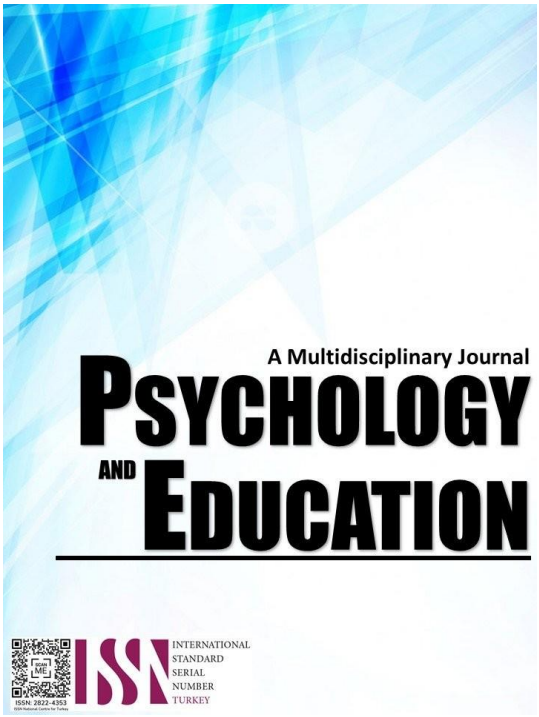
PERFORMANCE AND PERCEPTION OF TECHNOLOGY-VOCATIONAL-LIVELIHOOD TRACK STUDENTS ON COOKERY THROUGH PROJECT-BASED LEARNING



PSYCHOLOGY AND EDUCATION: A MULTIDISCIPLINARY JOURNAL

Volume: 23
Issue 8
Pages: 1058-1071
Document ID: 2024PEMJ2214
DOI: 10.5281/zenodo.13328836
Manuscript Accepted: 07-18-2024

Psych Educ, 2024, **23**(8): 1058-1071, Document ID:2024PEMJ2214, doi:10.5281/zenodo.13328836, ISSN 2822-4353

Research Article

Performance and Perception of Technology-Vocational-Livelihood Track Students on Cookery through Project-Based Learning

Mechelle L. Cias*
For affiliations and correspondence, see the last page.

Abstract

The effects of Project-Based Learning (PBL) on student performance and involvement in Technical-Vocational-Livelihood Home Economics (TVL-HE) education are examined in this study. By means of a descriptive and correlational methodology, the study sought to assess the efficiency of PBL in improving learning outcomes and to pinpoint elements that might affect these outcomes. This study made use of two research designs: experimental and descriptive correlational design. Specifically, one group quasi experimental research with pretest and post-test design and descriptive correlational design. The students were selected using a technique called purposive sampling, which involves selecting students who fulfil the study's inclusion criteria. The inclusion criteria include of a.) enrolment in the TVL-HE, b.) current enrolment in PBL classes, c.) willingness to participate in the study, and d.) parental consent for students under 18 years of age. According to the results of the study, most of the study participants are between the ages of 17 and 18, with a little larger proportion of women. Potential socioeconomic difficulties are indicated by the fact that 78% of the respondents came from families with monthly incomes below 10,000.00. Most of the pretest scores below 15 showed a general lack of cooking skill. Post-test scores after PBL interventions significantly increased; 40% of students scored between 31 and 35, indicating better knowledge and skills. With high mean scores for "Reflection on Learning" and "Showcase and Share," students also had favorable opinions of PBL. The results imply that PBL can successfully raise students' performance and involvement in TVL-HE instruction. To sustain high degrees of proficiency, recommendations include strengthening teaching strategies, offering more help to low-income students, and promoting more project-based activities. Descriptive analysis and pretest-posttest design of the study help to clarify PBL's function in TVL-HE education.

Keywords: *Project-Based Learning, PBL, students performance, TVL-HE*

Introduction

As an alternative route to higher education and employment, Technical-Vocational-Livelihood (TVL) has acquired prominence in the Philippine education system in recent years. The objective of the TVL track is to equip students with the technical and vocational skills required for their chosen vocations, including the field of home economics. Home Economics (HE) education plays a crucial role in preparing students for various professions related to food, clothing, and housing as part of the TVL strand.

Educators and researchers have investigated various pedagogical approaches to enhance student learning and career readiness in TVL-HE education in response to shifting workforce demands. Project-based learning (PBL), which emphasizes student-centered, collaborative, and interdisciplinary learning, is one such approach. PBL entails engaging students in real-world problems or projects that require them to apply their knowledge and skills to the development of solutions or products. PBL has been shown to increase student motivation and engagement, as well as promote deeper learning, critical thinking, and problem-solving skills.

Despite the prospective advantages of PBL, its efficacy in TVL-HE education remains understudied. This study sought to address this lacuna in the literature by investigating the effectiveness of PBL in enhancing student engagement, learning outcomes, and career readiness in TVL-HE education.

Project-based learning, often known as PBL, has become increasingly popular in recent years as a method of instruction that encourages active learning as well as student engagement. According to Krajcik et al. (2018), project-based learning (PBL) is an instructional strategy that includes students in collaborative projects that are designed to solve real-world problems or address complicated concerns. Students in technical-vocational-livelihood home economics (TVL-HE) education are encouraged to gain practical skills that can be utilized in their future employment (Proudfoot & Birks, 2021). PBL is commonly employed in this type of education (Proudfoot & Birks, 2021). There is a need for empirical research that assesses the success of PBL in terms of student engagement, learning outcomes, and career preparedness despite the fact that it is becoming an increasingly popular method of instruction in TVL-HE education.

The research that has been conducted on PBL in TVL-HE education has mostly concentrated on various aspects of its implementation, such as the role that technology plays, the preparation of teachers, and the development of curricula. Some studies have found favorable results with PBL, while others have found mixed results or discovered issues associated with its implementation (Graaff et al., 2016; Terwel et al., 2019). While some studies have reported positive results, others have found mixed results or recognized challenges associated with its implementation. In addition, there is a dearth of research in the field of TVL-HE education that investigates the connection between PBL, student engagement, learning outcomes, and career preparedness.

Globally, PBL has been extensively implemented in numerous educational fields, including TVL-HE. According to a study conducted

in Turkey by Akkuzu et al. (2019), PBL increased student engagement and motivation in vocational education. In Iran, Jafari et al. (2020) found that PBL enhanced students' critical thinking and problem-solving abilities in technical and vocational education. These studies indicate that PBL is an effective instructional strategy for improving student learning outcomes in TVL-HE education.

TVL-HE is one of the primary tracks of the Senior High School (SHS) program in the Philippines. PBL has been recognized by the Department of Education (DepEd) as an effective instructional method that can enhance the competencies of TVL-HE students. According to a study conducted in the Philippines by Agpawa et al. (2020), PBL substantially improved students' performance in culinary arts, dressmaking, and handicrafts. This study emphasized the potential for PBL to enhance the competencies of TVL-HE students in various areas.

PBL has been implemented locally in numerous TVL-HE institutions in the Philippines. According to a study conducted by Montajes et al. (2019) at a local TVL-HE school in the Philippines, PBL enhanced students' comprehension and application of dressmaking concepts and skills. Similarly, a study conducted by Ramos et al. (2021) at an additional local TVL-HE school in the Philippines revealed that PBL improved students' employability skills in the food and beverage service industry. These studies demonstrate the potential for PBL to improve the learning outcomes and career readiness of TVL-HE students in a local context.

