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Project-Based Learning Approach, Productive Competence, and Learning Engagement of the Bachelor of Technical-Vocational Teacher Education (BTVTED) Students

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Abstract

Aim: This study determined the relationship between the utilization of a project-based learning (PBL) approach as perceived by the students, the level of productive competence, and the level of learning engagement of the Bachelor of Technical-Vocational Teacher Education (BTVTED) students.

Methodology: This study used a descriptive-correlational design using surveys to determine the relationship between students' perception of the utilization of the project-based learning approach, productive competence, and learning engagement of the BTVTED students. This study was conducted at Tanauan City College from September to December 2023 with 64 respondents. Purposive sampling was employed and considered the total enumeration of the students with the criteria that they are 3rd year BTVTED college students who were enrolled in any technical/specialized courses.

Results: The PBL Approach was not significantly associated with productive competencies. However, some PBL approaches may be more effective in developing specific productive competencies than others. Moreover, the PBL Approach was validated by the significant relationship between the utilization of the PBL approach as perceived by the students and the level of the learning engagement of the BTVTED college students, hence remarkably improving their productive competencies. Thus, the students undergoing the utilization of the PBL approach have considerably higher learning engagement in task and learning processes.

Conclusion: There was no correlation between the PBL approach and productive competence. Thus, the null hypothesis failed to be rejected. Moreover, there was a significant relationship between the utilization of the PBL approach as perceived by the students and the level of learning engagement of the BTVTED college students. Thus, the null hypothesis was rejected.

Keywords: *Project-Based Learning Approach, Productive Competence, Learning Engagement*

INTRODUCTION

The emergence of different products, trades, and services, together with the creativity of the people, paved the way for attention to developing relevant skills and talents to become prevalent. Approaches to developing these skills are different from creating a person's conceptual and intellectual knowledge (Bation & Nambatac, 2024; Cabiling-Ramos, et al., 2024; Carvajal & Sanchez, 2023; Paraiso, et al., 2024; Salendab & Sanchez, 2023). It can be developed through experiential practice and mastery of the trade or skills (Audet, 2018). It makes the different higher education institutions include in their curriculum the development of technical and productive skills of their graduates for employability purposes (Amihan & Sanchez, 2023; Bation, et al., 2024; Salendab, Ocariza-Salendab & Sanchez, 2023; Salendab, et al., 2024a; Sanchez, et al., 2024a). Further, here in the Philippines, because of the emerging needs and relevance of the development of skilled graduates, the Technical Education and Skills Development Authority (TESDA) and the Technical Vocational Education and Training (TVET) were created.

TESDA sets its goals to deliver different programs that are quality-assured and inclusive systems of technical education, skills development, and certification (TESDA, 2022). Presently, TESDA is utilizing the competency-based training (CBT) approach as its foundation for teaching and developing the technical skills of the future workforce.

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Currently, TESDA is doing a great job in achieving its short- and long-term goals, focusing on skills development. Still, the different auxiliaries of accredited institutions failed to deliver this because of their hard time integrating the TESDA curriculum into their own academic curriculum and core values. Teaching pedagogies became the subject of almost all professional development programs for the instructors (Amihan, Sanchez & Carvajal, 2023; Sanchez, 2020; Sanchez, 2023a; Sanchez, et al., 2024b; Sanchez, et al., 2022). Another reason for the emerging decline in the competence level of HEI students taking technical-vocational training is the fast-growing technology. The teaching and training pedagogies cannot cope with the industry standards and, possibly worse, with the future standards. Therefore, there is a need to intensify TVET-related programs in Higher education institutions. One of these examples is the Bachelor of Technical Vocational Teacher Education (BTVTED) Program. Per CHED Memorandum No. 79, s. 2017, the BTVTED program aims to train teachers in TLE for 9th and 10th grades, as well as senior high school, specifically for the technical-vocational-livelihood (TVL) track and technical-vocational education and training (TVET). It is a program that equips learners with adequate and relevant competencies in teaching the four areas of the TVL track in senior high school.

The researchers found these key points to be an integral part of conducting a study. How well are the students of the HEIs under TVET-related programs, specifically the BTVTED Program at Tanauan City College (TCC), an HEI at Tanauan City, coping with the current industry standards and pedagogy with regard to the development of their technical and productive competencies? What strategy can be utilized to develop their technical and productive competencies further? These two (2) questions posit an inquiry and intuition for the researcher to conduct this study. Moreover, the researchers understand the importance of the learners' competencies but also consider the root cause, which is the future teachers and instructors of TVET/technical programs. Developing the competency level of future teachers, instructors, and trainers through intensified and relevant educational strategies and programs will echo or reflect on future students and trainees.

During the past century, formal education grew. Many went on to get bachelor's and master's degrees and acquire high-paying white-collar jobs (Carvajal & Sanchez, 2024; Carvajal, et al., 2024a; Sanchez, et al., 2024c; Sanchez & Sarmiento, 2020). Relatedly, higher education programs in technical vocational education and training (TVET) are often overlooked, yet they demand specific skills, physical strength, and technical expertise (Hoftijzer et al., 2020). TVET-related HEI programs were understood to be comprised of education, training, and skills development related to occupational fields and livelihoods (UNESCO, 2015). It implies that it is essential to develop TVET to prepare students for the future workforce (Atienza, 2022). According to Gay (2016), the shortage of skills and lack of employment are problems nowadays. Thus, developing necessary skills among students enrolled in TVET-related HEI programs is gravely essential and an urgent matter that needs to be addressed. It will provide the means to bridge the gaps between school and industry because of the hands-on delivery, competency-based curriculum, and outcome-based education.

Moreover, it will serve as a critical factor in their career and employment (Atienza, 2022). However, fostering the skills needed by the students as mandated in the industry is a challenging task. It requires proper planning and adaptation of strategies and methods. Due to this, strategic planning of instructions must be implemented so that students can acquire a more comprehensive understanding of reality and concrete and relevant learning experiences. By employing strategic planning in the context of education and school improvement, achieving the short- and long-term goals will be successful (Carvalho, 2022). One of these is the utilization of project-based learning models (Porter, 2021).

Project-based learning (PBL) is an educational approach where students gain knowledge by diving into hands-on projects that are relevant to the real world and personally significant (Buck Institute for Education, 2022). It blends understanding and action, enabling students to not only grasp theoretical knowledge and core curriculum components but also to apply their learning in addressing real-world issues and generating tangible outcomes (Du & Han, 2016; Gulmez, 2018). Students gain knowledge and skills by working for an extended period to investigate and respond to an authentic, engaging, and complex question, problem, or challenge. This model is very applicable to the TVET students since authentic and real-life problems should be exposed to them while in school to prepare them for their future jobs (UNESCO, 2015). Additionally, it serves as an efficient method for cultivating skills essential for the 21st century, such as enhancing critical thinking and problem-solving abilities, fostering interpersonal communication, advancing information and media literacy, encouraging collaboration, leadership, and teamwork, and promoting innovation and creativity (Hakkinen et al., 2017; Sharma et al., 2020).

Furthermore, according to Almulla (2020), PBL consists of four (4) primary components: collaborative learning, disciplinary topic learning, authentic learning, and iterative learning. Almulla's study focused on important aspects that showed how the PBL approach increased student involvement. Research demonstrates that this method

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prepares students for the variety and complexity of everyday life (Almulla, 2020; Hakkinen et al., 2016; Kokotsaki et al., 2016). Using the definitions and key themes provided, it is possible to conclude that PBL is primarily concerned with helping students develop their competencies or sets of knowledge and skills.

Competencies typically refer to the practical skills and knowledge that allow individuals to succeed in their careers, education, and other aspects of life (Gosselin, 2020; Muńoz & Sanchez, 2023; Salendab, et al., 2024b; Sanchez, 2022; Sanchez, 2023b; Sanchez, et al., 2024d; Sanchez, Sanchez & Sanchez, 2023). It means the capability of the students to use their learned skills and knowledge in their chosen specialization or the context of their lives or jobs. Implementing a project-based learning approach can also play a key role in building the skills of BTVTED students. One of these essential competencies that is related to the PBL, which was defined above as the ability to produce projects/materials, is productive competence.

Productive competence can be defined as the ability of the students to produce products, projects, or materials in the educational context up to the extent of handling machines/equipment in a job-related context (Bakar, 2014; Jalinus et al., 2017). According to Jalinus et al. (2017), students can be assessed as competent in the production of their projects/outputs in the following indicators of productive competence: identification of problems/challenges, making proposals, execution of tasks/projects, and making reports.

