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Outcomes-Based Independent Learning Paradigm (OBILP): Effects on Students' Engagement and Performance in Chemistry

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Abstract. This study investigated the effects of the Outcomes-Based Independent Learning Paradigm (OBILP) on Grade 10 students' engagement and performance in chemistry, focusing on the domains of gas laws, biomolecules, and chemical equations and reactions. An Explanatory Sequential Mixed-Methods design was employed. The quantitative phase utilized a quasi-experimental pretest–posttest control group design involving Grade 10 students from Bacayawan National High School during the school year 2022–2023. Results indicated that both control and experimental groups exhibited very high levels of affective engagement and high levels of behavioral and cognitive engagement, with no significant differences across the three components. However, the experimental group achieved significantly higher mean scores ($p = 0.010$) and mean gain scores ($p = 0.035$) than the control group. No significant correlation was found between students' engagement and performance before and after the intervention. The qualitative phase, through interviews and student journal entries, provided explanatory insights into these findings, revealing that OBILP enhanced student engagement and performance, while chemical reactions and equations remained the most challenging topic domain. These results suggest that OBILP has the potential to improve chemistry learning outcomes, although future studies should employ larger samples and broader contexts to strengthen generalizability.
Keywords: OBILP, student engagement, chemistry, performance, effects

1. Introduction

Chemistry is often regarded as the central science due to its integrative role across disciplines such as biology, physics, and earth science. Within the Philippine K to 12 Curriculum, chemistry instruction follows a spiral progression model, delivered in quarter-long segments across grade levels. Despite this structured approach, student performance in science has remained a persistent concern. Aloquin and Marpa (2016) reported that results from the 1994–1999 National Secondary Achievement Test (NSAT) identified science as the most challenging subject area, followed closely by mathematics.

Recent data continue to reflect this trend. highlighted that the National Achievement Test (NAT) results placed the Autonomous Region in Muslim Mindanao (ARMM, now Bangsamoro Autonomous Region in Muslim Mindanao or BARMM) at the lowest rank nationwide in science achievement. Within BARMM, Lanao del Sur II emerged as the poorest-performing school division, underscoring the urgency of targeted educational interventions (Dalidig, 2019).

One factor that strongly influences academic performance is student engagement. Delfino (2018) explained that engagement reflects how students behave and respond to the teaching–learning process, offering schools a way to assess the effectiveness of their practices. Lack of engagement has also been a global concern. The National Research Council and Institute of Medicine (2004), as cited by Al-Alwan (2014), reported that between 30% and 50% of middle school learners exhibited signs of disengagement. Wara, Aloka, and Odongo (2018) further observed that engagement has been understudied in countries outside the United States and Europe. Given its critical role in sustaining academic involvement, Dixson (2015) emphasized the importance of examining engagement among junior high school learners.

Education, after all, aims to develop individuals who can think critically and apply their knowledge in real-world contexts. Valdez and Bungihan (2019) pointed out that the Philippine education system has undergone many reforms to meet both national and global standards while improving the quality of science education; yet challenges remain. Estonanto (2017) stressed that the declining number of science and mathematics professionals can be traced back to weak performance in basic education. Similarly, Lee-Chua (2005, as cited in Estonanto, 2017) noted that Filipino learners have long struggled with numerical ability, which partly explains why the K to 12 program was introduced as a potential solution.

One response to these challenges is the Outcomes-Based Independent Learning Paradigm (OBILP), also known as the Central Visayan Institute Foundation–Dynamic Learning Program (CVIF-DLP). Pawilen and Manuel (2018) described this approach as a synthesis of classical and contemporary teaching theories designed to enhance creativity, productivity, and autonomous learning. Its key features include parallel learning groups (modified jigsaw strategies), activity-based learning across domains, in-school student portfolios, and a balanced integration of study, rest, and cultural-spiritual formation. Bernido, as cited by Aloquin and Marpa (2016), emphasized that the ultimate goal of CVIF-DLP is to equip students with the capacity to "learn how to learn." This paradigm aligns with the spiral progression framework of the K to 12 curriculum by scaffolding learning activities from simple to complex, thereby promoting sustained engagement and academic growth.

With these points in mind, this study seeks to determine the effects of OBILP on the engagement and chemistry performance of Grade 10 students at Bacayawan National High School.

1.1 Statement of the Problem

Science continues to be a challenging subject for many students, and this struggle is especially evident in regions like BARMM, where national assessments have consistently shown low performance. At Bacayawan National High School, this issue is no different. Students often find it difficult to stay engaged and perform well in science classes, particularly in chemistry. Given how closely student engagement is tied to learning outcomes, finding effective ways to address this concern has become a priority.