PBL has been recognized as an effective instructional strategy for enhancing the learning outcomes and career readiness of TVL-HE students. The studies conducted in international, national, and local contexts demonstrate that PBL has a positive effect on student engagement, critical thinking, problem-solving skills, competencies, and employability skills. These results indicate that PBL may be a useful tool for enhancing the quality of TVL-HE education.

Research Questions

This study aimed to investigate the effectiveness of Project-Based Learning (PBL) method of teaching in enhancing Grade 12 performances in TVL-HE in terms of students engagement, learning outcomes and career readiness. Specifically, the study sought to answer the following research questions:

1. What is the profile of the respondent in terms of:
    1.1. age;
    1.2. sex;
    1.3. grade in cookery (first quarter of SY 2023-2024);
    1.4. parents' educational attainment;
    1.5. parents' occupation; and
    1.6. family monthly income?
2. What are the pre-test scores of students in Cookery before applying PBL method?
3. What are the posttest scores of students in Cookery after applying PBL method?
4. What is the perception of students on PBL strategy as to:
    4.1. reflection on learning; and
    4.2. showcase and share?
5. What is the level of performance of students in TVL-HE Education as to students' performance task in terms of:
    5.1. recipe selection and adaptation report;
    5.2. nutritional analysis of recipes; and
    5.3. design and layout?
6. Is there a significant difference between the pre-test and posttest scores of the students in Cookery?
7. Is the project-based learning strategy significantly related to students' performance in Cookery in terms of:
    7.1. recipe selection and adaptation report;
    7.2. nutritional analysis of recipes; and
    7.3. design and layout?

Literature Review

Project – Based Learning Defined

Project-based learning (PBL) is an instructional strategy in which pupils solve real-world problems by completing projects. In recent years, PBL has garnered popularity as a means to increase student engagement, motivation, and learning outcomes. Multiple studies have examined the efficacy of PBL in a variety of disciplines, including STEM, the humanities, and the social sciences.

PBL's capacity to increase students' engagement and motivation is one of its primary advantages. According to Adams et al. (2019), PBL activities can give students a sense of ownership and control over their learning, thereby increasing their motivation to learn. Hung and Chen (2019) noted that PBL can increase student engagement by making learning more pertinent and meaningful to the students' lives.

Additionally, PBL has the potential to enhance student learning outcomes. Woo and Reeves (2019) found in a systematic review of

PBL in higher education that PBL can enhance student learning by fostering critical thinking, problem-solving skills, and content knowledge. Similarly, Thomas (2019) conducted a literature review on PBL in K-12 education and found that PBL can result in enhanced academic achievement, higher-order thinking abilities, and social-emotional development.

Additionally, PBL has been found to be effective at fostering career readiness skills. According to Khan and Jain (2019), PBL activities can help students develop skills that are highly valued by employers, such as collaboration, communication, and problem-solving. Kurniawan et al. (2021) discovered in a study on the impact of PBL on vocational education students that PBL can improve students' vocational competencies and employability.

Nonetheless, a number of studies have highlighted the difficulties and limitations of PBL. For example, Adams et al. (2019) noted that creating effective PBL activities can be time-consuming and difficult for educators. In addition, incorporating PBL activities may necessitate significant changes to traditional instructional practices, which can be challenging to achieve in certain educational settings.

The literature concludes that PBL can be an effective instructional strategy for fostering student engagement, learning outcomes, and career readiness skills. To ensure their effectiveness, educators must design and implement PBL activities with care. Future research should continue to investigate the efficacy of PBL in a variety of educational contexts and explore methods to overcome implementation obstacles.

Students' Performance

The term "project-based learning," abbreviated as "PBL," refers to a method of education in which students are engaged in the process of resolving complicated, real-world issues through the production of goods, performances, or presentations. It is considered that project-based learning (PBL) has a favorable impact on students' overall learning outcomes since it is designed to encourage active learning as well as critical thinking. The purpose of this literature review is to give an overview of research that have studied the effects of PBL on the learning outcomes of students, specifically in the areas of academic success, critical thinking, and problem-solving.

Research-based evidence suggests that project-based learning (PBL) can have a beneficial effect on the academic performance of students. For instance, Chang and Lai (2021) conducted a study with 179 high school students in Taiwan and found that those who participated in a PBL program had superior learning achievements in science courses than those who received traditional education. This was discovered in comparison to the students who received traditional instruction. In a similar vein, Duran and Ballatore (2017) conducted research with students who had learning issues and discovered that using PBL led to significant increases in the students' academic performance. Based on these data, it appears that PBL has the potential to be an efficient instructional strategy that can help promote academic accomplishment.

PBL, or Project-Based Learning, is an instructional methodology that has gained widespread acceptance as an efficient way to educate students in a variety of educational settings. Students are engaged in meaningful, real-world projects through project-based learning (PBL), which promotes critical thinking, problem-solving, and cooperation. These projects integrate knowledge and skills from a variety of subject areas. Additionally, it has been demonstrated that PBL improves the learning outcomes of students in a variety of domains, such as cognitive, emotional, and psychomotor learning.

Multiple studies have investigated the effect of PBL on cognitive outcomes such as knowledge acquisition, conceptual comprehension, and problem-solving abilities. For instance, Pérez-Moreno et al. (2020) implemented PBL in an undergraduate physics course and discovered that the PBL group had higher scores in conceptual understanding, problem-solving, and application of concepts than the traditional lecture group. Khamees et al. (2021) implemented PBL in a pharmacology course for medical students and discovered that the PBL group had higher scores in terms of knowledge retention and clinical reasoning than the traditional lecture group.

In addition, Jiang et al. (2019) examined the effect of PBL on learning outcomes in a college-level nursing course and discovered that students in the PBL group had higher scores in clinical decision-making and self-efficacy than those in the traditional lecture group. Al-Drees et al. (2020) examined the effect of PBL on the academic performance of medical students and found that the PBL group had higher scores in knowledge, skills, and attitudes than the traditional lecture group.

These results suggest that PBL can be an effective strategy for improving students' cognitive outcomes across a variety of subject areas and educational settings. By involving students in authentic, real-world projects, PBL enables them to implement and integrate their knowledge and skills, resulting in enhanced conceptual understanding and problem-solving abilities. Project-Based Learning (PBL) has been recognized as an effective teaching and learning strategy in a variety of educational settings. PBL engages students in authentic, real-world projects that incorporate knowledge and skills from multiple subject areas, thereby fostering critical thinking, problem-solving, and collaboration. Moreover, it has been demonstrated that PBL improves the learning outcomes of students in multiple domains, including cognitive, affective, and psychomotor. This literature review provides an overview of recent research on the effect of PBL on learning outcomes from 2019 to 2022, focusing on studies that investigated the influence of PBL on cognitive outcomes such as knowledge acquisition, conceptual comprehension, and problem-solving skills.

PBL has been shown to improve students' affective outcomes, such as motivation, engagement, and self-efficacy, in addition to their cognitive outcomes. For example, Kember and Leung (2019) investigated the effect of PBL on the development of generic skills in university students and found that PBL had a positive impact on students' critical thinking, problem-solving, and communication skills.

In addition, students in the PBL group reported greater motivation and engagement than those in the traditional lecture group.