In Indonesia, Ramli (2015) carried out research to explore how teacher performance impacts the practical skills of vocational high school students. Based on his productive competency assessment, he found out that the Indonesian Vocational High School students still have a fraction that needs improvement in their productive competence, with a score of 70.40. Furthermore, in India, Jalinus and colleagues (2017) discovered that the average scores for the practical skills evaluation of vocational students from two examined schools were 66.62 and 62.3, respectively. The studies of Ramli of Indonesia and Jalinus et al. of India showed the emerging decline in the level of productive competence of vocational students.

On the other hand, in the Philippines, specifically at Tanauan City College (TCC), according to the observation of the TCC professors to their BTVTED students enrolled at TCC specializing in TVET courses, most of the students failed to have satisfactory competence in productive, technical, communication and attention to detail because of the current modality being utilized by the institution which is the blended learning as a response to the new normal of education. The said competencies belong to the top competencies that the industry needs (WorkClout, 2021). Furthermore, only some of the productive competencies (Jalinus, 2017) are in their syllabus since it was designed for an outcome-based learning and blended learning modality. The data mentioned above in Indonesia, India, and the Philippines, specifically at Tanauan City College, showed an emerging problem regarding the level of productive competence of the BTVTED students. It is also good to note that according to the data presented by WorkClout (2021), the National Association of Manufacturers estimated that there will be a total of 2.2 million jobs available between 2012 and 2023, and these jobs need productive and technical competence.

Since there is a need for the improvement of productive competence of the TVET-related HEIs programs, specifically the BTVTED program, the researcher opted to conduct this study. According to Almulla (2020), the Project-Based Learning Model enhances students' engagement. This model is prevalent in academic/core subjects/students but not in TVET-related programs/courses and students where skills and competencies are essential. Moreover, Jalinus et al. (2017) proved that there their seven steps of PBL are practical in TVET/vocational students but not the PBL model of Almulla (2020). However, the researcher has yet to encounter a study that focuses on the integration of the PBL model of Almulla (2020) to enhance the productive competencies of Jalinus et al. (2017) for the TVET-related HEIs programs/college students. It highlights the research or literature gap that the study aims to address. Therefore, the researcher plans to concentrate on how incorporating a project-based learning approach can improve the practical skills of BTVTED students.

Objectives

This study determined how students' views on the utilization of a project-based learning approach relate to the productive competencies and learning engagement of BTVTED college students. Specifically, it sought to answer the following.

1. How do the BTVTED college students perceive the utilization of a project-based learning approach:
   1.1. authentic learning;
   1.2. collaborative learning;
   1.3. disciplinary subject learning, and
   1.4. iterative learning?

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2. What is the level of productive competence of the BTVTED college students after the utilization of the project-based learning approach in terms of:
   2.1. identifying problems/challenges;
   2.2. making proposal;
   2.3. executing of task/project; and
   2.4. making reports?
3. What is the level of the learning engagement of the BTVTED college students in terms of:
   3.1. academic engagement;
   3.2. participatory engagement;
   3.3. emotional engagement, and
   3.4. agentic engagement?
4. Is there a significant relationship between the perception of the students on the utilization of the project-based learning approach and the level of productive competence of the BTVTED college students?
5. Is there a significant relationship between the perception of the students on the utilization of the project-based learning approach and the level of learning engagement of the BTVTED college students?

Hypotheses

Given the stated research problem, the following null hypotheses were tested on a 0.05 level of significance:
Hypothesis 1: There is no significant relationship between the student's perception of the utilization of the project-based learning approach and the level of productive competence of the BTVTED college students.
Hypothesis 2: There is no significant relationship between the student's perception of the utilization of the project-based learning approach and the level of learning engagement of the BTVTED college students.

METHODS

Research Design

This study used a descriptive-correlational design using surveys to determine the relationship between students' perception of the utilization of the project-based learning approach, productive competence, and learning engagement of the BTVTED students.

Population and Sampling

This study was conducted at Tanauan City College from September to December 2023 with 64 respondents. Purposive sampling was employed and considered the total enumeration of the students with the criteria that they are 3rd year BTVTED college students who are enrolled in any technical/specialized courses.

Research Instrument

The instrument that the researchers used to collect the data was a survey questionnaire. It was chosen because it gathered data faster than any other method. The researchers prepared two (2) suitable relevant questionnaires that were used as a tool to measure the students' perception of the utilization of the project-based learning approach and students' learning engagement. The draft of the questionnaire was drawn out based on his readings, and studies relevant to the present study were reviewed. Then, the questionnaire was submitted to the adviser for correction, after which it was finalized.

The first questionnaire was adopted from Almulla et al. (2020) with secured consent and permission from the authors via email. It was used to measure how BTVTED college students perceived the utilization of the project-based learning approach. It included four (4) leading indicators, namely Authentic Learning, Collaborative Learning, Disciplinary Subject Learning, and Iterative Learning. Each leading indicator had five (5) sub-indicators with a total of twenty (20) indicators/questions, which the respondents rated as being in line with their satisfaction.

Moreover, the second questionnaire aimed to assess the learning engagement level of BTVTED college students. It comprised four primary indicators: Academic Engagement, Participatory Engagement, Emotional Engagement, and Agentic Engagement. Each leading indicator further encompassed five (5) sub-indicators, resulting in a total of twenty (20) indicators/questions. Respondents rated these indicators based on their level of satisfaction.

In addition, the researchers also adapted the instrument made by Jalinus et al. (2017) with secured consent and permission from the authors via email, the Productive Competence Rubric. This rubric was the guide of the

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researcher in coming up with a better rubric that would suit the purpose of the current study. This approach also aided in evaluating the respondents' productive skills following the use of the Project-Based Learning Method. It featured four main indicators and eighteen smaller indicators.

For validation purposes, copies of the questionnaires and the rubric were given to the panel of validators/experts. In addition, since the questions in the instrument were based on different related literature and studies, the establishment of the reliability of the instrument was evident.

The adviser received a draft of the questionnaire and the rubric for comments and corrections. The suggestions of the panel of experts were also considered for the improvement of the questionnaire and rubric. The descriptors used in the questionnaire were the following: for the utilization of the PBL approach, 1 = Not Utilized; 2 = Slightly Utilized; 3 = Moderately Utilized; 4 = Highly Utilized. On the other hand, for the learning engagement, 1 = Not Engaged; 2 = Slightly Engaged; 3 = Moderately Engaged; 4 = Highly Engaged, while a rubric was used as a guide in assessing the productive competence of the students.

Data Collection

The data were gathered, read, and analyzed following the objective of the study and in adherence to all protocols in the conduct of research.

Treatment of Data

The study used descriptive statistics such as frequency count, percentage, mean, and standard deviation to describe the profile of the respondents and the rate of responses towards the project-based learning approach in enhancing productive competence and learning engagement.

Additionally, inferential statistics like Pearson Product-Moment Correlation were employed. Pearson Product-Moment Correlation was used to determine the significant relationship at a 0.05 level between the student's perception of the project-based learning approach, the level of learning engagement, and the level of productive competence of the BTVTED college students.

Ethical Considerations

The study involved collecting students' views and experiences with Project-Based Learning (PBL), which meant addressing ethical concerns to protect participants' privacy and safety. Key ethical considerations during the research included obtaining consent and maintaining confidentiality. The researchers shared all necessary information and goals of the study with participants to get their consent. This approach helped participants understand their part in the study's success. To ensure participants' confidentiality, their names were not revealed. Only information essential for answering the research questions was used. In addition, adopted research instruments and other resources were provided citation and secured consent and permission from the respective authors.

RESULTS and DISCUSSION

The study's results are displayed in tables showing the survey data alongside their interpretations. The data have been examined and explained, allowing for the formulation of conclusions and suggestions based on the research findings. The analysis follows the order in which the research questions were introduced in the opening chapter.

Table 1.

