findings imply that policymakers and educators should continue to promote and scale up PBL initiatives, ensuring that vocational programs are rooted in authentic, practice-oriented experiences that elevate the overall quality of technical education and better meet the evolving demands of industry.

Problem No. 2: Is there a significant difference in the assessment of the two groups of respondents on the level of project-based learning in strengthening technical vocational education for quality learning?

Table 2 delineates the significant difference in the assessment of the two groups of respondents on the level of project-based learning in strengthening technical vocational education for quality learning.

Table 2. *Difference in the Assessment of the Two Groups of Respondents on the Level of Project-Based Learning in Strengthening Technical Vocational Education for Quality Learning*

Indicators	*Paired Differences*					*t*	*df*	*Sig. (2-tailed)*	*Decision Ho*	*Interpretation*
Teachers Students	*Mean*	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*						
				Lower	*Upper*					
Student Engagement and Motivation	.39167	.50294	.09182	.20387	.57947	4.265	29	.000	R	S
Practical and Technical Skills	.18333	.47766	.08721	.00497	.36170	2.102	29	.044	R	S
Problem-Solving and Critical Thinking Abilities	.26667	.53310	.09733	.06760	.46573	2.740	29	.010	R	S
Quality and Authenticity of Final Projects	.14167	.36367	.06640	.00587	.27746	2.134	29	.041	R	S
Overall	.24467	.32142	.05868	.12465	.36469	4.169	29	.000	R	S

Table 2 illustrates the significant difference in the assessment of the two groups of respondents on the level of project-based learning in strengthening technical vocational education for quality learning. The data show that the computed probability values are all less than the 0.05 level of significance; therefore, the null hypotheses are rejected. This means that there is a significant difference in the assessment of the two groups of respondents on the level of project-based learning in strengthening technical vocational education for quality learning in terms of student engagement and motivation, practical and technical skills, problem-solving and critical thinking abilities, and quality and authenticity of final projects.

The significant differences identified between the two respondent groups in their assessment of project-based learning (PBL) indicate that perceptions and evaluations of PBL's effectiveness in strengthening technical vocational education may vary based on factors such as experience, role, or background. These findings imply that stakeholders in vocational education, whether teachers, administrators, or students—may hold differing viewpoints on the impact of PBL in areas such as student engagement, motivation, practical skills, problem-solving, and the authenticity of final projects. Recognizing these differences is crucial for the development of tailored strategies that promote more cohesive implementation and acceptance of PBL practices. It also highlights the need for targeted professional development and interventions that align perceptions and foster a shared understanding of the value and application of PBL in enhancing the quality of technical education.

This finding aligns with a study by Santos and Rivera (2022), which found that educators and industry professionals sometimes perceive PBL's benefits differently, depending on their exposure and familiarity with the pedagogical approach. Their study emphasizes the importance of addressing these perceptual differences through collaborative efforts, training, and ongoing evaluation to maximize PBL's potential in improving educational outcomes. Such insights underscore the necessity of a holistic approach to PBL integration, considering diverse stakeholder perspectives to optimize its effectiveness and ensure consistent, high-quality implementation across vocational training programs.

Problem No. 3: What is the extent of project-based learning in strengthening technical vocational education for workforce readiness as assessed by the two groups of respondents in terms of alignment with industry standards and needs, application of knowledge in real-world contexts, development of soft skills and work readiness traits, and post-program employment?

Table 3.1 presents the extent of project-based learning in strengthening technical vocational education for workforce readiness as assessed by the two groups of respondents in terms of alignment with industry standards and needs.