One promising approach is the Outcome-Based Independent Learning Paradigm (OBILP), also known as the CVIF-Dynamic Learning Program. Designed to promote independent and active learning, OBILP has shown potential in various educational settings. However, its impact on student engagement and academic performance in Chemistry, especially among junior high school students in BARMM remains underexplored.

This study aims to fill that gap by examining how OBILP affects student engagement and performance in chemistry at Bacayawan National High School. Specifically, it seeks to answer the following research questions:

1. Is there a significant difference in the levels of engagement between the control group and the experimental group of students before and after the intervention?
2. Are there significant differences in the chemistry performance test scores of the control and experimental groups before and after the intervention, including their mean gain scores?
3. Is there a significant relationship between students' engagement and their performance in chemistry?

1.2 Hypotheses

Based on the research questions, the following null hypotheses were formulated and tested at the 0.05 level of significance:

H_01: There is no significant difference in the engagement of students in the control group and the experimental group before and after the intervention.

H_02: There are no significant differences in the chemistry performance test scores of students in the control group and the experimental group before and after the intervention, nor in their mean gain scores.

H_03: There is no significant relationship between students' engagement and their performance in chemistry.

1.3 Theoretical and Conceptual Framework

This study is grounded in a set of well-established learning theories that collectively inform its assumptions, design, and implications.

Edward Thorndike's *Theory of Connectionism* also known as the *Theory of Association* outlines three major laws of learning: (1) the Law of Readiness, the (2) Law of Exercise, and (3) the Law of Effect (Islam, 2015). Two of these laws are particularly relevant to this study. The Law of Exercise emphasizes that practice and repetition reinforce learning, underscoring the importance of drill, review, and continuous practice. Within the framework of OBILP, students reinforce their learning by actively engaging in learning activity sheets (LAS) which require copying, reading, self-directed understanding, and answering exercises independently. The Law of Effect posits that learning is strengthened when it produces satisfaction for the learner. Accordingly, if students perceive OBILP enjoyable and engaging, their positive feelings can enhance their engagement and performance in chemistry. This suggests that teachers should design learning experiences that are not only effective but enjoyable. As Tomlinson (2005) stressed, learning occurs more meaningfully when it is individualized and tailored to the needs and interests of each student.

Gagné's Theory of Instruction (as cited in Buo & Kurangking, 2014) further supports the study by emphasizing the importance of structured and well-planned instructional design. Meaningful learning occurs when activities are sequenced and scaffolded effectively. This aligns with Piaget's Theory of Cognitive Development, which posits that genuine learning occurs only when learners actively interact with information and their environment. Applied to the context of OBILP, students' engagement in chemistry lessons depends not only on the design of learning activities but also on the teacher's ability to effectively deliver concepts and principles in a manner that fosters curiosity and active participation.

Finally, Rosenberg's (1968) *Affective–Cognitive Consistency Theory* contributes to the theoretical foundation of this study by highlighting the relationship between emotional and cognitive domains. According to this theory, a change in a learner's affective state (e.g., interest or attitude) influences the cognitive outcomes (e.g., understanding and performance), leading to greater consistency between the two. Capuno et al. (2019) similarly argue that students' emotional responses toward a subject significantly affect their academic performance. In the case of OBILP, if students perceive the intervention as engaging, their motivation and confidence increase, which may positively affect their chemistry performance.

Taken together, these theories collectively provide a basis for examining the effects of OBILP on student engagement and performance. Thorndike highlights the role of practice and positive reinforcement; Gagné and Piaget underscore the importance of systematic, active learning; and Rosenberg demonstrates the dynamic interplay between affective and cognitive factors. The integration of these theoretical perspectives guided the formulation of this study and its conceptual framework, as illustrated in Figure 1.

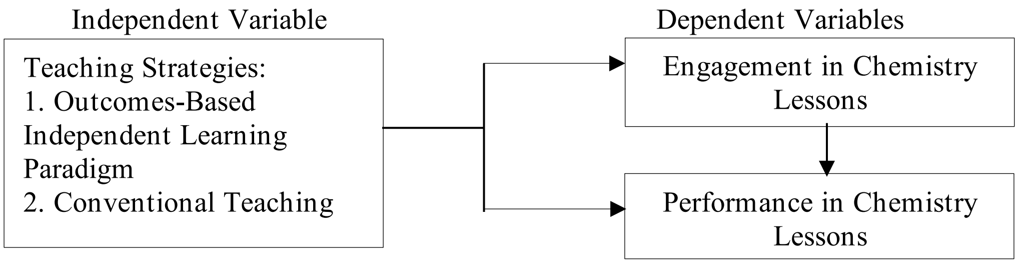


Figure 1. Schematic Diagram of the Conceptual Framework

2. METHODOLOGY

This chapter presents the methodological procedures employed in the study. Specifically, it outlines the research design, participants, research instruments, data collection procedures, and statistical tools utilized for analysis.