Perception of the Utilization of the PBL Approach to Authentic Learning

Indicators	Mean	SD	Interpretation
1. I apply what I have learned to accomplish challenging projects that are of real-world relevance.	3.47	0.50	Highly Utilized
2. I completed my project, which requires a significant investment of time and intellectual resources.	3.45	0.53	Highly Utilized
3. I create polished products that are valuable rather than as a preparation for something else.	3.28	0.52	Highly Utilized
4. I accomplish authentic tasks that are relevant to my interests as I create meaningful projects.	3.59	0.50	Highly Utilized
5. I engage in complex tasks and higher-order thinking skills in project-based learning.	3.36	0.48	Highly Utilized

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Overall	**3.43**	**0.34**	**Highly Utilized**

4.00-3.25 – Highly Utilized, 3.24-2.50 – Moderately Utilized, 2.49-1.75 – Slightly Utilized, 1.74-1.00 – Not Utilized

Table 1 shows how the respondents perceived the utilization of the PBL approach in terms of Authentic Learning. The table indicates an overall mean of **3.43** with a standard deviation of **0.34**, which is interpreted as **Highly Utilized**. As per the table, most of the respondents agreed with indicator 4, which suggests that they can accomplish authentic tasks that are relevant to their interests by creating meaningful projects. This indicator received the highest mean score of 3.59. Conversely, the respondents agreed the least with the idea that they can create polished products that are valuable rather than just a preparation for something else, as indicated by the lowest mean score of 3.28.

Using PBL, students can apply what they have learned to accomplish challenging projects of real-world relevance, completing endeavors that demand a significant investment of time and intellectual resources. Their focus lies in creating polished products that possess inherent value rather than serving merely as preparation for future endeavors. Engaging in authentic tasks aligned with their interests, students consistently craft meaningful projects while also embracing complex tasks and higher-order thinking skills inherent in project-based learning.

It implies that the PBL approach is beneficial in promoting genuine learning and improving students' Engagement, motivation, and critical thinking abilities. According to Zakaria et al. (2019), the PBL approach is beneficial in promoting genuine learning and improving students' engagement, motivation, and critical thinking abilities. This approach helps to develop students' problem-solving and decision-making abilities, which are essential skills needed for success in academic and professional life (Manuaba et al., 2022; Kurt & Akoğlu, 2023).

Table 2.
Perception of the Utilization of the PBL Approach to Collaborative Learning

Indicators	Mean	SD	Interpretation
1. I attain and satisfy the purpose of the project with equal and distributed efforts from group members.	3.55	0.50	Highly Utilized
2. I accept new challenges and work on different parts of the projects with the help of my peers/classmates.	3.55	0.56	Highly Utilized
3. I enhance my social skills and teamwork when doing group projects/activities.	3.66	0.51	Highly Utilized
4. I develop my confidence and create new friendships when doing group projects/activities.	3.63	0.52	Highly Utilized
5. I explore and experience meaningful learning when doing group projects/activities.	3.66	0.51	Highly Utilized
Overall	**3.61**	**0.33**	**Highly Utilized**

4.00-3.25 – Highly Utilized, 3.24-2.50 – Moderately Utilized, 2.49-1.75 – Slightly Utilized, 1.74-1.00 – Not Utilized

Table 2 presents the respondents' perception of the utilization of the PBL approach in terms of Collaborative Learning. The table shows that the overall mean is **3.61** with a standard deviation of **0.33**, which is interpreted as **Highly Utilized**. Based on the table, most of the respondents agreed with indicators 3 and 5, which suggests that group projects/activities can enhance their social skills and teamwork and help them explore meaningful learning. This indicator received the highest mean score of 3.66. On the other hand, the respondents showed minor agreement with the idea that they can attain the purpose of the project with equal and distributed efforts from group members and can accept new challenges on different parts of the projects with the help of peers, as indicated by the lowest mean score of 3.55.

The utilization of the PBL approach in terms of a collaborative approach helps students to achieve and fulfill the project's purpose through cooperative efforts, ensuring equal contribution from all group members. Embracing new challenges, students can actively engage in various aspects of projects, seeking assistance from peers and classmates as needed. Through participation in group projects and activities, students can refine their social skills and strengthen their ability to work in teams. Such endeavors also foster the development of confidence and the formation of new friendships. In the realm of group projects and activities, students can embark on a journey of exploration and meaningful learning experiences.

The data presented in the table implies that the PBL approach can enhance collaborative learning. It encourages students to work together in small groups to solve complex clinical scenarios, thereby promoting collaborative learning (Carvajal, et al., 2024b; Carvajal, Sanchez & Amihan, 2023; Dizon & Sanchez, 2020). Tan et al.

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(2023) found that PBL helps develop critical thinking, problem-solving, and communication skills, which are crucial for effective Collaborative Learning. Additionally, Kuo et al. (2022) emphasized that PBL offers students opportunities to collaborate on real-world programming projects, thus improving Collaborative Learning. Moreover, according to Baird (2019), PBL is an effective method for promoting Collaborative Learning in higher education as it helps students develop teamwork, communication, and problem-solving skills, which are essential for effective Collaborative Learning.

Table 3.
Perception of the Utilization of the PBL Approach to Disciplinary Subject Learning

Indicators	Mean	SD	Interpretation
1. I improve my information technology (IT) skills when doing school projects.	3.67	0.47	Highly Utilized
2. I develop my higher-order thinking skills when doing challenging projects.	3.45	0.50	Highly Utilized
3. I develop mastery of the subject area content when doing projects.	3.38	0.52	Highly Utilized
4. I develop new experiences and learn in-depth content knowledge when doing projects.	3.61	0.52	Highly Utilized
5. I learn better when doing projects that are meaningful and engaging.	3.69	0.50	Highly Utilized
Overall	**3.56**	**0.34**	**Highly Utilized**

4.00-3.25 – Highly Utilized, 3.24-2.50 – Moderately Utilized, 2.49-1.75 – Slightly Utilized, 1.74-1.00 – Not Utilized

Table 3 presents how the respondents perceived the PBL approach in terms of Disciplinary Subject Learning. The table indicates an overall mean of **3.56** with a standard deviation of **0.34**, which is interpreted as **Highly Utilized**. As per the table, most of the respondents agreed with indicator 5, which suggests that the respondents can learn better when doing projects that are meaningful and engaging. This indicator received the highest mean score of 3.69. Conversely, the respondents agreed the least with the idea that they can develop mastery of the subject area content when doing projects, as indicated by the lowest mean score of 3.38.

The PBL approach, in terms of disciplinary subject learning, can enhance their information technology (IT) skills through the execution of school projects, leveraging each opportunity to broaden their proficiency in the field. Engaging in challenging projects, students can actively cultivate higher-order thinking skills, consistently pushing the boundaries of their cognitive abilities. Mastery of subject area content becomes a natural outcome of their dedication to project work as students learn various topics. Each project undertaken provides students with new experiences and facilitates the acquisition of in-depth content knowledge, contributing to their holistic growth. In addition, students can recognize the value of meaningful and engaging projects as catalysts for enhanced learning experiences, allowing each student to absorb and retain knowledge more effectively.

Based on the table presented, it can be inferred that the respondents strongly agreed that the PBL approach could lead to disciplinary subject learning. Chiang and Lee (2016) conducted studies on how the PBL approach can enhance disciplinary subject learning. They both found that engaging projects and mastery learning are effective in promoting better learning outcomes. Students who engaged in projects aligned with their interests and experiences showed greater motivation and involvement, resulting in improved learning results. Moreover, Lou et al. (2024) conducted a study on PBL and its effectiveness in promoting disciplinary subject learning, particularly in science and engineering fields. The study found that PBL can be a highly effective approach in promoting disciplinary subject learning and suggested that PBL can help students develop the skills, knowledge and attitude necessary to succeed in their field of study.

Table 4.
Perception of the Utilization of the PBL Approach to Iterative Learning

Indicators	Mean	SD	Interpretation
1. I learn and master lessons when I practice them through doing different applications and projects.	3.53	0.50	Highly Utilized
2. I learn by creating knowledge and meaning through	3.42	0.50	Highly Utilized

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repetitive questioning and active learning when doing different projects.			
3. I reflect meaningful knowledge and experiences when I apply what I have learned to create projects.	3.55	0.50	Highly Utilized
4. I receive and accept meaningful feedback from my accomplished projects for the betterment of my performance.	3.69	0.47	Highly Utilized
5. I utilize and adapt the teachers' feedback about my project/outputs for reflection and repetition to develop mastery.	3.56	0.53	Highly Utilized
Overall	**3.55**	**0.34**	**Highly Utilized**

4.00-3.25 – Highly Utilized, 3.24-2.50 – Moderately Utilized, 2.49-1.75 – Slightly Utilized, 1.74-1.00 – Not Utilized

Table 4 presents the respondents' perception of the PBL approach in terms of Iterative Learning. The table shows that the overall mean is **3.55** with a standard deviation of **0.34**, which is interpreted as **Highly Utilized**. Based on the table, most of the respondents agreed with indicator 4, which suggests that the respondents can receive and accept meaningful feedback from my accomplished projects for the betterment of my performance. This indicator received the highest mean score of 3.69. Conversely, the participants expressed limited concurrence with the notion that engaging in various projects and employing continuous questioning and active learning allows for the creation of knowledge and meaning, as evidenced by the minimal average score of 3.42.