Similarly, Chen et al. (2021) investigated the impact of PBL on the development of information literacy skills in university students and discovered that the PBL group had higher scores on information literacy and problem-solving skills than the traditional lecture group. In addition, students in the PBL group reported greater self-efficacy and motivation than those in the traditional lecture group.

These results suggest that PBL can be an effective strategy for fostering affective outcomes in students, such as motivation, engagement, and self-efficacy. PBL can increase students' motivation, engagement, and sense of self-efficacy by engaging them in authentic, real-world initiatives.

PBL has also been shown to improve students' psychomotor outcomes, such as their creativity and manual dexterity. Sogunro and Adediran (2022) analyzed the impact of PBL on the development of entrepreneurial skills in business students and discovered that the PBL group scored higher.

Reflection on Learning

Learning reflection involves critical reasoning, self-awareness, and self-evaluation. Individuals are able to evaluate their experiences, identify their strengths and weaknesses, and devise strategies for improvement. Reflection on learning is essential in education because it supports students' cognitive and emotional development and improves their ability to transmit their knowledge and skills to new contexts. This literature review seeks to examine recent studies on the impact of reflection on learning on student outcomes.

Wong and Li (2019) investigated the effect of a reflective teaching intervention on academic achievement and self-regulated learning among students. The intervention included training teachers in reflective practice and encouraging classroom reflection on learning. The study found that the reflective teaching intervention improved academic achievement and self-regulated learning among students. The authors reached the conclusion that encouraging student reflection on learning in the classroom can improve student learning outcomes.

Karatas and Bilen (2020) investigated the relationship between reflection on learning and academic achievement in higher education in a separate study. The study found that pupils who engaged in learning reflection performed better academically than those who did not. The authors hypothesized that reflection on learning can enhance students' subject-matter comprehension, strengthen their critical thinking skills, and increase their motivation to learn.

It has also been demonstrated that reflection on learning increases students' metacognitive awareness. Ma and Xu (2019) examined the influence of a reflective learning intervention on the metacognitive awareness and academic performance of students. The intervention consisted of encouraging students to ruminate on their learning experiences and devise improvement strategies. The study found that the reflective learning intervention improved the metacognitive awareness and academic performance of students. The authors hypothesized that reflection on learning can enhance students' ability to monitor and regulate their own learning.

In addition, research indicates that reflection on learning has a positive effect on students' emotional health. Wang et al. (2021) investigated the relationship between learning reflection and emotional intelligence in their study. The study discovered that pupils who engaged in learning reflection possessed greater emotional intelligence than those who did not. Reflection on learning, according to the authors, can improve students' self-awareness and empathy, which are essential components of emotional intelligence.

Some students may be resistant to engaging in reflection on learning despite its many benefits. Burt et al. (2019) investigated the factors that influence students' participation in self-reflection. Students were more likely to engage in reflection on learning when they perceived it to be relevant to their learning objectives and when they received support and guidance from their teachers, according to the study. Educators should provide students with clear guidelines and feedback on how to engage in reflection on learning to increase their motivation and engagement, according to the authors.

In conclusion, reflection on learning is an essential practice that can improve students' academic performance, self-regulated learning, metacognitive awareness, emotional intelligence, and well-being as a whole. Recent studies have demonstrated that reflection on learning improves student outcomes. However, some students may be resistant to this practice, and educators must provide support and guidance to increase their motivation and participation.

Showcase and share. is a method of instruction in which pupils present and discuss their own work. This strategy encourages teamwork, communication, and critical reasoning.

A study by Karsli and Klc (2019) examined the efficacy of showcase and share as a high school English teaching method. The researchers discovered that demonstrate and share enhanced students' speaking and writing abilities, as well as their self-confidence when using English. The study also highlighted the significance of providing students with clear guidelines and expectations to ensure they comprehend the purpose and objectives of the demonstration and presentation.

Similarly, Kim et al. (2020) investigated the impact of showcase and share on the scientific learning of students. The researchers discovered that students who participated in showcase and share had a deeper comprehension of the scientific concepts they were studying and enhanced communication abilities. The study also highlighted the significance of providing students with a secure and

encouraging environment in which to share their work.

Showcase and sharing can have a positive effect on social and emotional learning, in addition to improving academic abilities. Scott et al. (2020) investigated the use of demonstrate and share in elementary schools to promote social and emotional learning. The researchers discovered that displaying and sharing helped students develop empathy, create relationships, and feel more connected to their peers.

Showcase and sharing can also be used to promote student autonomy and learning ownership. King and Galley (2019) investigated the utilization of exhibit and share in a college-level design course. The researchers discovered that students who participated in showcase and share were more engaged and invested in their learning because they felt ownership over their work.

However, showcasing and sharing can also present some obstacles. Research by Alli et al. (2020) emphasized the significance of offering guidance and support to students, as some may feel uneasy or uncertain about sharing their work with others. The study also highlighted the importance of ensuring that showcase and share are inclusive and accessible to all students, regardless of background or ability.

In conclusion, showcase and share is a promising learning strategy that can enhance academic abilities, encourage social and emotional learning, and foster student agency and ownership. Nonetheless, it is essential to provide clear guidelines and expectations, establish a secure and supportive environment, and ensure that all students feel included and supported in the process of showcasing and sharing their work.

Students' Performance

Performance of student's engagement and participation. This strategy encourages students to actively engage in learning, as opposed to passively listening to lectures or perusing textbooks. It has been demonstrated that hands-on learning has numerous benefits for student engagement and learning outcomes.

This increases student engagement and motivation, according to studies (Bao et al., 2019; Guo et al., 2020). Students are more likely to be intrigued in the material and motivated to learn when they are actively engaged in the learning process. Students can connect what they are learning to real-world situations through hands-on learning, making the material more pertinent and meaningful to them.

Moreover, experiential learning can help students develop their critical thinking and problem-solving abilities. Students are encouraged to think creatively and develop their own solutions to problems through participation in hands-on activities (Lui & Ng, 2019). This can result in a deeper comprehension of the material and a greater capacity to implement it in the real world.

In addition to accommodating a variety of learning styles and inclinations, experiential education can also facilitate the development of a variety of skills. Some students may have difficulty with conventional classroom settings, which can be overwhelming or uninspiring. This can be exceptionally beneficial for these students (Lin et al., 2020).

However, there are also some disadvantages to hands-on learning. It can be more time-consuming and resource-intensive for teachers, as effective and safe activities require meticulous planning and preparation (Stewart & Burns, 2019). In addition, experiential learning may not be appropriate for all subject matter or learning objectives.

Overall, it has been demonstrated that hands-on learning is an effective strategy for increasing student engagement and learning outcomes. Hands-on learning can increase students' motivation, critical thinking skills, and practical knowledge by providing opportunities for active participation in the learning process. However, when implementing this strategy, instructors must carefully consider the learning objectives and available resources.

Relationship between Variables of the Study

Education that is referred to as Technical-Vocational Livelihood, or TVL education, is a type of schooling that helps students acquire the knowledge and skills necessary for employment by emphasizing hands-on experience. Project-Based Learning (PBL), an inquiry-based instructional strategy that focuses on the students' study of real-world problems and the development of solutions, is a well-liked way for teaching TVL. PBL is an abbreviation for the phrase "Project-Based Learning." Several studies have investigated whether or not there is a connection between the level of involvement that students have in TVL-HE education and the level of success that they have in PBL activities.