Table 3.1 *Mean of the Respondents' Assessment on the Extent of Project-Based Learning in Strengthening Technical Vocational Education for Workforce Readiness in Terms of Alignment with Industry Standards and Needs*

	Indicators	*Teachers*		*Students*	
		Mean	*VI*	*Mean*	*VI*
1.	Project-based learning greatly enhances students' readiness to meet current industry standards and requirements.	3.93	GE	3.73	GE
2.	The skills developed through PBL closely align with the competencies required by industry employers.	3.90	GE	3.65	GE
3.	The incorporation of industry-relevant projects in PBL significantly bridges the gap between education and actual job market needs.	3.97	GE	3.73	GE
4.	Students engaged in project-based learning are more adaptable to changing industry demands.	3.93	GE	3.80	GE
5.	The use of industry-specific projects in PBL substantially increases students' workforce readiness.	3.93	GE	3.72	GE
	Mean	3.93	GE	3.73	GE

****Legend: 3.26-4.00-Greatly Extent; 2.51-3.25- Extent; 1.76-2.50 –Moderately Extent; 1.00-1.75 – Not at All*

Table 3.1 presents the assessment of the two groups of respondents on the extent of project-based learning in strengthening technical vocational education for workforce readiness in terms of alignment with industry standards and needs. The findings show that the respondents assessed the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of quality and authenticity of final projects as great extent as supported by the combined category means of both participants which is 3.83.

The findings indicated that respondents perceive project-based learning (PBL) as having a substantial impact on enhancing the quality and authenticity of final projects in technical vocational education, with a combined mean score of 3.83. This underscores the potential of PBL to promote meaningful, real-world application of skills, thus elevating the overall educational experience and ensuring that students produce outputs that reflect genuine industry standards. These implications suggest that integrating PBL more deeply into vocational curricula can serve as a vital strategy for improving the credibility and relevance of student outputs, ultimately leading to a more competent and workforce-ready graduating cohort. Emphasizing authentic project work through PBL encourages students to develop practical skills while fostering ownership of their learning, which can translate into higher employability and better industry alignment.

According to Chen and Li's (2023) study, authentic project assignments not only motivate students but also better prepare them for workplace challenges by requiring the application of real-world tasks. These findings imply that educators and curriculum developers

should prioritize creating opportunities for students to engage in authentic, industry-aligned projects, thereby reinforcing the practical significance of PBL.

Table 3.2 exhibits the extent of project-based learning in strengthening technical vocational education for workforce readiness as assessed by the two groups of respondents in terms of application of knowledge in real-world contexts.

Table 3.2 *Mean of the Respondents' Assessment on the Extent of Project-Based Learning in Strengthening Technical Vocational Education for Workforce Readiness in Terms of Application of Knowledge in Real-World Contexts*

	Indicators	*Teachers*		*Students*	
		Mean	*VI*	*Mean*	*VI*
1.	Project-based learning greatly enhances students' ability to apply theoretical knowledge to real-world work scenarios.	4.00	GE	3.87	GE
2.	Students working on PBL activities demonstrate a higher proficiency in applying learned skills in practical, real-life situations.	3.97	GE	3.60	GE
3.	PBL effectively bridges the gap between classroom theory and industry practice by emphasizing real-world applications.	4.00	GE	3.59	GE
4.	The applications of knowledge developed through PBL prepare students adequately for the demands of actual job tasks.	4.00	GE	3.58	GE
5.	PBL enhances students' understanding of how to solve real-world problems using their technical skills.	4.00	GE	3.81	GE
	Mean	3.99	GE	3.66	GE

****Legend: 3.26-4.00-Greatly Extent; 2.51-3.25- Extent; 1.76-2.50 –Moderately Extent; 1.00-1.75 – Not at All*

Table 3.2 exhibits the assessment of the two groups of respondents on the extent of project-based learning in strengthening technical vocational education for workforce readiness in terms of application of knowledge in real-world contexts. The findings indicate that respondents evaluated the effectiveness of project-based learning in enhancing technical vocational education for quality learning, as perceived by both groups, in terms of applying knowledge in real-world contexts to a great extent. This is supported by the combined category means of both participants, which stands at 3.83. The findings indicated that PBL encourages students to transfer their theoretical understanding into practical situations, which is crucial for developing industry-ready professionals. The implication is that integrating PBL more deeply into vocational curricula can foster experiential learning, bridging the gap between classroom instruction and real-world applications. Such an approach not only strengthens students' practical skills but also boosts their confidence and preparedness to address actual workplace challenges, ultimately improving the overall quality of vocational training.