2.1 Research Design

This study employed an *Explanatory Sequential Mixed-Methods Design*, wherein quantitative data collection and analysis were conducted first, followed by qualitative data collection to provide further explanation and support for the quantitative findings.

Treatment group	M_1	O	X	O
Control group	M_2	O	C	O

Table 1. Quasi-Experimental Design of the Quantitative Phase

Table 1 shows that the quantitative phase utilized a *quasi-experimental design* with a matched-pairs pretest–posttest control group. ***M*** indicates that the subjects in each group were matched based on their previous grades in science and then randomly assigned to either the control or experimental group using the *fishbowl method*. Students with the same previous grade were paired, and each pair was assigned to groups through a draw-lots procedure: one to the control group and the other to the experimental group. The ***O*** in the second column represents the pretest observation of both students' engagement and performance in chemistry, while ***X*** refers to the intervention applied to the experimental group, and ***C*** denotes the control group with no intervention. Finally, ***O*** in the fourth column represents the posttest observation of students' engagement and performance after the intervention.

The intervention covered selected chemistry topics, specifically: (1) *Gas Laws*: Kinetic Molecular Theory, volume, pressure, and temperature relationships, and Ideal Gas Law; (2) *Chemical Reactions*: naming compounds, factors affecting chemical reactions, types of reactions, and balancing chemical equations; (3) *Biomolecules*: elements present in biomolecules, carbohydrates, lipids, proteins, and nucleic acids.

Through this design, the study primarily established the statistical effects of OBILP on students' engagement and performance (quantitative phase) and then used qualitative evidence from interviews and journals to deepen the explanation of how and why these effects occurred.

2.2 Subject Participant of the study

The participants of this study were 74 Grade 10 junior high school students enrolled at Bacayawan National High School during the school year 2022–2023. Sampling was not applied since the study involved the two intact sections of Grade 10. To ensure comparability between groups, the students were matched based on their previous grades in science. A minimum of 30 participants is generally required for an experimental study; however, this study successfully matched 37 pairs of students, resulting in a total of 74 participants.

2.3 Research Instruments

To gather the necessary data, the study employed both quantitative and qualitative instruments.

2.3.1. **Student Engagement Scale.**

Students' engagement was measured using a questionnaire adapted from the international study of Lam et al. (2014), which was administered across 12 countries. The instrument consists of three dimensions of engagement: affective (emotional), behavioral, and cognitive, comprising a total of 32 items. The original validation study demonstrated high internal consistency, with Cronbach's alpha values of .80 for affective engagement, .84 for behavioral engagement, and .89 for cognitive engagement. The full scale reported acceptable reliability with $\alpha = .78$ (Espejo, 2018). In terms of construct validity, Lam et al. (2014) found that a one-factor model did not fit the data adequately, while both the three-factor model and the second-order model provided a reasonable fit. Moreover, concurrent validity tests revealed moderate and positive correlations between engagement scores and contextual factors such as instructional practices, teacher support, peer support, and parent support.

In this study, the questionnaire was slightly modified to localize the context. For example, the term *"school"* in the original instrument was changed to *"chemistry class",* since the OBILP intervention did not extend to extracurricular activities. Pilot testing confirmed the reliability of the modified instrument, with Cronbach's alpha values of .723 for affective engagement (7 items, after the removal of item 5), .802 for behavioral engagement (12 items), and .888 for cognitive engagement (12 items). The overall reliability of the full scale was very high, at $\alpha = .928$, indicating strong internal consistency. Consistent with Lam et al. (2014), responses for affective and behavioral engagement were recorded on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with reverse coding applied to negatively worded items. Cognitive engagement was measured on a five-point frequency scale ranging from 1 (*never*) to 5 (*always*). For interpretation, students' engagement levels were categorized as follows: very high (*strongly agree/always*), high (*agree/often*), moderate (*undecided/sometimes*), low (*disagree/rare*), and very low (*strongly disagree/never*).