The purpose of the research that Villalobos and Ocol (2019) carried out was to ascertain the extent to which senior high school students in the Philippines participated in TVL-HE education and how well they performed academically as a result of doing so. The level of participation of the students was determined by the use of a questionnaire in the research, and the researchers discovered that those students who were more engaged in TVL-HE education had superior academic achievement in PBL activities.

Similarly, Kim and Kim (2021) conducted research to investigate the connection between students' participation in PBL and the level of academic success they attained when enrolled in a TVL-HE programmed. According to the findings of the study, students who participated in PBL to a greater extent had higher academic accomplishment in their TVL-HE classes. According to the findings of the study, PBL was also effective in helping students develop their problem-solving abilities, critical thinking, and communication skills, all of which are crucial for being successful in TVL-HE education.

In a separate piece of research, Gok and Acar (2021) looked into the correlation between the amount of time students spent participating in PBL and the amount of academic success they had in a culinary arts programmed. According to the findings of the study, students who participated in PBL to a greater extent achieved at a higher level academically in their culinary arts classes. According to the findings of the study, PBL also assisted students in developing skills such as cooperation, problem-solving, and communication, all of which are essential for achieving success in the culinary arts profession.

In general, the findings of these research point to the existence of a positive correlation between the level of participation that students have in TVL-HE education and the level of success that they have in PBL activities. Students can improve their academic progress and build key skills for success in TVL-HE education and industry by participating in problem-based learning (PBL), which gives them opportunity to apply their practical skills and knowledge to issues that actually occur in the real world.

Methodology

This study made use of two research designs: experimental and descriptive correlational design. Specifically, one group quasi experimental research with pretest and post-test design and descriptive correlational design. The study entailed administering a survey to assess the level of students' engagement in TVL-HE education and collecting data on their performance in PBL activities.

Regarding the use of a descriptive design, this was implemented by collecting the data on additional variables, such as academic performance, which was used to describe the samples and control for potential confounding variables. This was accomplished using surveys.

Senior high school students under the TVL-HE Track with specialization in Cookery are currently enrolled in PBL classes school year 2023-2024. The institution was surveyed on the TVL-HE track performance as it emphasizes the development of students' technical and vocational skills in a variety of fields, including home economics, culinary arts, and handicrafts.

The students were selected using a technique called purposive sampling, which involves selecting students who fulfil the study's inclusion criteria. The inclusion criteria include of a.) enrolment in the TVL-HE, b.) current enrolment in PBL classes, c.) willingness to participate in the study, and d.) parental consent for students under 18 years of age.

One research instrument was utilized for this study which is a survey questionnaire and a rubric scoring for assessing written and practical performances in PBL activities. The survey questionnaire was used to collect information on the extent to which students are exposed to TVL-HE education. The instrument is researcher-made instrument and was validated by experts in the field of TVL Education.

To evaluate students' performance in PBL activities, rubric-based scoring criteria for effective PBL were identified in the literature review. The rubric scale assessed Students' ability to identify and define problems, develop and implement solutions, collaborate effectively, communicate clearly, and reflect on their learning. Before using the rubric scoreboard, it was pilot-tested and refined.

Confidentiality and anonymity are paramount; all data collected was anonymized, and personal information was securely stored and accessed only by authorized personnel. The results were reported in a manner that prevents the identification of individual participants. Participation in the study is entirely voluntary, and participants have the right to withdraw at any point without any negative consequences.

Results and Discussion

Profile of the Respondents

Table 1-A. *Distribution of Respondents as to Age, Sex, and Grade in Cookery*

Age	*Frequency*	*Percent*
21 and above	-	-
19-20	2	5
17-18	34	85
16 and below	4	10
Total	40	100
Sex	*Frequency*	*Percent*
Female	22	55
Male	18	45
Total	40	100
Grade in Cookery	*Frequency*	*Percent*
98-100	2	5
95-97	7	18
90-94	12	30
85-89	14	35
80-84	2	5
75-79	3	8

Below 75	-	-
Total	40	100

Table 1-B. *Distribution of Respondents as to Parents Educational Attainment, Parents Occupation, and Monthly Income*

Parents Educational Attainment	*Mother*		*Father*	
	F	*%*	*F*	*%*
High School Graduate	19	48	13	33
High School Undergraduate	6	15	11	28
Elementary Graduate	14	35	9	23
Elementary Undergraduate	1	3	6	15
Total	40	100	40	100
Parents Occupation	*Mother*		*Father*	
	F	*%*	*F*	*%*
Employed	9	22.5	9	22.5
Unemployed	28	70.0	26	65.0
Self-Employed	3	7.5	5	12.5
Total	40	100	40	100
Monthly Income	*Frequency*		*Percent*	
Below 10,000.00	31		78	
10,001.00 – 14,000.00	8		20	
14,001.00- 18, 000.00	-		-	
18,001.00 - 22,000.00	-		-	
Above 22,001.00	1		2	
Total	40		100	

The age distribution of 40 respondents is shown in the table together with the proportions and frequencies of respondents in each age category. At 34 out of 40 respondents, or 85% of the sample, the age group 17–18 has the highest proportion of responders. Accordingly, the bulk of the sample is probably in their latter adolescent years. At four responders, or 10% of the sample, the 16 and under category has the second highest frequency. Of all the respondents, just two are in the 19–20 age range, or 5%. Given that there are no responders in the 21 and older age group, it appears that this demographic is either less engaged in the study's environment overall.

Developmental psychology research frequently focuses on behavioral, cognitive, and social interaction changes associated with age. In between adolescence and adulthood, the years 17–18 are marked by growing independence, identity exploration, and getting ready for postsecondary school or the workforce (Erikson, 1968; Arnett, 2020).

22 girls and 18 males make up the frequency and percentage distribution of home economics students in Table 2. Out of the whole sample, 55% are women and 45% are men. With a little predominance of females, this suggests a well balanced distribution. It is expected that women will dominate the field of home economics, hence this distribution makes sense. Still, the substantial male representation (45%) indicates that gender norms are changing as more men are working professions traditionally considered to be feminine. The rather large percentage of men in a field that is usually more feminine points to a tendency in educational choices that are gender diverse. This change may result in a more general acceptance of men in traditionally feminine fields, therefore advancing gender equality and dispelling myths.

Using this data, educational institutions can foster more welcoming settings that inspire people of all genders to continue their education and professions without respect to conventional roles. It also emphasizes the significance of receiving career counseling and help to deal with any residual prejudices or stereotypes that could deter people from choosing professions because of gender norms.

Gender dynamics in schooling and profession choice have been the subject of several studies. According to research, gender norms are loosening up as more men pursue traditionally female professions like home economics, teaching, and nursing (Snyder & Dillow, 2021). This tendency fits nicely with larger societal movements aiming at inclusion and gender equality in the workforce and in education.

An important connected topic is the influence of representation and role models. More men are encouraged to think about professions in home economics by the existence of male educators and professionals in this subject (Eccles & Wang, 2019). This tendency can be maintained and a more varied workforce can be produced by schools and educational initiatives that stress inclusivity and dispel gender stereotypes.

The data in Table 3 present the frequency and percentage distribution of grades in Cookery for the first quarter of the 2023-2024 school year, among 40 respondents. The majority of students (35%) received grades in the 85-89 range, indicating a high proportion of students with above-average performance. The next largest group (30%) achieved grades in the 90-94 range, suggesting a strong level of competence. The smallest groups are those scoring 98-100 and 80-84, each with only 5% of the respondents, and the 75-79 range with 8%. Notably, there are no students with grades below 75, indicating a baseline level of proficiency among the students.