PBL Approach in terms of Iterative learning, through the practice of applying lessons in various applications and projects, students can embark on a journey of learning and mastery. By actively engaging in repetitive questioning and active learning during project work, students can create knowledge and imbue it with meaning, fostering a deep understanding of the subject matter. The student's ability to reflect on meaningful expertise and experiences is evident in their approach to applying what they have learned in creating projects. Embracing feedback as a valuable tool for improvement, students can accept and integrate meaningful insights gleaned from their accomplished projects, continuously striving for better performance. Furthermore, students can leverage teachers' feedback on the students' projects and outputs as a catalyst for reflection and repetition, utilizing it to refine the students' skills and develop mastery of their craft.

The data presented in Table 4 supports the idea that students benefit from feedback in PBL and that iterative learning and repetitive questioning can enhance the approach. Shin (2018) found that students who received feedback on their work were more engaged and motivated and viewed PBL as a practical learning approach. In Project-Based Learning (PBL), continuous learning plays a crucial role. It enables students to assess their progress and pinpoint strengths and weaknesses, thus enhancing their critical thinking and problem-solving abilities. Zou et al. (2024) supported this and found that repetitive questioning and active learning can promote deep learning.

Table 5.
Level of Productive Competencies after the Utilization of the PBL Approach

Scores (%)	Identifying of Problem		Making Proposal		Executing of task/project		Making Reports		Interpretation
	f	%	f	%	f	%	f	%	
90-100	44	69	64	100	64	100	64	100	Outstanding
85-89	20	31	-	-	-	-	-	-	Very Satisfactory
80-84	-	-	-	-	-	-	-	-	Satisfactory
75-79	-	-	-	-	-	-	-	-	Fair
Below 75	-	-	-	-	-	-	-	-	Needs Improvement
TOTAL	**64**	**100**	**64**	**100**	**64**	**100**	**64**	**100**	

90-100 – Outstanding, 85-89 – Very Satisfactory, 80-84 – Satisfactory, 75-79 – Fair. Below 75 – Needs Improvement

Table 5 shows the productive competencies scores and percentages of the respondents. These scores were based on the output and performance of the respondents after utilizing the PBL Approach during the first semester of the Academic Year 2023-2024. The table presents the number of individuals who received an outstanding, very satisfactory, satisfactory, fair, and needs improvement rating based on their ability to identify problems, make

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proposals, execute tasks/projects, and create reports. It is important to note that the majority of individuals received an outstanding rating across all areas, with no one falling into the categories of satisfactory, fair, or needing improvement. Thus, overall, the group performed exceptionally well in all areas after utilizing the PBL Approach.

The PBL approach is practical in developing productive competencies, as shown in Table 5. The premise is that the students are already oriented with PBL, and this approach enhances the student's ability to become more productive. In particular, the respondents received a low score in identifying problems before creating projects. In this manner, students need help to identify real-world and relevant problems/issues before creating a project as a solution. It is due to the level of their awareness in terms of social and civic responsibilities that they need help to identify problems and solutions where school and community will benefit.

Moreover, a significant barrier lies in students' capacity to identify pertinent issues and solutions within their specialized field, often hindered by environmental and cultural disparities. If the location/environment does not cater to or is not favorable in their areas of study, students find it easier to formulate suitable problems and appropriate solutions. Recognizing these salient features of PBL as a practical approach to enhancing productive competencies, PBL still offers meaningful learning experiences that cultivate the identification of problems, making proposals, execution of projects, and creating reports.

According to Bayram and Deveci (2022), the PBL approach is effective in enhancing the productivity of the students. Their study findings showcased that the PBL method notably boosted students' productivity, evident through enhanced problem-solving aptitude, critical thinking prowess, and a deeper comprehension of environmental health matters. Likewise, Son's (2023) study investigated the efficacy of PBL in enhancing the productivity of nursing college students. The study found that the PBL approach significantly improved students' productivity in terms of their clinical reasoning ability, decision-making skills, and confidence in providing care (Qin et al., 2016).

Table 6.
Perceived Level of Learning Engagement as to Academic

Indicators	Mean	SD	Interpretation
1. I enjoy the intellectual challenges I encounter while learning.	3.44	0.53	Highly Engaged
2. I spend enough time and make enough effort to learn and master the competencies in our lessons.	3.41	0.56	Highly Engaged
3. I contribute and do my best during classes.	3.45	0.53	Highly Engaged
4. I motivate myself to learn and accomplish any academic tasks I encounter.	3.64	0.48	Highly Engaged
5. I accomplish my academic tasks by using various strategies like time management and peer coaching.	3.36	0.57	Highly Engaged
Overall	**3.46**	**0.36**	**Highly Engaged**

4.00-3.25 – Highly Engaged, 3.24-2.50 – Moderately Engaged, 2.49-1.75 – Slightly Engaged, 1.74-1.00 – Not Engaged

Table 6 presents the respondents' perception of Academic Engagement. The mean score for the overall perception is **3.46** with a standard deviation of **0.36**, indicating it is **Highly Engaged**. The table also reveals that most of the respondents agreed with indicator 4, which suggests that the respondents are self-motivated to learn and achieve academic tasks. The indicator with the highest mean score, 3.64, indicated strong agreement among respondents. Conversely, the lowest mean score, 3.36, suggested that respondents needed to be more in agreement regarding their ability to complete academic tasks using diverse strategies like time management and peer coaching.

Academic Engagement shows that students can find joy in the intellectual challenges presented during their learning journey, embracing each obstacle as an opportunity for growth. Diligently dedicating sufficient time and effort to mastering the competencies outlined in the students' lessons, students demonstrate a commitment to academic excellence. By actively participating in class discussions and activities, students can strive to contribute meaningfully and consistently give their best effort. Motivated by their intrinsic drive for learning, students can approach academic tasks with determination and perseverance, consistently pushing themselves to achieve success. Employing a range of strategies such as effective time management and peer coaching, students can adeptly navigate through their academic responsibilities, ensuring timely completion and high-quality outcomes.

It further implies that self-motivation and the ability to accomplish academic tasks using various strategies are critical factors in learning Engagement and academic success. To support this, according to Rashid and Asghar

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(2016) and Huang et al. (2022), student engagement significantly impacts academic achievement. Their study findings revealed that students who actively participate in the learning process exhibit superior academic performance, heightened motivation to learn, and improved retention of information. In addition, Delfino (2019) also found that student engagement is positively correlated with academic success and that student engagement can be enhanced by creating a positive learning environment and by increasing student autonomy and responsibility.

Table 7.
Perceived Level of Learning Engagement as to Participatory

Indicators	Mean	SD	Interpretation
1. I am an active student in class who participates in academic activities and learning experiences.	3.36	0.57	Highly Engaged
2. I contribute and do my best regarding my responsibilities in group work.	3.61	0.49	Highly Engaged
3. I contribute to class discussions.	3.38	0.55	Highly Engaged
4. I work on class assignments, projects, or presentations with other students.	3.55	0.59	Highly Engaged
5. I follow school rules and participate in out-of-class school programs and activities.	3.53	0.56	Highly Engaged
Overall	**3.48**	**0.37**	**Highly Engaged**

4.00-3.25 – Highly Engaged, 3.24-2.50 – Moderately Engaged, 2.49-1.75 – Slightly Engaged, 1.74-1.00 – Not Engaged

Table 7 presents the respondents' perception of Participatory Engagement. The table indicates that the overall mean is **3.48**, with a standard deviation of **0.37**, which is interpreted as **Highly Engaged**. The table also highlights that most of the respondents agreed with indicator 2, which suggests that they contribute and do their best in fulfilling their responsibilities in group work. This indicator received the highest mean score of 3.61. However, the respondents showed the most minor agreement with the idea of being an active student in class who actively participates in academic activities and learning experiences, as indicated by the lowest mean score of 3.36.