2.3.2. **Chemistry Performance Test.**

Students' performance in chemistry was assessed through the Chemistry Performance Test (CPT), which consisted of 85 items. The instrument was reviewed and validated by experts, then subjected to item analysis and reliability testing. The CPT demonstrated excellent reliability, with an internal consistency of $\alpha = .955$. Performance levels were categorized using the Mean Percentage Score (MPS) scale adopted from the Department of Education's (DepEd) K to 12 grading system, which provides a standardized framework for assessing student achievement. The categorization of scores and corresponding percentages is summarized in the succeeding table.

Percentage	Raw Score	Level of Performance
96% – 100%	82 – 85	Mastered
86% – 95%	73 – 81	Closely Approximating Mastery
66% – 85%	56 – 72	Moving Towards Mastery
35% – 65%	30 – 55	Average
15% – 34%	13 – 29	Low
5% – 14%	4 – 12	Very low
0 – 4%	0 – 3	Absolutely No Mastery

Table 2. Categorization of Scores and Corresponding Percentages

2.3.3. **Interview and Students Journal.**

These qualitative instruments provided supplementary evidence to support and validate the quantitative findings. They also offered deeper insights into students' experiences during the intervention, thereby enabling a more meaningful interpretation and discussion of results.

3.4 Statistical Tools

The data gathered in this study were subjected to appropriate statistical treatments and analyzed at a significance level of $\alpha = 0.05$, with the assistance of an expert statistician.

Descriptive statistics such as frequency, percentage, mode, mean, and standard deviation were employed to determine students' engagement levels and their performance in chemistry. Responses from the engagement questionnaire were tabulated, categorized, and analyzed using the *Mann–Whitney U Test* to examine whether there was a significant difference between the experimental and control groups' engagement before and after the intervention.

To establish comparability of the groups, a *normality test* and an *independent samples t-test* were conducted on the pre-test scores and pre-engagement results. *Levene's Test* was also applied to confirm the equality of variances, thereby providing a valid basis for comparing the two groups' mean gain scores. Finally, since the engagement data were analyzed using *nonparametric statistics*, *Spearman's rho correlation* was utilized to determine the relationship between Grade 10 students' engagement and their performance in chemistry.

3. Results and Discussion

This section presents the findings in relation to the research problems earlier identified.

3.1 Comparison of Student Engagement Levels between the Control and Experimental Groups Before and After the Intervention.

Table 3. *Engagement Levels of Students Before and After the Intervention*

Difference between two groups	Group	Non-Parametric Statistic*	*p*-value	Remark
Affective (Pre)	Experimental and control	608	.349	Not significant
Behavioral (Pre)		438	.005**	Significant
Cognitive (Pre)		476	.016**	Significant
Affective (Post)		680	.954	Not significant
Behavioral (Post)		587	.255	Not significant
Cognitive (Post)		626	.470	Not significant

Note: *Mann-Whitney U test, **significant at .05 level of significant

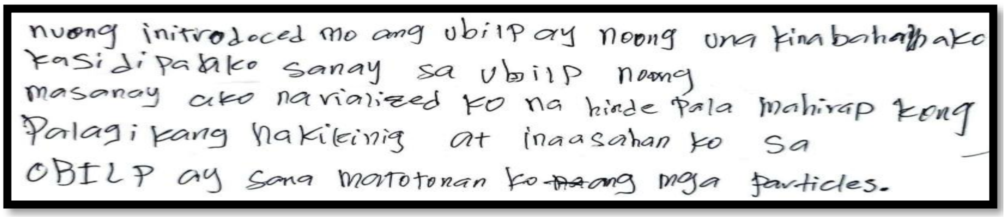
Table 3 presents the engagement levels of the control and experimental groups before and after the intervention. The *Mann–Whitney U Test* was employed to determine whether significant differences existed between the two groups.

Prior to the intervention, no significant difference was found between the groups in terms of affective engagement, indicating that both groups were comparable in this component. However, significant differences were observed in behavioral and cognitive engagement, suggesting that the control and experimental groups significantly differed in their behavioral and cognitive engagement levels before the intervention.

After the intervention, Table 3 indicates no significant differences in affective, behavioral, and cognitive engagement between the groups. This suggests that, overall, both groups exhibited comparable levels of engagement following the implementation of the OBLIP. Although the experimental group exhibited a slight increase in engagement, the difference was not statistically significant. Notably, their engagement remained at a high level throughout the intervention period. In contrast, the control group experienced a decline in behavioral and cognitive engagement, although their overall engagement also remained high.