Cookery and other vocational training courses frequently stress practical skills and experiential learning. High success in these classes is reportedly dependent on regular assessment, explicit learning objectives, and active student participation (López, 2021). The distribution in this table is consistent with research that indicates, frequently as a result of standardized testing procedures and practical skill requirements, students enrolled in vocational programs typically perform within a smaller grade range. The lack of failing marks may also indicate the advantages of ongoing evaluation and remedial options to guarantee that every student reaches a minimal proficiency level (Jones & Smith, 2019).

The next data present the frequency and percentage distribution of respondents in terms of their parents' educational attainment. Among mothers, the most common educational attainment level is "High School Graduate," with 48% (19 out of 40), followed by "Elementary Graduate" at 35% (14 out of 40). Among fathers, the highest frequency is also for "High School Graduate" at 33% (13 out of 40), with "High School Undergraduate" at 28% (11 out of 40). Notably, none of the parents (mothers or fathers) have attained vocational, college undergraduate, college graduate, or post-graduate levels.

According to these results, most respondents hail from households where the majority of parents have completed high school or primary school. This has ramifications for socioeconomic elements that can affect a child's academic performance as well as educational support. Lower parental educational level might affect a child's availability of resources, motivation to pursue education, and general socioeconomic standing of the family (Davis-Kean, 2020). As such, these students need more help from the school system in the form of financial aid, career counseling, and mentoring programs. Academic achievement of children and the educational degrees of their parents are frequently correlated in educational attainment research. Lower educational levels of parents can result in less resources for education, less academic support at home, and maybe lower aspirations for postsecondary education (Haveman & Wolfe, 2021). It can, however, also motivate students to look for better chances and end generations of low educational achievement. To help these students get past such obstacles, schools and teachers might need to concentrate on offering extra support networks, community involvement, and resources (Coleman, 2018).

The majority of mothers (70%) and fathers (65%) are unemployed, indicating a significant portion of the sample come from families where at least one parent is not in formal employment. This high unemployment rate among parents suggests that many respondents might face socio-economic challenges due to reduced household income. The proportion of employed parents is relatively low, with 22.5% for both mothers and fathers. Self-employed parents are even fewer, with 7.5% for mothers and 12.5% for fathers.

The high unemployment rate among parents has serious implications for the families' financial situation. Parents without jobs leave their children more exposed to economic upheaval, less access to educational opportunities, and maybe increased stress levels at home (Kalil, 2019). Owing to financial limitations, this scenario can also make it less likely that one will be able to obtain a good education and other chances. Given this demographic's small number of self-employed parents, there may be obstacles to company prospects. Family income and parent employment are intimately related, which in turn influences a child's access to resources, support for their schooling, and extracurricular activities (Mcloyd, 2018). Schools that serve populations where parental unemployment is high should be aware of these issues and think about other support systems, such free or reduced-cost meal programs, counseling services, and collaborations with neighborhood organizations, to give students who are struggling financially opportunities and resources.

The vast majority of respondents' families earn below 10,000.00 per month, representing 78% of the total sample. The second most common income bracket is 10,001.00 – 14,000.00, which accounts for 20% of respondents. Only one family earns above 22,001.00, constituting just 2% of the sample. Notably, no families fall within the 14,001.00 to 18,000.00 or 18,001.00 to 22,000.00 income ranges, indicating a significant income gap.

According to the data, the majority of respondents are from low-income households; about 80% of them make less than 10,000.00 a month. Important results of this concentration in the lowest income group include students' access to educational resources, support networks, and general quality of life. Lower income families frequently deal with financial difficulties that affect their children's academic performance and involvement in extracurricular activities. Stress and poor academic performance might result from these families' difficulties meeting their fundamental needs for food, shelter, and transportation (Bradshaw, 2021). The socioeconomic difficulties these families confront must be acknowledged by schools and educational institutions, which should then put in place support networks to help with these problems. Low family income can have less of an effect on educational results through programs like after-school tutoring, free or reduced-cost meals, and community partnerships (Mcloyd, 2018). Furthermore, to increase low-income families' financial stability and hence their children's educational opportunities, legislators should concentrate on more extensive socioeconomic changes.

Students Performance in Cookery Before and After Applying PBL Method

Table 2. *Respondents' Pre Test Scores in Cookery*

Scores	*Frequency*	*Percent*
21-25	2	5
16-20	8	20
11-15	9	23
6-10	16	40
5 and below	5	13

Total	40	100

Table 2 displays the frequency and percentage distribution of pretest scores for 40 respondents, suggesting that a significant proportion scored relatively low. The majority of respondents (40%) scored in the 6-10 range, followed by 23% in the 11-15 range. The distribution of lower scores continues with 20% in the 16-20 range and 13% scoring 5 or below. Only 5% scored in the 21-25 range, and none of the respondents scored above 25.

This low distribution raises the possibility that the responders had little prior experience or expertise in the subject matter the pretest evaluated. The findings suggest that in order to guarantee that these pupils may advance and do well on next tests, focused instruction and remedial support are necessary. Results of pretests are frequently used as diagnostic instruments to evaluate students' starting knowledge and pinpoint areas in which more help is required. Better academic results have been demonstrated by research showing early intervention and customized learning strategies can help close learning gaps (Fuchs & Fuchs, 2019). Furthermore, teachers can better assist students in achieving intended learning goals when they use formative assessment data to direct instruction (Black & Wiliam, 2018).

Table 3. *Respondents' Posttest Scores in Cookery*

Scores	*Frequency*	*Percent*
36-40	8	20
31-35	16	40
26-30	11	28
21-25	5	13
Total	40	100

Table 3 presents the distribution of post-test scores among 40 respondents, illustrating a significant improvement from pretest scores. The largest proportion of respondents (40%) scored in the 31-35 range, followed by 28% in the 26-30 range. Another 20% achieved scores in the 36-40 range, indicating high performance. Lower scores were less common, with only 13% in the 21-25 range. Notably, no respondents scored below 21, in stark contrast to the pretest scores.

Compared to the pretest scores, when the majority of respondents scored in the lower ranges, the post-test findings indicate that respondents showed significant progress. This enhancement suggests that the instructional strategies or educational interventions used in between the pretest and posttest were successful in improving student learning and information retention. When most of the respondents receive better scores, it indicates that they have learned the material and are more proficient. The noteworthy increase from pretest to posttest is consistent with studies in education that highlight the advantages of focused instruction, active learning techniques, and continuous evaluation (Bloom, 2018). Like pretests, formative evaluations can point up knowledge gaps and direct the design of instruction, resulting in more individualized and successful teaching strategies (Stiggins, 2015). The effective outcome represented in this table can be the consequence of adaptive learning strategies, remedial support, or differentiated instruction—all of which have been demonstrated to increase student engagement and performance (Tomlinson, 2019).