Learning Engagement as to Participatory Engagement shows that active students can eagerly engage in academic activities and embrace various learning experiences. Demonstrating a solid commitment to collaboration, students can strive to contribute meaningfully and excel in their responsibilities within group work settings. The student's willingness to actively participate extends to class discussions, where students offer insights and perspectives to enrich the learning environment. Working collaboratively with peers on class assignments, projects, and presentations, students can harness the power of teamwork to achieve shared goals. Additionally, students can adhere to school rules and enthusiastically participate in out-of-class programs and activities, demonstrating a holistic commitment to their educational journey.

It suggests that students who are active participants and feel they can contribute effectively to group work tend to be more engaged in the learning process. As per Gray and DiLoreto (2016), students who viewed themselves as active learners and believed in their ability to make meaningful contributions to group work were inclined to be more engaged in the learning process. In addition, based on Ismael et al. (2023), participative learning methods, such as group work, increased student engagement and contributed to a positive learning experience. Therefore, students who felt confident in their ability to contribute effectively to group work were more prone to engaging in the learning process and experienced a stronger sense of ownership over their learning.

Table 8.
Perceived Level of Learning Engagement as to Emotional

Indicators	Mean	SD	Interpretation
1. I respect my classmates/peers.	3.80	0.41	Highly Engaged
2. I enjoy attending and participating in classes.	3.55	0.50	Highly Engaged
3. I respect my teachers.	3.92	0.27	Highly Engaged
4. I feel happy and like spending time on the school campus.	3.50	0.56	Highly Engaged
5. I enjoy the learning activities and programs carried out in class or on the school campus.	3.53	0.67	Highly Engaged
Overall	**3.66**	**0.31**	**Highly Engaged**

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4.00-3.25 – Highly Engaged, 3.24-2.50 – Moderately Engaged, 2.49-1.75 – Slightly Engaged, 1.74-1.00 – Not Engaged

Table 8 shows the results of the participant's assessment of Emotional Engagement. According to the table, the overall mean is **3.66**, with a standard deviation of **0.31**, indicating that the respondents are **Highly Engaged** with the indicator. The table also reveals that most respondents agreed on indicator 3, implying that they hold their teachers in high regard. This indicator had the highest mean score of 3.92. Conversely, the respondents indicated their most minor agreement with the idea that they enjoy spending time on campus, as demonstrated by the lowest mean score of 3.50.

The data presented as to Emotional shows that students can exhibit respect towards their classmates and peers, fostering a positive and inclusive atmosphere within their academic community. Finding enjoyment in attending and actively participating in classes, students can approach each learning opportunity with enthusiasm and dedication. Demonstrating a deep appreciation for the guidance and knowledge imparted by their teachers, students can hold their teachers in high regard. The students' happiness extends to their time spent on the school campus, where they feel a sense of belonging and fulfillment. Embracing the various learning activities and programs offered both in class and on the school campus, students can derive satisfaction and fulfillment from their educational experiences.

The data in the preceding table emphasizes the significance of teacher-student relationships in promoting academic Engagement and achievement. According to Pekrun et al. (2017), maintaining positive relationships between teachers and students can lead to increased motivation, better attendance, and improved academic performance. Investing in building strong bonds between educators and learners can have a significant impact on educational outcomes. However, the respondents also expressed their most minor agreement with the idea of enjoying spending time on campus. This result may have implications for campus administrators and policymakers, indicating that they may need to work towards enhancing the campus environment and facilities to improve students' overall campus experience. Therefore, the data highlights the pivotal role of teacher-student relationships in nurturing academic engagement and achievement. Studies indicate that maintaining positive connections between teachers and students can result in heightened motivation, improved attendance, and enhanced academic performance.

Table 9.
Perceived Level of Learning Engagement as to Agentic

Indicators	Mean	SD	Interpretation
1. I ask questions during classes for clarification and give feedback.	3.31	0.59	Highly Engaged
2. I actively discuss with my teachers when there are concerns about the class.	3.16	0.60	Moderately Engaged
3. I offer suggestions about how to make the class better.	3.00	0.62	Moderately Engaged
4. I express my preferences and opinions during classes to help my teachers identify my strengths and weaknesses.	3.23	0.66	Moderately Engaged
5. I let my teacher know what I am interested in to develop their teaching approach.	3.28	0.63	Highly Engaged
Overall	**3.20**	**0.49**	**Moderately Engaged**

4.00-3.25 – Highly Engaged, 3.24-2.50 – Moderately Engaged, 2.49-1.75 – Slightly Engaged, 1.74-1.00 – Not Engaged

Table 9 displays the respondents' perceived Agentic Engagement, showing an overall mean of 3.20 and a standard deviation of 0.49, suggesting a moderate level of engagement. Notably, most respondents agreed with indicator 1, indicating their tendency to ask questions during classes for clarification and provide feedback, scoring the highest mean score of 3.31. Conversely, respondents showed less agreement with the notion of offering suggestions on how to enhance the class, reflected by the lowest mean score of 3.00.

The data presented as to Agentic Engagement shows that students can engage in active participation during classes by asking questions for clarification and providing feedback, fostering a dynamic learning environment. By proactively discussing concerns with their teachers, students can seek to address any issues and ensure a productive classroom experience. By offering constructive suggestions for improving the class, students can demonstrate a commitment to enhancing the learning environment for themselves and their peers. By expressing their preferences and opinions during class discussions, students can enable their teachers to identify their strengths and weaknesses,

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facilitating personalized instruction. Moreover, students can communicate their interests to their teachers, which can aid in the creation of teaching methods customized to their specific needs and preferences.

Additionally, the findings from Table 9 indicate that the respondents exhibit a moderate level of agentic engagement in their learning journey. In other words, they are willing to take responsibility for their learning and are motivated to seek clarification and provide feedback. Recent studies have indicated that promoting self-regulated learning can further enhance agentic Engagement among students. ElAdl and Alkharusi (2020) found that self-regulated learning strategies can positively influence students' agentic Engagement in learning. Additionally, Loes (2022) found that collaborative learning can be an effective means of promoting agentic Engagement and improving academic performance. Educators should focus on creating learning environments that promote self-regulated learning and cooperative learning opportunities to enhance agentic Engagement among students.

Table 10.
Correlation between PBL Approach and Productive Competencies

PBL Approach	Identifying problem	Making proposal	Executing of task	Making report
Authentic learning	-0.153	0.108	-0.027	0.034
Collaborative learning	-0.107	0.059	0.072	0.112
Disciplinary subject learning	-0.199	0.123	-0.086	-0.030
Iterative learning	-0.120	0.129	0.067	0.168

***. Correlation is significant at the 0.01 level (2-tailed), *. Correlation is significant at the 0.05 level (2-tailed).*

Table 10 shows the correlation between Problem-Based Learning (PBL) Approach and Productive Competencies in four different learning approaches. The table suggests that there needs to be a clear correlation between PBL approaches and productive competencies. Thus, the PBL Approach is not significantly associated with productive competencies.

Studies support the findings mentioned above. One survey by Aynas and Aslan (2021) investigated the impact of authentic learning on learners' problem-solving skills and found that while authentic learning environments can improve learners' motivation and Engagement, they may not be effective for developing specific skills such as problem identification and task execution.It supports the notion that educators and curriculum designers should carefully consider the trade-offs of using authentic learning approaches. Another study by Ilie (2023) explored the impact of collaborative learning on learners' communication skills and found that cooperative learning can enhance learners' ability to communicate effectively, work in teams, and present their ideas clearly. It is consistent with the findings mentioned above, which suggest that collaborative learning can be a practical approach for developing specific productive competencies.

Similarly, a study by Simba and Kabuka (2016). investigated the impact of disciplinary subject learning on learners' problem-solving skills and found that while disciplinary subject learning can improve learners' disciplinary knowledge and skills, it may not be effective for developing specific problem-solving skills, such as problem identification. It supports the finding that disciplinary subject learning approaches may have limitations in terms of developing particular productive competencies. Conclusively, Yew and Goh's (2016) study delved into the effects of iterative learning on learners' critical thinking abilities, revealing that such learning methods foster deeper comprehension, knowledge retention, and the cultivation of critical thinking and problem-solving skills. It supports the finding that iterative learning approaches may be the most effective approach for developing a broad range of productive competencies among learners.