These findings imply that while OBLIP did not yield a statistically significant increase in engagement, it helped sustain the experimental group's high level of involvement in chemistry. Both groups' consistently high engagement indicates that students generally valued their learning experiences in chemistry and exerted considerable effort. It is worth noting that other external factors, aside from the OBLIP, may also have influenced students' engagement.

One plausible explanation for the initial disparity in behavioral and cognitive engagement is students' responses to the novelty of OBLIP. Some expressed anxiety or apprehension, as paradigm disrupted their usual classroom routine. Others responded with curiosity or enthusiasm, while a few held negative preconceptions. This mixed response is reflected in Student E30's journal (Figure 2), where he admitted feeling nervous due to unfamiliarity with the approach.


nuong initrodoced mo ang ubilp ay noong una kinabahabako
kasidi pa ako sanay sa ubilp noong
masanay ako navialized ko na hinde pala mahirap kong
Palagi kang nakikinig at inaasahan ko sa
OBILP ay sana matotonan ko ~~naang~~ mga particles.

(When OBILP was introduced, I was nervous because I wasn't familiar with it. But as I got used to it, I realized that it's not difficult as long as you pay attention. What I hope to learn through OBILP is the lesson on particles.)

Figure 2. Student Journal Entry (E30 11/19/2022)

Similarly, during the interview, Student E02 acknowledged both positive and negative aspects of the OBLIP:

Researcher: What insights or recommendations can you offer regarding the implementation of the Outcomes-Based Instruction and Learning Plan (OBILP)?

Student E02: *Yung parang, natut-natututo ka talaga. Parang na-aactive talaga yung brain ng students, na yung negative naman na parang yung hindi mo masyadong maintindihan yung iba pero naiintidihan mo naman.*
(It is like you're really learning. It really activates the brain of students. The negative side is that you don't fully understand some concepts, although you are still able to learn overall.)

This indicates that while OBLIP stimulated active engagement, and the challenges in fully grasping some concepts may have tempered students' overall engagement.

3.2 Comparison of Chemistry Performance Test Scores of the Control and Experimental Groups Before and After the Intervention and in Their Mean Gain Scores

Table 4 presents the chemistry performance of the control and experimental groups before and after the implementation of the Outcomes-Based Independent Learning Paradigm (OBILP), as well as their respective mean gain scores. *Levene's Test* for Equality of Variances was conducted to assess the homogeneity of variance between the groups. Results indicated no significant differences in variance across the pretest, posttest, and mean gain scores, confirming that the groups were statistically comparable in terms of performance.

Table 4. Performance of Students Before and After the Intervention

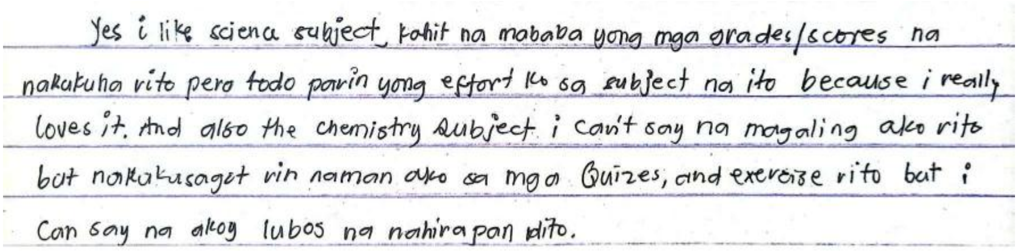
Period	Group	Mean Score			Remark
		$\bar{x}$	t	*p-value*	
Before Intervention	Control (n=37) Experimental (n=37)	20.4865 21.7027	1.209	.230	Not Significant
After Intervention	Control (n=37) Experimental (n=37)	27.1351 33.0270	2.637	.010	Significant
		Mean Gain Score			
	Control (n=37) Experimental (n=37)	6.6486 11.3243	2.147	.035	Significant

Prior to the intervention, the independent samples t-test yielded a t-value of 1.209 and a p-value of .230, exceeding the 0.05 threshold for statistical significance. Consequently, the null hypothesis (Ho_2), which posits no significant difference between the groups' mean scores, was not rejected. The mean difference of 1.22 (21.70 vs. 20.49) was not statistically significant, suggesting that both groups demonstrated similar baseline performance. This outcome was anticipated, as the chemistry performance test covered topic domains that were newly introduced at this grade level.

After the intervention, however, a statistically significant difference emerged between the groups. The *t-test* yielded a *t-value* of 2.637 and a p-value of .010, which is less than the 0.05 significance level. Thus, the null hypothesis is rejected. The experimental group, with a mean score of 33.03, outperformed the control group, which had a mean of 27.14. The mean difference of 5.89 was statistically significant, indicating that the OBILP intervention had a positive impact on student performance in chemistry.