Recent literature supports these implications by emphasizing the importance of experiential and applied learning in vocational education. For instance, Williams and Mendez (2022) found that projects rooted in real-world scenarios significantly improved students' problem-solving skills and their ability to transfer classroom knowledge to workplace tasks. This evidence underscores that PBL, when aligned with industry practices, enhances students' readiness for real-world application and encourages lifelong learning. Consequently, educators and vocational training institutions should prioritize designing projects that simulate workplace environments, providing students with authentic experiences that reinforce their knowledge and prepare them more effectively for industry demands.

Table 3.3 shows the extent of project-based learning in strengthening technical vocational education for workforce readiness as assessed by the two groups of respondents in terms of development of soft skills and work readiness traits.

Table 3.3 *Mean of the Respondents' Assessment on the Extent of Project-Based Learning in Strengthening Technical Vocational Education for Workforce Readiness in Terms of Development of Soft Skills and Work Readiness Traits*

	Indicators	*Teachers*		*Students*	
		Mean	*VI*	*Mean*	*VI*
1.	Project-based learning greatly enhances students' development of soft skills such as communication, teamwork, and adaptability.	4.00	GE	3.72	GE
2.	Participation in PBL activities significantly improves students' time management and organizational skills.	3.97	GE	3.48	GE
3.	PBL helps students build resilience and the ability to handle work-related stress more effectively.	3.97	GE	3.45	GE
4.	The application of PBL results in the development of key employability traits such as dependability and professionalism.	3.97	GE	3.43	GE
5.	Students involved in PBL demonstrate increased confidence and readiness to participate in work environments.	4.00	GE	3.68	GE
	Mean	3.98	GE	3.52	GE

****Legend: 3.26-4.00-Greatly Extent; 2.51-3.25- Extent; 1.76-2.50 –Moderately Extent; 1.00-1.75 – Not at All*

Table 3.3 exhibits the assessment of the two groups of respondents on the extent of project-based learning in strengthening technical vocational education for workforce readiness in terms of development of soft skills and work readiness traits. The findings show that the respondents assessed the level of project-based learning in strengthening technical vocational education for quality learning as assessed by the two groups of respondents in terms of development of soft skills and work readiness traits as great extent as supported by the combined category means of both participants which is 3.75. The findings indicated that respondents perceive project-based

learning (PBL) as highly effective in promoting the development of soft skills and work readiness traits among students in technical vocational education, with a combined mean score of 3.75. This implies that PBL not only enhances technical competencies but also cultivates essential soft skills such as communication, teamwork, time management, and problem-solving, which are crucial for employment success. The implications are clear: integrating PBL more extensively into vocational curricula can significantly prepare students for the realities of the workplace, fostering traits that contribute to their adaptability and effectiveness in professional settings. Enhancing these traits through authentic project experiences can lead to more confident, competent graduates who are better equipped to meet industry expectations and thrive in their careers.

According to the study of Johnson and Lopez (2023), students engaged in collaborative, real-world projects demonstrated improved communication, teamwork, and problem-solving competencies, leading to higher employability and job performance. This evidence underscores the importance of embedding PBL into vocational training to produce well-rounded individuals capable of integrating technical skills with essential interpersonal and professional traits. As industries increasingly value these soft skills, educational institutions must prioritize PBL approaches that simulate real workplace environments, ensuring students graduate with both the technical proficiency and work-ready traits necessary for success.

Table 3.4 manifests the extent of project-based learning in strengthening technical vocational education for workforce readiness as assessed by the two groups of respondents in terms of post-program employment.