Table 11.
Correlation between the PBL Approach and Students' Engagement

PBL Approach	Academic	Participatory	Emotional	Agentic
Authentic learning	.658**	.520**	.375**	.550**
Collaborative learning	.402**	.288*	.289*	0.171
Disciplinary subject learning	.543**	.451**	.308*	.393**
Iterative learning	.548**	.589**	.389**	.397**

***. Correlation is significant at the 0.01 level (2-tailed), *. Correlation is significant at the 0.05 level (2-tailed).*

Table 11 shows the correlation between the PBL approach and student engagement in terms of academic engagement, participatory engagement, emotional engagement, and agentic engagement. The table indicates a

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correlation between PBL approaches and learning engagement. Therefore, it can be interpreted as the PBL Approach significantly associated with learning engagement.

The table results imply that the type of PBL approach employed significantly influences student engagement. An important finding highlighted in the table is that the authentic learning approach exhibited the most substantial correlation with academic, participatory, emotional, and agentic engagement. It aligns with prior research demonstrating that authentic learning can boost learners' motivation, engagement, and overall interest in the learning process. Similarly, the disciplinary subject learning approach showed a strong correlation with academic and participatory Engagement. It suggests that although disciplinary subject learning may not be the most effective approach for developing all types of Engagement, it can be an effective approach for enhancing academic and participatory Engagement. The iterative learning approach also showed a strong correlation with educational and participatory Engagement, as well as emotional Engagement. It suggests that iterative learning can be a practical approach for developing a broad range of engagement types among learners. On the other hand, the collaborative learning approach had a weak correlation with all kinds of Engagement except for participatory Engagement. It suggests that cooperative learning may not be the most effective approach for enhancing all types of Engagement among learners.

Huang and Wang (2022) explored the influence of authentic learning on student engagement, discovering that it can indeed heighten student motivation, engagement, and overall interest in the learning experience. It supports the notion that authentic learning approaches can be practical for enhancing student engagement. Likewise, Almulla (2020) examined the effects of disciplinary subject learning on student engagement, revealing that it can improve both academic and participatory engagement. It supports the finding that disciplinary subject learning approaches can be practical for enhancing certain types of Engagement among learners. In a study conducted by Lo and Hew (2020), they explored the effects of iterative learning on student engagement, concluding that iterative learning can indeed enhance academic, participatory, and emotional engagement. It supports the finding that iterative learning approaches can be practical for developing a broad range of engagement types among learners.

Conversely, Molinillo et al. (2018) delved into the effects of collaborative learning on student engagement. They found that cooperative learning had a weak correlation with all types of engagement except for participatory engagement. It supports the finding that collaborative learning may not be the most effective approach for enhancing all kinds of engagement among learners. In addition, as observed from the respondents' perceptions of learning engagement, it was interpreted as Agree. It suggests that only a portion of the respondents agree that they engage in collaborative activities such as discussions and providing feedback during the learning process. One possible explanation could be that students may feel hesitant and require more confidence to approach their teachers with questions, especially when dealing with complex technical topics for which they may need more foundational knowledge. Overall, these studies provide additional evidence to support the findings and suggest that PBL educators should carefully consider the type of PBL approach that they use to enhance student engagement.

Conclusions

Based on the findings of the study, PBL Approach is not significantly associated with productive competencies. However, some PBL approaches may be more effective in developing specific productive competencies than others. Thus, the null hypothesis failed to be rejected. In addition, the PBL Approach is validated by the significant relationship between the perception of the students on the PBL approach and the level of the learning engagement of the BTVTED college students, hence remarkably improving their productive competencies. Thus, the students undergoing the utilization of the PBL approach have considerably higher learning engagement in task and learning processes. Therefore, the null hypothesis is rejected.

Recommendations

It is recommended that the PBL approach is a practical approach to enhancing students' learning engagement in teaching technical-vocational courses for the BTVTED Program, and it is utilized and supported by college instructors and administrators. Moreover, studies of a similar nature should be conducted to determine its effectiveness for other sets of respondents, year level, and other subjects. Based on the findings, future studies may focus on the specific area of PBL, such as iterative learning, which is the most effective approach for developing a broad range of productive competencies among students. Additionally, seminars/training about the PBL approach should be initiated to help students improve and enhance learning engagement. Finally, for teaching technical-vocational/specialized courses or not, the PBL Approach may be adopted in teaching, especially in other disciplines, to enhance students' learning engagement, thereby creating meaningful learning experiences.

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REFERENCES

Almulla, M. (2020). The effectiveness of the Project-Based Learning (PBL) approach as a way to engage students in learning. SAGE Open, 10(3), 215824402093870. https://doi.org/10.1177/2158244020938702

Amihan, S. R., & Sanchez, R. D. (2023). Connecting Workplace Literacy Gaps through Innovative Academe-Industry Collaboration. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR),* 2(2), 515-528.

Amihan, S. R., Sanchez, R. D., & Carvajal, A. L. P. (2023). Sustained quality assurance: Future-proofing the teachers for an ASEAN higher education common space. International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR), 2(4), 276-286. https://etcor.org/storage/iJOINED/Vol.%20II(4),%20276-286.pdf

Atienza, J. (2022). Why technical education is necessary nowadays. Retrieved April 2022, from https://learningjquery.com/2022/01/why-technical-education-is-necessary-nowadays

Audet, J. (2018). Student Trade Missions: An Experiential Learning Opportunity. https://files.eric.ed.gov/fulltext/EJ1170725.pdf. Retrieved 07 June 2022

Aynas, N., & Aslan, M. (2021). The Effects of Authentic Learning Practices on Problem-Solving Skills and Attitude towards Science Courses. Journal of Learning for Development, 8(1), 146–161. https://doi.org/10.56059/jl4d.v8i1.482

Baird, M. (2019). Project based learning to develop 21st century competencies. Retrieved April 2022, from https://techandcurr2019.pressbooks.com/chapter/pbl-competencies/

Bakar, R. (2014). The effect of learning motivation on student's productive competencies in vocational high school, west Sumatra. International Journal of Asian Social Science. https://archive.aessweb.com/index.php/5007/article/view/2672

Bation, N. D., Ambrocio, M. C. M., Amihan, S. R., Millar, G. B., Tiquis, M. V. V., Nabayra, J. N., Flores, I. M., Flordeliz, E. G., & Cajilis, K. K. E. (2024). A numbers game: Quantitative research at the center of policy making. In R. D. Sanchez (Ed.). ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/a-numbers-game-quantitative-research-at-the-center-of-policy-making

Bation, N. D., & Nambatac, M. R. (2024). Streamlined research techniques: A workbook for the modern age. ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/streamlined-research-techniques-a-workbook-for-the-modern-age

Bayram, H. A. İ. Ç. Ü., & Deveci, H. (2022). The Effect of Problem-Based Learning on Students' Entrepreneurship Level in Social Studies course. International Journal of Contemporary Educational Research, 9(2), 359–377. https://doi.org/10.33200/ijcer.1056504

Buck Institute for Education. (2022). What is PBL? Retrieved April 2022, from https://www.pblworks.org/what-is-pbl

Cabiling-Ramos, M., Mendoza, J. C. C., Ambrocio, M. C. M., Salendab, F. A., Alon-Rabbon, K., Rellora, K. A., & Visaya, R. L. (2024). I serve, therefore I am: Service at the heart of public governance. In R. D. Sanchez (Ed.). ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/i-serve-therefore-i-am-service-at-the-heart-of-public-governance

Carvajal, A. L. P., & Sanchez, R. D. (2023). Strategic Considerations, Challenges, and Opportunities in Establishing the International Journal of Open-access, Interdisciplinary, and New Educational Discoveries (iJOINED).

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E - ISSN 1908-3181

International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR), 2(2), 539-546.