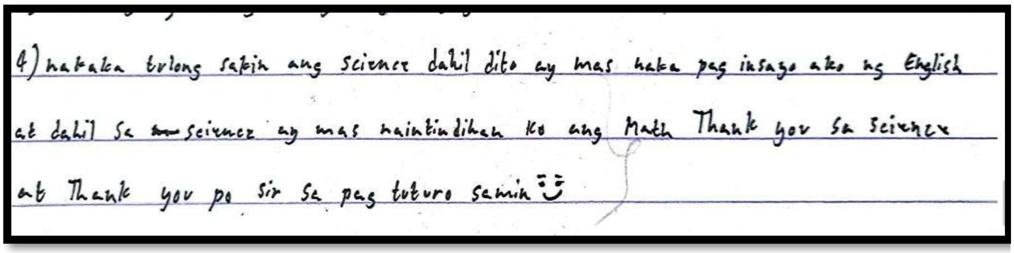
Similarly, when comparing the mean gain scores of the two groups, a significant difference was observed. The *t-test* produced a *t-value* of 2.147 and a *p-value* of .035, both below the 0.05 significance level. The experimental group achieved a higher mean gain score (11.3243) compared to the control group (6.6486), resulting in a significant mean difference of 4.67568. This suggests that students who underwent the OBLIP intervention demonstrated greater improvement in their performance than those in the control group.

These results align with the claims of proponents of the CVIF-DLP (OBLIP), who argue that the approach enhances learners' performance by promoting individualized learning, sharpening critical thinking, and fostering creativity. The intervention encouraged students to become active and independent learners. This finding is further supported by students' journal reflections (Figure 3 and 4), where they highlighted that OBLIP not only developed their scientific skills but also strengthened competencies in other disciplines. Despite encountering difficulties in chemistry, students persisted in learning, demonstrating resilience and motivation.


Yes i like science subject kahit na mababa yong mga grades/scores na nakakuha rito pero todo parin yong effort ko sa subject na ito because i really loves it. And also the chemistry subject i can't say na magaling ako rito but nakakusaget rin naman ako sa mga Quizes, and exercise rito but i Can say na akog lubos na nahirapan dito.

(Yes, I like science as a subject even though I often get low grades or scores in it. I still give my full effort because I really love it especially chemistry. I can't say I'm good at it, but I can still manage to answer the quizzes and exercises. Honestly, I find it really difficult to learn.)

Figure 3. Student Journal Entry (E12 11/19/2022)


4) nakaka tulong sakin ang science dahil dito ay mas naka pag insayo ako ng English at dahil sa science ay mas naintindihan ko ang Math Thank you sa Science at Thank you po sir sa pag tuturo samin :)

(Science, especially chemistry, has really helped me. Through it, I've been able to practice using the English language, and it also helped me understand mathematics better. Thank you, sir, for teaching us science, and thank you for your guidance.)

Figure 4. Student Journal Entry (E25 11/04/2022)

With respect to mean gain scores, both groups were initially comparable as verified through *Levene's Test*. Nonetheless, subsequent analysis demonstrated that the experimental group achieved significantly higher mean gain scores—approximately 50 percent greater than those of the control group. This outcome provides sufficient evidence that students exposed to OBLIP demonstrated markedly improved performance relative to students instructed through conventional methods. Thus, OBLIP may be regarded as a more effective pedagogical strategy for teaching Chemistry, as evidenced by its superior impact on performance test outcomes.

It is important to consider additional factors that may have influenced student performance. Capuno et al. (2019) emphasized that student academic performance may also be influenced by engagement in extracurricular activities. Physically demanding school activities such as intramurals may divert student attention from academics, leading to exhaustion and diminished capacity to review lessons or accomplish assignments. Furthermore, excused absences resulting from such activities compromise students' learning opportunities, given that they miss exposure to class discussions and teacher-led activities. It follows that teachers cannot simply compensate for such losses by awarding grades without evidence of learning, as achievement must reflect actual academic engagement.

In addition, student attitudes toward subject matter appear to play a critical role in their performance. Improved performance in the experimental group may be attributed, in part, to student interest in topics such as gas laws and biomolecules, which were perceived as relatable to real-life biological processes. Conversely, lower performance was frequently associated with perceived difficulty in learning chemical reactions, which students identified as the most challenging topic during the intervention.