Table 3.4 *Mean of the Respondents' Assessment on the Extent of Project-Based Learning in Strengthening Technical Vocational Education for Workforce Readiness in Terms of Post-Program Employment*

	Indicators	*Teachers*		*Students*	
		Mean	*VI*	*Mean*	*VI*
1.	Project-based learning greatly increases students' chances of securing employment immediately after program completion.	3.97	GE	3.67	GE
2.	Students who participate in PBL are more likely to find employment relevant to their field after completing the program.	3.80	GE	3.48	GE
3.	PBL provides students with practical skills that significantly improve their employability in the workforce.	3.70	GE	3.43	GE
4.	The skills and experience gained through PBL make students more competitive job applicants.	3.70	GE	3.40	GE
5.	Students working on real-world projects through PBL demonstrate skills that employers highly value, increasing their prospects for employment.	4.00	GE	3.65	GE
	Mean	3.79	GE	3.49	GE

****Legend: 3.26-4.00-Greatly Extent; 2.51-3.25- Extent; 1.76-2.50 –Moderately Extent; 1.00-1.75 – Not at All*

Table 3.4 manifests the assessment of the two groups of respondents on the extent of project-based learning in strengthening technical vocational education for workforce readiness in terms of post-program employment. The findings indicate that respondents evaluated the impact of project-based learning on enhancing technical vocational education for quality learning, as assessed by both groups, in terms of post-program employment. This assessment is supported by the combined category means of both participants, which stands at 3.64. The findings indicated that project-based learning (PBL) is perceived as highly effective in enhancing post-program employment prospects for students in technical vocational education, as reflected by the combined mean score of 3.64. This indicates that PBL not only fosters relevant technical and soft skills but also equips students with practical experience and confidence that facilitate smoother transitions into the workforce. The implication is that integrating PBL more systematically into vocational programs can significantly improve students' employability by providing authentic, industry-aligned projects that mirror real job requirements. Such experiential learning prepares students to meet employer expectations, ultimately contributing to higher employment rates and more career-ready graduates.

The recent studies of Martinez and Singh (2022) found that students who engaged in project-based internships and capstone projects demonstrated higher employment rates and faster employment start post-graduation times compared to traditional learning approaches. This evidence underscores the importance of embedding PBL in curricula as a strategic effort to enhance workforce readiness. By focusing on industry-relevant projects, educational institutions can better bridge the gap between academic learning and job market demands, thereby improving the transition from education to meaningful employment and fostering sustainable career development for vocational students.

Table 3.5 shows the summary of the extent of project-based learning in strengthening technical vocational education for workforce readiness.

Table 3.5 presents the assessment of the two groups of respondents regarding the summary of the extent to which project-based learning strengthens technical vocational education for workforce readiness. The findings indicate that the summary of project-based learning's impact on enhancing technical vocational education for workforce readiness, as assessed by the two respondent groups, is considered to be of great significance. This assessment is supported by the combined category means of both participants, which is 3.76. The findings indicated that project-based learning (PBL) is perceived as significantly effective in enhancing workforce readiness among students in technical vocational education, with a combined mean score of 3.76.

Table 3.5 *Summary of the Mean of the Respondents' Assessment on the Extent of Project-Based Learning in Strengthening Technical Vocational Education for Workforce Readiness*

Indicators	*Teachers*		*Students*	
	Mean	*VI*	*Mean*	*VI*
Alignment with Industry Standards and Needs	3.93	GE	3.73	GE
Application of Knowledge in Real-World Contexts	3.99	GE	3.66	GE
Development of Soft Skills and Work Readiness Traits	3.98	GE	3.52	GE
Post-Program Employment	3.79	GE	3.49	GE
Composite Mean	3.92	GE	3.60	GE

****Legend: 3.26-4.00-Highly Evident; 2.51-3.25- Evident; 1.76-2.50 –Slightly Evident; 1.00-1.75 – Not Evident*

This implies that PBL plays a crucial role in equipping students with practical skills, problem-solving abilities, and industry-relevant competencies necessary for successful entry into the workforce. The implications point towards the importance of integrating PBL across vocational programs to foster hands-on experiences that mirror real-world work environments, thus ensuring students are not only knowledgeable but also prepared to meet immediate industry demands. Promoting PBL as a core instructional approach can help bridge the gap between academic learning and employment, cultivating graduates who are confident, capable, and ready to contribute effectively to their chosen fields.