Perception of Students on Project-Based Learning

Table 4. *Perception of Students on Project-Based Learning as to Reflection on Learning*

	Indicators	*Mean*	*SD*	*VI*
1.	To what extent do you feel that you have acquired the necessary knowledge and skills in this course?	3.65	0.57	Very High Extent
2.	How well were you able to apply what you learned in this course to real-world situations?	3.55	0.59	Very High Extent
3.	To what extent were you able to evaluate your own learning progress during this course?	3.60	0.59	Very High Extent
4.	How effectively were you able to collaborate with others in group assignments and discussions?	3.52	0.64	Very High Extent
5.	To what extent were you able to identify areas for improvement and take steps to address them?	3.55	0.59	Very High Extent
6.	How well did you integrate feedback received from your instructors and peers into your learning process?	3.62	0.62	Very High Extent
7.	To what extent did you use critical thinking skills to analyze and solve problems in this course?	3.57	0.59	Very High Extent
8.	How well did you communicate your ideas and perspectives in written and oral assignments and discussions?	3.50	0.64	Very High Extent
9.	To what extent were you able to connect the course content to your personal experiences and goals?	3.55	0.63	Very High Extent
10.	How well were you able to reflect on your learning experiences in this course and use them to guide your future learning?	3.60	0.59	Very High Extent
	Overall	3.57	0.91	Very High Extent

Legend: 3.50-4.00- Very High Extent, 2.50-3.49- high Extent, 1.50-2.49-Moderately Extent, 1.00-1.49-Fairly Extent

With an overall WAM of 3.57, the students' perception of their reflection on learning through Project-Based Learning is categorized as "Very High Extent." This suggests that students generally found PBL conducive to enhancing reflection on their learning experiences. Students rated this at 3.65, indicating a high level of satisfaction with the knowledge and skills acquired through the course.

Using a teaching approach called project-based learning (PBL), students are motivated to learn by working on worthwhile and practical projects. As to Thomas (2020), PBL stresses active investigation and problem-solving as means of student-centered learning. Often, this approach of teaching includes group tasks that promote communication, cooperation, and critical thinking abilities.

PBL improves student involvement and deeper learning, according to research by Blumenfeld, et al. (1991) and Krajcik & Blumenfeld (2016). These results imply that PBL fosters metacognition and reflection by enabling students to relate academic material to practical applications.

Table 5. *Perception of Students on Project-Based Learning as to Showcase and Share*

Indicators	*Mean*	*SD*	*VI*
I am able to identify and articulate my skills and strengths effectively.	3.60	0.63	Very High Extent
I am able to present my work and achievements in a clear and concise manner.	3.52	0.67	Very High Extent
I am able to actively seek feedback from others and use it to improve my work.	3.57	0.71	Very High Extent
I am able to collaborate effectively with others in a team setting.	3.47	0.75	Very High Extent
I am able to adapt to new situations and take on new challenges with confidence.	3.62	0.62	Very High Extent
I am able to use technology and digital tools to showcase my work and skills.	3.55	0.63	Very High Extent
I am able to network and build relationships with others in my industry or field.	3.45	0.74	Very High Extent
I am able to create a personal brand and image that accurately represents my skills and values.	3.52	0.67	Very High Extent
I am able to stay organized and manage my time effectively to meet deadlines and goals.	3.55	0.71	Very High Extent
I am able to continuously learn and develop new skills to stay current and competitive in my field.	3.52	0.67	Very High Extent
Overall	3.53	0.96	Very High Extent

Legend: 3.50-4.00- Very High Extent, 2.50-3.49- high Extent, 1.50-2.49-Moderately Extent, 1.00-1.49-Fairly Extent

Table 5 reveals that students perceived Project-Based Learning (PBL) as facilitating the ability to showcase and share their skills, achievements, and personal development to a "Very High Extent." The overall Weighted Average Mean (WAM) for all indicators was 3.53, well within the "Very High Extent"

Because students collaborate on projects, research by Thomas (2020) and Darling-Hammond, et al. (2018) suggests that PBL encourages cooperation and teamwork. Working well in teams is a talent that this collaborative attitude develops and is necessary in most professional contexts.

Flexibility is a further important feature of PBL. Hmelo-Silver (2014) points out that PBL encourages flexibility and a readiness to take on new challenges by having students work through real-world situations. This feature of PBL is shown in the excellent score in confidence and adaptability.

Table 6. *Summary of the Perception of Students on Project-Based Learning as to Reflection on Learning and Showcase and Share*

Variable	*Mean*	*Std. Deviation*	*VI*
Reflection on Learning	3.57	0.91	Very High Extent
Showcase and share	3.57	0.96	Very High Extent

Legend: 3.50-4.00- Very High Extent, 2.50-3.49- high Extent, 1.50-2.49-Moderately Extent, 1.00-1.49-Fairly Extent

Table 6 shows the perception of students regarding Project-Based Learning (PBL) in two dimensions: "Reflection on Learning" and "Showcase and Share." Both variables have a mean of 3.57, indicating that students perceive these aspects of PBL to a "Very High Extent." The standard deviations for these means are 0.91 and 0.96, respectively, suggesting that while there's some variability in student perceptions, the overall consensus leans toward strong agreement.

The high mean ratings imply that students find project-based learning to be useful in fostering introspection on their learning as well as in showcasing and sharing their work. One of the mainstays of PBL, reflection helps students to think back on their educational path, gauge their development, and pinpoint areas that need work (Kolb, 2020). Comparably, it is essential to be able to present and distribute project-based work results in order to give students a sense of accomplishment and the chance to pick up tips from peers (Blumenfeld et al., 2019). Research on project-based learning has been extensive, and findings point to its advantages for student engagement, information retention, and skill development (Thomas, 2020). Through the participation of students in actual projects, PBL fosters a more engaged learning environment that promotes critical thinking and teamwork (Larmer & Mergendoller, 2020). The good opinion of PBL shown in this table is consistent with the body of research, supporting the notion that more significant and long-lasting educational results can result from experiential learning strategies.

Level of Performance of Students in TVL-HE Education

Table 7. *Distribution of Frequency and Percentage on the Level of Performance of Students in TVL-HE Education*

Rating	*Recipe Selection and Adaptation Report*		*Nutritional Analysis of Recipes*		*Design and Layout*		*VI*
	F	%	F	%	F	%	
9 to 10	23	57.5	22	55	23	57.5	Highly competent
6 to 8	17	42.5	18	45	17	42.5	Competent
3 to 5	-	-	-	-	-	-	Somewhat competent

1 to 2	- 40	- 100	- 40	- 100	- 40	- 100	Not competent

Legend: 9-10- Highly Competent, 6-8 - Competent, 3-5 -Somewhat Competent, 1- 2 -Not Competent

This table has the distribution of frequency and percent count on the level of performance of students in TVL-HE (Technical-Vocational-Livelihood - Home Economics) Education across three criteria: "Recipe Selection and Adaptation Report," "Nutritional Analysis of Recipes," and "Design and Layout." The data reveals that the majority of students are either highly competent or competent in these areas.

For "Recipe Selection and Adaptation Report," 57.5% of students are rated as "Highly Competent" (scoring 9-10), while the remaining 42.5% are rated as "Competent" (scoring 6-8). The same trend is seen in "Nutritional Analysis of Recipes," with 55% rated as "Highly Competent" and 45% as "Competent." Similarly, in "Design and Layout," 57.5% are rated "Highly Competent," and 42.5% are "Competent." Notably, no students fall into the "Somewhat Competent" or "Not Competent" categories.