Researcher :	Why do you like Gas Laws?
Student E10:	*Uhn I love the topic kasi na I love solving. Doon talaga ako na inlove sa solving na yun. Yung chemical reactant talaga dun ako na stress doon ako na stress.* (Uhmm I love the topic because I enjoy solving problems. That's where I truly fell in love with the solving part. But when it came to chemical reactants, that's where I got stressed. That part really stressed me out.)
Researcher:	How about the biomolecules?
Student E10:	*Uhmm gusto ko rin siya kasi dun nga ako na inlove nung ni discuss nung teacher namin na habang dinidiscuss niya yung biomolecules na gusto ko nang malaman yung inang topic pa*

doon kung ano pang topic sa biomolecule kasi na nung dinidiscuss ng teacher namin na parang ang sayang pakinggan pag may malaman ka lang na particles. kung ano bang, kung saan ba dapat yun kung saan daw sila papunta.
(uhmm I also liked it because that's when I fell in love with the topic—when our teacher discussed biomolecules. While he was explaining it, I found myself wanting to learn more about the other topics related to biomolecules. It was exciting to hear about particles and understand where they come from and where they're supposed to go.).

Although OBLIP was found to enhance student performance as reflected in their test scores, the overall achievement of students in Chemistry remained at an average level when assessed using the Mean Percentage Score (MPS) benchmark prescribed by the Department of Education. This underscores the need for sustained instructional support and further pedagogical innovation to elevate student mastery in science.

3.3 Correlation between Students' Engagement and Their Performance in Chemistry

Table 5. *Students' Pre- and Post-Engagement and Performance in Chemistry*

Pre- and Post- Engagement vs. Pre-test Correlation (2-tailed sig.)				
Relationship		Correlation coefficient*	*p*-value	Remark
Affective (Pre)	Pretest score	.082	.486	Not significant
Behavioral (Pre)		.149	.206	Not significant
Cognitive (Pre)		-.082	.487	Not significant
Affective (Post)		-.009	.939	Not significant
Behavioral (Post)		.221	.058	Not significant
Cognitive (Post)		.100	.398	Not significant

Pre- and Post-Engagement a vs. Post Test Correlation (2-tailed sig.)				
Relationship		Correlation coefficient*	*p*-value	Remark
Affective (Pre)	Posttest score	.180	.124	Not significant
Behavioral (Pre)		.141	.230	Not significant
Cognitive (Pre)		.030	.801	Not significant
Affective (Post)		.073	.536	Not significant
Behavioral (Post)		.185	.115	Not significant
Cognitive (Post)		.116	.323	Not significant

Note: * Spearman's rho at 0.05 level of significance

Table 5 presents the correlation results between students' engagement and their performance in Chemistry. Given the nature of the data, *Spearman's rho*, a nonparametric statistical test, was employed to examine the relationship between the two variables. The results revealed insufficient evidence to establish a statistically significant correlation between students' pre-engagement levels and their pre-test scores. Although a relationship was observed, it did not reach the threshold for significance.

Similarly, post-engagement and post-test scores showed no significant correlation between the three dimensions of engagement (affective, behavioral, and cognitive) and students' post-test scores in Chemistry. Hence, these findings suggest that students' levels of engagement were not significantly associated with their academic performance following the implementation of the OBILP intervention.

One possible explanation for this outcome lies in the disparity between students' self-reported engagement and their actual performance gains. While both control and experimental groups reported high to very high levels of engagement, their Chemistry Performance Test (CPT) scores showed only modest improvements. This disconnect implies that engagement, while present, did not translate into proportionate academic gains. It is also worth noting that when data from both groups were combined, the heterogeneity of group characteristics may have further diluted any potential correlation, contributing to the absence of a statistically significant relationship.

Contrary to previous studies which argued that cognitive engagement is a predictor of academic achievement (Wara et al., 2018), that science students' engagement is correlated with achievement and attitude (Sunday, 2013), that school engagement directly influences academic performance (Al-Alwan, 2014), and that behavioral, emotional, and cognitive engagement positively correlate with academic achievement (Delfino, 2018), the present study found no significant relationship between engagement and performance in Chemistry. This finding is, however, consistent with the results of Osman et al. (2014), who, in examining students under an Outcome-Based Education (OBE) framework, also reported no significant correlation between the four dimensions of engagement and academic achievement. These findings suggest that engagement may not always serve as a direct predictor of student achievement in specific subject areas.