It goes with the findings of Nguyen et al. (2022) demonstrate that students engaged in industry-contextual projects exhibited higher levels of employability skills, including teamwork, adaptability, and technical competence. This evidence emphasizes that embedding such practical learning strategies within vocational education can lead to better employment outcomes and support sustainable career development. Consequently, policymakers and educators should consider expanding PBL initiatives to foster a culture of experiential learning, aligning educational experiences closely with industry expectations and workforce demands.

Problem No. 4: Is there a significant difference in the assessment of the two groups of respondents on the extent of project-based learning in strengthening technical vocational education for workforce readiness?

Table 4 delineates the significant difference in the assessment of the two groups of respondents on the extent of project-based learning in strengthening technical vocational education for workforce readiness.

Table 4. *Difference in the Assessment of the Two Groups of Respondents on the Extent of Project-Based Learning in Strengthening Technical Vocational Education for Workforce Readiness*

Indicators	*Paired Differences*					*t*	*df*	*Sig. (2-tailed)*	*Decision Ho*	*Interpretation*
Teachers Students	*Mean*	*Std. Deviation*	*Std. Error Mean*	*95% Confidence Interval of the Difference*						
				Lower	*Upper*					
Alignment with Industry Standards and Needs	.21667	.45832	.08368	.04553	.38781	2.589	29	.015	R	S
Application of Knowledge in Real-World Contexts	.49167	.34418	.06284	.36315	.62019	7.824	29	.000	R	S
Development of Soft Skills and Work Readiness Traits	.43333	.39355	.07185	.28638	.58029	6.031	29	.000	R	S
Post-Program Employment	.36667	.48126	.08787	.18696	.54637	4.173	29	.000	R	S
Overall	.37667	.19370	.03536	.30434	.44900	10.651	29	.000	R	S

Table 4 illustrates the significant difference in the assessment of the two groups of respondents on the extent of project-based learning in strengthening technical vocational education for workforce readiness. The data show that the computed probability values are all less than the 0.05 level of significance; therefore, the null hypotheses are rejected. This means that there is a significant difference in the assessment of the two groups of respondents on the extent of project-based learning in strengthening technical vocational education for workforce readiness in terms of alignment with industry standards and needs, application of knowledge in real-world contexts, development of soft skills and work readiness traits, and post-program employment. The rejection of the null hypotheses indicates a significant difference in how the two groups of respondents perceive the extent to which project-based learning (PBL) strengthens technical vocational education for workforce readiness. This implies that perceptions of PBL's effectiveness may vary based on factors such as experience, role, or familiarity with industry expectations. These differences highlight the need for targeted professional development and curriculum alignment efforts to ensure consistency in the application and perception of PBL's benefits. Addressing such perceptual gaps can enhance collaborative efforts among educators, industry partners, and policymakers to effectively integrate PBL strategies that are aligned with industry standards, ensuring that all stakeholders share a common understanding and commitment

to preparing students for real-world challenges.

In the study by Chen and Nguyen (2022), it was found that collaborative curriculum design involving industry stakeholders and educators led to more relevant PBL activities, which improved students' application of knowledge and soft skills in workplace simulations. This evidence emphasizes that addressing perceptual differences through stakeholder engagement and continuous curriculum review can optimize PBL's impact on workforce preparedness. Such strategies ensure that vocational education remains responsive to evolving industry demands, ultimately producing graduates who are competent, adaptable, and well-prepared for employment.

Problem No. 5: Is there a significant relationship between Project-Based Learning in strengthening technical vocational education for quality learning and workforce readiness?

Table 5 presents the significant relationship between Project-Based Learning in strengthening technical vocational education for quality learning and workforce readiness.