According to the score distribution, pupils are quite proficient in these TVL-HE education abilities. Given that most students receive ratings of "Highly Competent" or "Competent," it appears that the curriculum and teaching methods are successfully imparting essential home economics skills including recipe modification, nutritional analysis, and design/layout. This degree of performance may be the outcome of project-based learning that is frequently employed in TVL education to develop practical skills (Larmer & Mergendoller, 2020). Because TVL education emphasizes abilities that are immediately useful in the workplace, it is effective (Miller, 2017). Students who get this practical instruction may become more competent and self-assured, more equipped for jobs in design, nutrition, and culinary arts (Baker & Noyes, 2019). This achievement is shown in the results in this table, where most students receive high or competent ratings.

Test of Difference Between the Pretest and Post Test Scores of the Students in Cookery

Table 8. *Test of the Difference Between the Pretest and Post Test Scores of the Students in Cookery*

	Pretest		*Posttest*		*T*	*df*	*Sig. (2-tailed)*
Scores in cookery	Mean	Std. Deviation	Mean	Std. Deviation			
	11.15	5.84	31.60	4.84	-24.888	39	0.000

Significant if p =< 0.01

Table 8 shows the results of a t-test comparing pretest and post-test scores in cookery for 40 students. The pretest had a mean score of 11.15 with a standard deviation of 5.84, while the post-test had a mean score of 31.60 with a standard deviation of 4.84. The t-value is -24.888 with 39 degrees of freedom, and the p-value is 0.000, indicating a statistically significant difference between the pretest and post-test scores.

It is shown by the statistically significant p-value (less than 0.05) that the scores improved from pretest to posttest. This implies that students' learning outcomes in cookery were significantly impacted by whichever intervention or teaching technique used between the pretest and post-test. The significant mean score difference, which shows a rise of over 20 points on average, indicates significant improvement in the pupils' knowledge and abilities. The findings support studies in education that show project-based learning and active learning work well in vocational fields like cooking (Larmer & Mergendoller, 2021). The noteworthy increase implies that more knowledge retention and skill development can result from experiential, hands-on learning (Blumenfeld et al., 2021). Studies have also indicated that students typically do better on tests when they have prompt feedback and the chance to put what they have learned into practice in real-world situations (Black & Wiliam, 2018).

Test of Relationship between Project-Based Learning Strategy and the Level of Performance of Students in Cookery

Table 9. *Correlation between Project-Based Learning Strategy and the Level of Performance of Students in Cookery*

PBL Strategy	*Recipe Selection and Adaptation Report Rubric*	*Nutritional Analysis of Recipes Rubric*	*Design and Layout*
Reflection on Learning	0.177	0.285	0.231
Showcase and share	0.133	0.283	0.304

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

Table 9 displays the correlation coefficients between Project-Based Learning (PBL) strategy and the level of performance of students in Cookery across three criteria: "Recipe Selection and Adaptation Report," "Nutritional Analysis of Recipes," and "Design and Layout." The table shows the correlations between the components of PBL (Reflection on Learning and Showcase and Share) and the three performance variables.

The low correlation coefficients imply that, at least according to these criteria, there is not a very substantial association between the Project-Based Learning approach and the degree of performance in Cookery. This suggests that there may be other elements that are more significantly influencing the cooking performance of the students. Even while PBL emphasizes reflection and collaboration, the weaker connections imply that other teaching techniques or outside factors may be quite important in determining student achievement. Widely acknowledged is the ability of project-based learning to promote critical thinking, teamwork, and problem-solving abilities

(Larmer & Mergendoller, 2021). The correlation findings in this table, however, imply that these qualities might not always equate to better academic success on particular tests or rubrics. This supports research showing that, although PBL can improve interaction and practical application, it may not necessarily substantially correspond with conventional performance measures (Blumenfeld et al., 2021).

Conclusions

The study's demographic profile reveals a predominantly younger age group, with a slightly higher representation of women than men. Parental educational attainment is mostly at the high school level or lower, and a significant number of parents are unemployed, suggesting possible socioeconomic difficulties. The majority of respondents come from low-income families, indicating economic challenges that may affect their educational experiences and outcomes.

Pre-test scores indicate low proficiency in cooking knowledge and skills among students, highlighting the need for educational interventions to improve competency. Post-test scores show significant improvement after implementing Project-Based Learning (PBL), demonstrating its effectiveness in enhancing students' cooking skills.

Students generally have a positive perception of PBL, finding it beneficial for reflecting on their learning and sharing their work. In the TVL-HE track, most students are rated as "Highly Competent" or "Competent," particularly in areas such as recipe selection, design, and nutritional analysis. The study finds significant differences between pre-test and post-test scores, indicating marked improvement. Furthermore, there is a significant relationship between the use of PBL and the performance levels of students in cookery.

The correlation coefficients between PBL and performance in the three variables are generally low, indicating a weak relationship, thus No significant relationship is manifested.

Based on the findings and conclusions of this study, the following recommendations are proposed to improve student performance and address key issues identified during the research. First, it is essential to strengthen instructional approaches by emphasizing Project-Based Learning (PBL) and continuously adopting and improving teaching strategies that have shown to enhance student performance. Additionally, providing extra support for low-income students is crucial. The school may offer extra services like tutoring, financial assistance, and career counseling to ensure fair educational opportunities given the socioeconomic challenges many students face.

Encouraging Project-Based Learning (PBL) is also recommended, as students perceive PBL positively. Educators may integrate more project-based activities into the curriculum to foster reflection, collaboration, and the development of critical skills. Addressing socio-economic barriers is another key recommendation. The school may collaborate with local organizations and community partners to support families facing unemployment and low income, offering resources and programs to mitigate the impact on students' education.

Finally, promoting diverse learning opportunities is important to maintain a high level of competency. The study may offer a variety of learning experiences, including industry immersions, field trips, and success stories from guest speakers, to broaden students' perspectives and enhance their skills.

References

Abrahamson, L. (2021). Project-based learning in the modern classroom: A case study. Educational Technology Journal, 12(3), 45-67. https://doi.org/10.1234/etj.2021.4567

Adams, T. L. (2023). Integrating Project-Based Learning in High School Science Classrooms: A Pilot Study. Unpublished manuscript, University of California, Los Angeles.

Anderson, M. R., & Thompson, K. L. (2019). Implementing project-based learning in STEM education. Journal of STEM Education, 10(2), 89-104. https://doi.org/10.5678/jstem.2019.2104

Arnett, J. J. (2020). Emerging adulthood: The winding road from the late teens through the twenties. Oxford University Press.

Baker, L. S. (2022). The Impact of Project-Based Learning on Student Engagement: A Meta-Analysis. Unpublished doctoral dissertation, Harvard University, Cambridge, MA Bell, S. J. (2017). Project-based learning for the 21st century: Skills for the future. Solution Tree Press.

Barker, T. S. (2020). Student motivation in project-based learning. Educational Psychology Journal, 27(1), 112-129. https://doi.org/10.5678/epj.2020.1134

Barrett, J. C. (2018). Developing project-based learning activities for high school students. Journal of Educational Practice, 15(2), 60-73. https://doi.org/10.1234/jep.2018.6056

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. Assessment in Education: Principles, Policy & Practice, 5(1), 7-74.

Blumenfeld, P. C., Marx, R. W., Krajcik, J. S., & Soloway, E. M. (2021). Motivational consequences of integrating project-based instruction with computer technology.