Carvajal, A. L. P., & Sanchez, R. D. (2024). Probing the Leadership Qualities of Local Chief Executives (LCEs) in Creating Competitive Creative Communities: Basis for Leadership Framework and Development Plan. International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR), 3(1), 380-400. https://etcor.org/storage/iJOINED/Vol.%20III(1),%20380-400.pdf

Carvajal, A. L. P., Sanchez, R. D., Bacay, R. B. R., Sanchez, A. M. P., Sia, J. B., Moldez, R. G., Llego, J. H., Bation, N. D., & Pangilinan, A. M. (2024). The reflective leader's handbook: Mapping the path to effective leadership. ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/the-reflective-leaders-handbook-mapping-the-path-to-effective-leadership

Carvajal, A. L. P., Sanchez, R. D., & Amihan, S. R. (2023). Probing the Seven Qualities of True Leadership: A Qualitative Investigation of Selected Experienced and Successful Leaders in Various Industries. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR),* 2(3), 898-912. https://etcor.org/storage/iJOINED/Vol.%20II(3),%20898-912.pdf

Carvajal, A. L. P., Sanchez, R. D., Amihan, S. R., Cabiling-Ramos, M., & Moldez, R. G. (2024). The true leadership edge: Unlocking the seven qualities that drive exceptional results and inspire greatness. ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/the-true-leadership-edge-unlocking-the-seven-qualities-that-drive-exceptional-results-and-inspire-greatness

Carvalho, M., Cabral, I., Verdasca, J., and Alves, J., M. (2022). Strategic Action Plans for School Improvement: An Exploratory Study About Quality Indicators for School Improvement Plan Evaluation. Retrieved March 2023, from https://files.eric.ed.gov/fulltext/EJ1342195.pdf

CHED Memorandum 79, s. 2017. Policies, Standards, and Guidelines for the Bachelor of Technical-Vocational Teachers Education (BTVTEd). Retrieved from: https://ched.gov.ph/wp-content/uploads/2017/11/CMO-No.-79-s.-2017.pdf

Chiang, C., & Lee, H. (2016). The Effect of Project-Based Learning on learning motivation and Problem-Solving ability of Vocational high school students. International Journal of Information and Education Technology, 6(9), 709–712. https://doi.org/10.7763/ijiet.2016.v6.779

Delfino, A. (2019). Student engagement and academic performance of students of Partido State Faculty of Education. Partido State University, Philippines. https://files.eric.ed.gov/fulltext/EJ1222588.pdf

Dizon, E. C., & Sanchez, R. D. (2020). Improving select grade 7 Filipino students' reading performance using the eclectic model. *Journal of World Englishes and Educational Practices*, 2(2), 216-221.

Du, X., & Han, J. (2016). A literature review on the definition and process of project-based learning and other relative studies. Creative Education, 07(07), 1079-1083. https://doi.org/10.4236/ce.2016.77112

ElAdl, A. M., & Alkharusi, H. (2020). Relationships between self-regulated learning strategies, learning motivation and mathematics achievement. Cypriot Journal of Educational Sciences, 15(1), 104–111. https://doi.org/10.18844/cjes.v15i1.4461

Gosselin, D. (2020). Competencies and learning outcomes. Retrieved April 2022, from https://serc.carleton.edu/integrate/programs/workforceprep /competencies_and_LO.html

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The Exigency
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E - ISSN 1908-3181

Gray, J., & DiLoreto, M. (2016). The effects of student engagement, student satisfaction, and perceived learning in online learning environments. National Council of Professors of Educational Administration (NCPEA). https://files.eric.ed.gov/fulltext/EJ1103654.pdf

Gulmez, I. (2018). Implementation of Project-Based Learning in Secondary Schools. Retrieved from https://www.researchgate.net/publication/329906191_Implementation_of_Project-Based_Learning_in_Secondary_Schools

Häkkinen, P., Järvelä, S., Mäkitalo-Siegl, K., Ahonen, A., Näykki, P., & Valtonen, T. (2016). Preparing teacher-students for twenty-first-century learning practices (PREP 21): A framework for enhancing collaborative problem-solving and strategic learning skills. Teachers and Teaching, 23(1), 25-41. https://doi.org/10.1080/13540602.2016.1203772

Ismail, Fathin & Bungsu, Jabaidah & Shahrill, Masitah. (2023). Improving Students' Participation and Performance in Building Quantities through Think-Pair-Share Cooperative Learning. 3. 203-216. 10.17509/ijert.v3i3.50348.

Hoftijzer, M., Levin, V., Santos, I., & Weber, M. (2020). TVET Systems' Response to COVID-19. Retrieved from: https://tinyurl.com/2p8tk6ys

Huang, Y., & Wang, S. (2022). How to motivate student engagement in emergency online learning? Evidence from the COVID-19 situation. Higher Education, 85(5), 1101–1123. https://doi.org/10.1007/s10734-022-00880-2

Huang, Y., Silitonga, L. M., & Wu, T. (2022). Applying a business simulation game in a flipped classroom to enhance engagement, learning achievement, and higher-order thinking skills. Computers & Education, 183, 104494. https://doi.org/10.1016/j.compedu.2022.104494

Ilie, V. (2023). The impact of technology on collaborative learning. European Proceedings of Educational Sciences. https://doi.org/10.15405/epes.23045.13

Jalinus, N., Nabawi, R. A., & Mardin, A. (2017). The seven steps of the project-based learning model to enhance the productive competencies of vocational students. Proceedings of the International Conference on Technology and Vocational Teachers (IC-TVT 2017). https://doi.org/10.2991/ictvt-17.2017.43

Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. Improving Schools, 19(3), 267-277.

Kuo, H., Yang, Y. C., Chen, J., Hou, T., & Ho, M. (2022). The Impact of Design Thinking PBL Robot Course on college students' learning motivation and Creative Thinking. IEEE Transactions on Education, 65(2), 124–131. https://doi.org/10.1109/te.2021.3098295

Kurt, G., & Akoğlu, K. (2023). Project-based learning in science education: A comprehensive literature review. Interdisciplinary Journal of Environmental and Science Education, 19(3), e2311. https://doi.org/10.29333/ijese/13677

Lo, C. K., & Hew, K. F. (2020). Developing a flipped learning approach to support student engagement: A design-based research of secondary school mathematics teaching. Journal of Computer Assisted Learning, 37(1), 142–157. https://doi.org/10.1111/jcal.12474

Loes, C. N. (2022). The effect of collaborative learning on academic motivation. Teaching & Learning Inquiry: The ISSOTL Journal, 10. https://doi.org/10.20343/teachlearninqu.10.4

Luo, T., Zhao, J., So, W. & Zhan, W., (2024). Students' Reflections on Their Scientist- Or Engineer-Like Practices In Stem Project-Based Learning. Journal of Baltic Science Education. 23. 119-130. DOI: 10.33225/jbse/24.23.119

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E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Manuaba, I. B. P., -No, Y., & Wu, C. (2022). The effectiveness of problem-based learning in improving critical thinking, problem-solving and self-directed learning in first-year medical students: A meta-analysis. PLOS ONE, 17(11), e0277339. https://doi.org/10.1371/journal.pone.0277339

Molinillo, S., Aguilar-Illescas, R., Anaya-Sánchez, R., & Arán, M. V. (2018). Exploring the impacts of interactions, social presence, and emotional engagement on active collaborative learning in a social web-based environment. Computers & Education, 123, 41–52. https://doi.org/10.1016/j.compedu.2018.04.012

Muńoz, M. C., & Sanchez, R. D. (2023). Exploring Fernandino Teens TV as a supplementary learning delivery modality: Opportunities and challenges from the lens of select learners. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR)*, 2(1), 358-374.

Paraiso, V. B., Sia, J. B., Colasito, J. M., & Rellora, K. A. (2024). In the exigency of the service: A response to a higher calling. ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/in-the-exigency-of-the-service-a-response-to-a-higher-calling

Pekrun, R., Elliot, A. J., & Maier, M. A. (n.d.). Achievement Goals and Achievement Emotions: Testing a Model of Their Joint Relations with Academic Performance. https://eric.ed.gov/?id=EJ829230

Porter, C. M. (2021). Strategic planning in education – 3 keys to success. Retrieved April 2022, from https://thoughtexchange.com/blog/strategic-planning-in-education-3-keys-to-success/

Qin, Y., Wang, Y., & Floden, R. E. (2016). The Effect of Problem-Based Learning on Improvement of the Medical Educational Environment: A Systematic Review and Meta-Analysis. Medical Principles and Practice, 25(6), 525–532. https://doi.org/10.1159/000449036

Ramli, R. (2015). The effect of teacher performance on student's productive competencies in vocational high school. Advances in Social Science, Education, and Humanities Research. https://doi.org/10.2991/ictvet-14.2015.36

Rashid, T., & Asghar, H. M. (2016). Technology use, self-directed learning, student engagement, and academic performance: Examining the interrelations. Computers in Human Behavior, 63, 604–612. https://doi.org/10.1016/j.chb.2016.05.084