Table 5. *Relationship Between Project-Based Learning in Strengthening Technical Vocational Education for Quality Learning and Workforce Readiness*

Indicators		*Pearson r*	*Sig*	*Ho*	*VI*
Level of PBL in Strengthening TVE for Quality Learning	Extent of PBL in strengthening TVE for Workforce Readiness	.326	.000	R	S

****Legend: FR-Failed to Reject; R-Rejected; NS-Not Significant; S-Significant*

Table 5 presents the significant relationship between Project-Based Learning in strengthening technical vocational education for quality learning and workforce readiness. The data show that the computed probability value is less than the 0.05 level of significance; therefore, the null hypothesis is rejected. This means that there is a significant relationship between Project-Based Learning in strengthening technical vocational education for quality learning and workforce readiness. Pearson's r correlation between Project-Based Learning and the strengthening of technical vocational education for quality learning and workforce readiness is 0.326, indicating a low positive correlation. The findings indicated a significant relationship between project-based learning (PBL) and its contribution to strengthening technical vocational education for workforce readiness, as evidenced by the probability value being less than 0.05 and a Pearson 'r' of .326. Although this correlation is categorized as low, it still signifies a positive association, suggesting that increased engagement in PBL can positively influence students' preparedness for the workforce. This implies that educators and policymakers should prioritize the integration of PBL into vocational curricula, as even a modest positive relationship can accumulate into meaningful improvements in practical skills, industry alignment, and soft skills development, all of which are critical for effective workforce entry. Recognizing the importance of this relationship supports ongoing efforts to enhance practical, real-world learning experiences that directly impact students' transition from education to employment.

This goes with the study of Lopez and Chen (2022) reported that students participating in industry-oriented PBL activities demonstrated notable improvements in skills such as teamwork, problem-solving, and adaptability—attributes highly sought after by employers. These findings reinforce that while the correlation may be low, its positive impact is substantial enough to justify continued and expanded use of PBL strategies within vocational training. Therefore, ongoing refinement and scaling of PBL initiatives, coupled with industry collaboration, can significantly contribute to producing graduates who are not only technically competent but also highly prepared to meet workplace demands.

Conclusions

As can be deduced from the findings, the conclusions drawn from the study:

Project-based learning improves technical vocational education by increasing student engagement and motivation, practical and technical skills, problem-solving and critical thinking abilities, and the quality and authenticity of finished products.

Teachers and students have drastically different perspectives on how project-based learning improves technical vocational education for quality learning.

Project-based learning significantly improves technical vocational education for preparing students for jobs by aligning what they learn with what industries require, allowing them to apply their knowledge in real-world situations, developing soft skills and work traits, and increasing their chances of finding work after the program.

There is a significant discrepancy in the evaluation of PBL's efficacy by teachers and students in Project-Based Learning in Strengthening Technical Vocational Education for Workforce Readiness.

Project-based learning shows a substantial association between learning quality and workforce preparedness.

As an outcome of the findings and the conclusions, the following recommendations were enumerated:

Teachers may design industry-relevant, hands-on projects that align with current industry standards to facilitate practical skill

development and experiential learning. Incorporate real-world challenges to increase student engagement and motivation.

Teachers may Provide professional development opportunities focused on effective PBL facilitation, assessment strategies, and integrating soft skills development into technical projects to enhance teaching effectiveness.

Teachers may foster collaborative learning environments by encouraging teamwork, peer assessment, and reflective practices to strengthen soft skills and target workforce readiness.

Students may actively participate in industry partnerships and project collaborations to gain insights into workplace expectations and develop problem-solving, communication, and teamwork skills.

Students may embrace a growth mindset by viewing PBL as an opportunity to learn from real-world mistakes, thereby strengthening resilience, adaptability, and lifelong learning traits

School administrators may allocate resources and infrastructure, such as tools, materials, and technology, necessary for implementing effective PBL activities that simulate real work environments.

A parallel study may be conducted using different variables.

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