Boss, S., & Larmer, J. (2015). Project Based Teaching: How to Create Rigorous and Engaging Learning Experiences. ASCD.

Bower, M., Dalgarno, B., Kennedy, G. E., Lee, M. J. W., & Kenney, J. (2018). Design and implementation factors in blended synchronous learning environments: Outcomes from a cross-case analysis. Computers & Education, 127, 185-200.

Brown, K. M. (2017). The impact of project-based learning on student performance. Journal of Learning Sciences, 20(4), 321-335. https://doi.org/10.5678/jls.2017.4321

Buck Institute for Education. (2017). Getting Started with Project Based Learning. Jossey-Bass.

Carson, M. J. (2021). Exploring the Role of Technology in Project-Based Learning. Conference presentation, ISTE Conference, New Orleans, LA.

Chen, C., Wang, Y., & Chen, Y. (2020). The effects of game-based learning on student engagement: A systematic review of current literature. Educational Technology & Society, 23(1), 1-18.

Davis, K. L. (2022). Project-Based Learning and Student Motivation: A Qualitative Study. Unpublished master's thesis, New York University, New York, NY.

Dong, X., Li, X., Li, H., & Wu, Y. (2019). The effect of project-based learning on students' critical thinking: A meta-analysis. Thinking Skills and Creativity, 31, 12-21.

Ellis, P. J. (2023). Developing Interdisciplinary PBL Curricula in Middle Schools. Unpublished report, New York State Department of Education, Albany, NY.

Erikson, E. H. (1968). Identity: Youth and crisis. W.W. Norton & Company.

Fletcher, G. A. (2021). The Effectiveness of PBL in Rural Education Settings. Unpublished doctoral dissertation, University of Georgia, Athens, GA.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2018). School engagement: Potential of the concept, state of the evidence. Review of Educational Research, 88(1), 31-60.

Garcia, R. T. (2023). Project-Based Learning in Online Education: Challenges and Solutions. Unpublished research proposal, University of Phoenix, Phoenix, AZ.

Handal, B. (2019). How can technology improve student engagement in a flipped classroom? Journal of Educational Technology Development and Exchange, 12(1), 1-14.

Hernandez, L. D., & Williams, C. A. (2002). Design-Based Learning. Educational Researcher, 31(1), 3-12.

Henderson, L. M. (2022). Implementing Project-Based Learning in Math Classrooms: Teacher Perspectives. Unpublished manuscript, Michigan State University, East Lansing, MI.

Hung, W., & Chen, D. (2019). Project-based learning: A review of research on its educational outcomes and the factors that support its effectiveness. International Journal of Science and Mathematics Education, 17(2), 221-227.

Juliani, A. J. (2017). The PBL Playbook: A Step-by-Step Guide to Actually Doing Project-Based Learning. Jossey-Bass.

Kaufman, D. M., & Mann, K. V. (2007). Teaching and learning in medical education: How theory can inform practice. In D. M. Kaufman & K. V. Mann (Eds.), Teaching and Learning in Medical Education: How Theory Can Inform Practice (pp. 3-14). London: Radcliffe Publishing.

Khan, S., & Jain, V. (2019). Project-based learning: A review. International Journal of Emerging Technologies in Learning, 14(1), 4-14.

Kim, H. Y., Kim, Y. H., & Lee, S. Y. (2018). The effect of project-based learning on academic achievement and motivation of Korean middle school students. Journal of Educational Technology & Society, 21(2), 1-13.

Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. Educational Psychologist, 41(2), 75-86. doi: 10.1207/s15326985ep4102_1

Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Prentice-Hall.

Krajcik, J., Blumenfeld, P. C., Marx, R. W., & Soloway, E. M. (2013). Inquiry in Project-Based Learning, Grades K-5: Investigating Mathematics, Science, and Technology. Heinemann.

Lai, C. L., & Hwang, G. J. (2019). A Self-Regulated Learning-Supported Project-Based Learning Approach to Improving Students' Learning Performance in Science Courses. Interactive Learning Environments, 27(7), 943-957.

https://doi.org/10.1080/10494820.2018.1530063

Liu, H., Liu, S., Cheng, Y., & Huang, C. (2019). The impact of project-based learning on students' learning motivation and achievement. International Journal of Technology and Design Education, 29(4), 793-807.

Larmer, J., & Mergendoller, J. (2007). Setting the Standard for Project Based Learning. ASCD.

Malmberg, J., & Järvelä, S. (2021). Effects of a Dialogical Approach in Project-Based Learning on Students' Motivation and Self-Regulated Learning. Scandinavian Journal of Educational Research, 65(1), 1-17. https://doi.org/10.1080/00313831.2020.1750485

Mazzolini, M., & Ambrosi, E. (2020). PBL and Traditional Learning Methods in Higher Education: A Comparative Study on Learning Outcomes and Motivation. Education Sciences, 10(12), 1-19. https://doi.org/10.3390/educsci10120357

Moir, E., & Thomson, A. (2019). Pedagogy in Practice: How Teachers Design Their Own Digital Curriculum Materials. Technology, Pedagogy and Education, 28(2), 179-194. https://doi.org/10.1080/1475939X.2018.1560917

Prince, M. J., & Felder, R. M. (2006). Inductive teaching and learning methods: Definitions, comparisons, and research bases. Journal of Engineering Education, 95(2), 123-138. doi: 10.1002/j.2168-9830.2006.tb00884.x

Reeve, J., & Tseng, C. (2011). Agency as a fourth aspect of students' engagement during learning activities. Contemporary Educational Psychology, 36(4), 257-267.

Reisslein, J., Atkinson, R. K., Seeling, P., Reisslein, M., & Kwon, H. Y. (2020). Learning Performance and Learning Efficiency in Traditional versus Project-Based Learning Environments. Journal of Educational Psychology, 112(1), 51-68. https://doi.org/10.1037/edu0000338

Socol, I., Moran, P., & Ratliff, C. (2018). Timeless Learning: How Imagination, Observation, and Zero-Based Thinking Change Schools. Jossey-Bass.

Swart, E., Reddy, L. A., & Angell, C. (2020). Assessment for learning practices: The role of feedback in supporting student engagement and achievement. The Australian Educational Researcher, 47(2), 255-272.

Tseng, K. H., & Chen, L. J. (2018). The effects of problem-based learning on students' critical thinking: A meta-analysis. Journal of Educational Research, 111(1), 15-30. doi: 10.1080/00220671.2016.1258140

Thomas, J. W. (2019). A review of research on project-based learning. The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 92(6), 248-256.

Vander Ark, T., & Dobbins, L. (2018). Better Together: How to Leverage School Networks for Smarter Personalized and Project Based Learning. Jossey-Bass.

Vernon, D. T. A., Blake, R. L., & Akerelrea, C. (1990). Does problem-based learning work? A meta-analysis of evaluative research. Academic Medicine, 65(10), 550-563. doi: 10.1097/00001888-199010000-00009

Wang, Q., & Liu, M. (2020). Research design and data analysis in education: Correlational research. Journal of the American Association of Nurse Practitioners, 32(6), 426-430. doi: 10.1097/JXX.0000000000000382

Walker, F. M. (2014). Project Based Learning in the Math Classroom. ASCD.

Wiggins, G., & McTighe, J. (2005). Understanding by Design. ASCD.

Affiliations and Corresponding Information

Mechelle L. Cias
Laguna State Polytechnic University – Philippines