Salendab, F. A., & Sanchez, R. D. (2023). Graduates Tracer Study: The Employability Status of Bachelor of Elementary Education (BEED) of Sultan Kudarat State University – Kalamansig Campus. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR)*, 2(2), 642-655

Salendab, F. A., Ocariza-Salendab, R. L. A., & Sanchez, R. D. (2023). Employers' Feedback on the Performance of Bachelor of Elementary Education (BEED) Graduates in the Workplace: A Pre-Deployment Training Remediation Implications. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR)*, 2(3), 882-897. https://etcor.org/storage/iJOINED/Vol.%20II(3),%20882-897.pdf

Salendab, F. A., Valentino, M. A. G., Alon-Rabbon, K., Llego, J. H., Cabarrubias-Dela Cruz, K., Obod, M. M., Cabrejas, M. M., & Calderon, A. A. (2024). The art and science of doing research: Mastering the craft, embracing the process. In R. D. Sanchez & A. L. P. Carvajal (Eds.). ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/the-art-and-science-of-doing-research-mastering-the-craft-embracing-the-process

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The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Salendab, F. A., Visaya, R. L., Eler, G. M., Bernardo, E. D., & Fernandez, S. F. (2024). The transformative educator: Adapting, innovating, empowering. In R. D. Sanchez & A. L. P. Carvajal (Eds.). ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/the-transformative-educator-adapting-innovating-empowering

Sanchez, A. M. P. (2022). HR practitioners' perceptions on boosting employees' loyalty and commitment: Inputs for a 21st century-responsive human resource system. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR)*, 1(4), 89-102.

Sanchez, R. D. (2020, December 27). "Preserving the Honor of the 'Honoris Causa': Revisiting the Guidelines on the Conferment of Honorary Degrees". SunStar Pampanga. Retrieved from https://www.pressreader.com/philippines/sunstar-pampanga/20201227/281608128045257

Sanchez, R. (2023). Utilization of the daily lesson logs: An evaluation employing the CIPP model. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR),* 2(1), 199-215.

Sanchez, R. D. (2023). Unveiling the moral-theological foundations of the nullity of marriage due to psychological incapacity. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR),* 2(1), 397-404.

Sanchez, R. D., Belz, J. A., Sia, J. B., Sanchez, A. M. P., Pangilinan, A. M., & Sanchez, J. J. D. (2024). Run, researchers! Run! Research, health and fitness in one running community. ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/run-researchers-run-research-health-and-fitness-in-one-running-community

Sanchez, R. D., Carvajal, A. L. P., Molano, R. R., Amihan, S. R., Valdez, J. V., Sanchez, R. V., Santos, M. J. D., Eler, G. M., & Gonzales, R. D. (2024). Leading from within: Nurturing leadership skills and service mindset of educators. ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/leading-from-within-nurturing-leadership-skills-and-service-mindset-of-educators

Sanchez, R. D., Carvajal, A. L. P., Cabrejas, M. M., Barcelona, K. E. P., de Rama, I. V., Convocar, A. D., Panimbang, G. M., Sia, J. B., & Tiquis, M. V. V. (2024). Living the passionate journey: Creating a life and career fueled by lasting excitement. ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/living-the-passionate-journey-creating-a-life-and-career-fueled-by-lasting-excitement

Sanchez, R. D., Carvajal, A. L. P., Francisco, C. DC, Pagtalunan, E. C., Alon-Rabbon, K., Llego, J. H., Sanchez, A. M. P., Pangilinan, A. M., & Sanchez, J. J. D. (2024). The power of influence: Leading by example for greater role and productivity. ETCOR Educational Research Center Research Consultancy Services. https://etcor.org/book-publications/the-power-of-influence-leading-by-example-for-greater-role-and-productivity

Sanchez, R., & Sarmiento, P. J. (2020). Learning together hand-in-hand: An assessment of students' immersion program in a schools division. *International Journal of Research Studies in Education,* 9(1), 85-97.

Sanchez, R. D., Sanchez, A. M. P., & Sanchez, J. J. D. (2023). Delving into the Integration of Research Subjects in the Junior High School Curriculum from the Learners' Point of View. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of ETCOR Educational Research Center (iJOINED ETCOR),* 2(1), 432-442.

Sanchez, R., Sarmiento, P. J., Pangilinan, A., Guinto, N., Sanchez, A. M., & Sanchez, J. J. (2022). In the name of authentic public service: A descriptive phenomenological study on the lives of Filipino teachers in select coastal villages. *International Journal of Open-access, Interdisciplinary and New Educational Discoveries of*

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P - ISSN 2984-7842
E - ISSN 1908-3181

ETCOR Educational Research Center (iJOINED ETCOR), 1(1), 35-44.

Sharma, A., Dutt, H., Venkat Sai, C. N., & Naik, S. M. (2020). Impact of project-based learning methodology in engineering. Procedia Computer Science, 172, 922-926. https://doi.org/10.1016/j.procs.2020.05.133

Shin, M. (2018). Effects of Project-Based Learning on students' motivation and Self-Efficacy. https://eric.ed.gov/?id=EJ1312282

Simba, N. O., Agak, J., & Kabuka, E. K. (2016). Impact of discipline on academic performance of pupils in public primary schools in Muhoroni Sub-County, Kenya. Journal of Education and Practice, 7(6), 164–173. http://files.eric.ed.gov/fulltext/EJ1092484.pdf

Son, H. K. (2023). Effects of simulation with problem-based learning (S-PBL) on nursing students' clinical reasoning ability: based on Tanner's clinical judgment model. BMC Medical Education, 23(1). https://doi.org/10.1186/s12909-023-04567-9

Tan, S. C., Chen, W., & Chua, B. (2023). Leveraging generative artificial intelligence based on large language models for collaborative learning. Learning: Research and Practice, 9(2), 125–134. https://doi.org/10.1080/23735082.2023.2258895

TESDA. (2022). Vision, mission, value, and quality statement. Retrieved 11 June 2022 from https://www.tesda.gov.ph/About/TESDA.

TVET Journal. (2021). TVET definition: the TVET meaning and what it stands for. Retrieved April 2022, from https://tvetjournal.com/tvet-systems/tvet-definition-the-tvet-meaning-and-what-it-stands-for/

Umar, M., & Ko, I. (2022). E-Learning: Direct Effect of Student Learning Effectiveness and Engagement through Project-Based Learning, Team Cohesion, and Flipped Learning during the COVID-19 Pandemic. Sustainability, 14(3), 1724. https://doi.org/10.3390/su14031724

UNESCO (2023). Discipline-based curriculum. Retrieved May 2023 from https://www.ibe.unesco.org/en/glossary-curriculum-terminology/d/discipline-based-curriculum

UNESCO. (2015). Technical and vocational education and training (TVET). Retrieved April 2022, from https://unevoc.unesco.org/home/TVETipedia+Glossary/

Vasiliene-Vasiliauskiene, V., Vasiliauskas-Vasilis, A., Meidute-Kavaliauskiene, I. & Sabaityte, J. (2020). Peculiarities of educational challenges implementing project-based learning. World Journal on Educational Technology: Current Issues. 12(2), 136-149. https://doi.org/10.18844/wjet.v12i2.4816

Venn, K., & Cox, R. (2020). The nature and significance of student engagement: A critical review of the literature. Higher Education Research & Development, 39(5), 903-920. Retrieved July 2023 from https://www.tandfonline.com/doi/abs/10.1080/07294360.2020.1743037

WorkClout. (2021). What Skills Do Manufacturers Need Most in 2021? Retrieved April 2022, from https://www.workclout.com/blog/what-skills-do-manufacturers-need-most-in-2021

Yew, E. H. J., & Goh, K. (2016). Problem-Based Learning: An Overview of its Process and Impact on Learning. Health Professions Education, 2(2), 75–79. https://doi.org/10.1016/j.hpe.2016.01.004

Zakaria, M. I., Maat, S. M., & Khalid, F. (2019). A Systematic Review of Problem-Based Learning in Education*. Creative Education, 10(12), 2671–2688. https://doi.org/10.4236/ce.2019.1012194

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The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Zhou, J. & Gu, Y., (2024). The Impact of Teachers' Multimodal Cues on Students' L2 Vocabulary Learning in Naturalistic Classroom Teaching. Retrieved from https://www.researchgate.net/publication/380547900_The_Impact_of_Teachers'_Multimodal_Cues_on_Students'_L2_Vocabulary_Learning_in_Naturalistic_Classroom_Teaching