Qualitative data from interviews further illuminate this result. When asked to compare the two teaching strategies in terms of engagement, one student expressed a preference for conventional teaching, noting that it made him feel more engaged. However, when asked which method helped him perform better in Chemistry, he identified OBLIP. From this, it can be inferred that while OBLIP did not necessarily increase the student's sense of engagement, it nonetheless supported higher performance outcomes. This indicates that student engagement in Chemistry does not directly determine performance outcomes, as instructional strategy appears to exert an independent effect on achievement.

Researcher:	Between OBILP and conventional teaching, which approach do you find more engaging, and why?
Student E26:	*Parang yung dati. Parang mas mahirap yung OBILP.* (It would be the former. OBILP seems hard)
Researcher:	In what ways has OBILP influenced your performance in chemistry?
Student E26:	*Miyakaito* (It decreased.)
Researcher:	Between OBILP and conventional teaching, which approach do you think supports your performance more effectively, and why?
Student E26:	*So OBILP.* (The OBILP)
Researcher:	*Gusto mo ba na ipapatuloy pa yung pagtuturo sa inyo ng OBILP o hindi na?* (Would you prefer to continue learning OBILP in future lessons?)
Student E26:	*Tayp akn a ipagpatuloy na so kasatiman ah.. so oman gawii.* (I'd be okay with continuing OBILP as long as the Learning Activity Sheets are given one at a time like just one LAS per day.)
Researcher:	*Okay.. antona e kiyababayaan ka ko OBILP?* (Alright, what part of OBILP did you enjoy the most?)
Student E26:	*Parang mas malubod a kapkailaya aknon* (I guess I find OBILP easier to follow)
Researcher:	*Mas malubod a kapkailay angawn kay sa sa dating pagtuturo?* (Do you find it easier compared to conventional teaching?)
Student E26:	*Oway. Piyaka bokl bokl sa walay* (Yes, studying at home can be really boring.)

Student E26 explained that his low performance was largely due to his absence during the lessons on chemical reactions, which resulted in an accumulation of Learning Activity Sheets (LAS). He reported feeling disengaged because of the overwhelming backlog and suggested that LAS would be more effective if administered only during class sessions and tackled one at a time. He expressed difficulty completing them asynchronously at home, noting that independent learning outside class compromised his quality time. As a result, he preferred to complete learning tasks in class rather than at home. Despite this behavioral disengagement, however, he acknowledged that OBLIP was beneficial and expressed a preference for being taught through this method to improve his performance in Chemistry. This account further supports the quantitative findings that student engagement did not significantly correlate with performance, as high or low engagement levels did not consistently predict achievement outcomes.

Similarly, Student E33 recognized the pedagogical advantages of OBILP, noting improvements in note-taking speed, recall, and confidence during discussions and written tasks. Nevertheless, she expressed a preference for conventional classroom routines, particularly those that did not involve Learning activity Sheets (LAS). Her reflections highlight a tension between perceived instructional effectiveness and personal comfort with traditional learning environments. Although OBILP facilitated cognitive and behavioral growth, it did not foster a sustained preference for the method.

Researcher: In what ways has OBILP affected your engagement in your chemistry lessons?

Student E33: *Uhmm so mambo so OBILP na malo aknon miyasuwa so uhh malo miyaanad aknon so mga about sa mga chemistry pero mas tayp akn parin talaga so piyor dn a ka klass sa science so da mga LAS ron pero mapia dn mambo giyanan a OBILP ka parang pakagaan ron so kasurat akn, ago pakagaan so kapamimikiran akn so ipag answer akn ago so about sa essay na pakagaanon so kapamimikiran akn tuna ipag answer aknon.* (I did learn something from OBILP. I gained knowledge about chemistry through it. But honestly, I still prefer conventional teaching in science, especially when there are no LAS to complete. Still, OBILP has its good sides. It helps me copy concept notes more quickly, and it pushes me to think faster when answering the discussion part and figuring out how to respond.)

These narratives underscore a key insight: greater engagement does not necessarily guarantee better performance, nor does improved performance always lead to higher engagement. Instructional strategy appears to exert an independent influence on achievement, separate from students' affective or behavioral responses. While OBILP was effective in enhancing certain academic competencies, its impact on engagement was more nuanced and varied across learners.

4. Discussion

Prior to the intervention, both the control and experimental groups exhibited very high levels of affective engagement, with no significant difference observed between them. In terms of behavioral engagement, the control group demonstrated a very high level, whereas the experimental group reflected only a high level. In terms of cognitive engagement, the control group also reported a very high level compared to the experimental group's high level.

After the intervention, however, both groups demonstrated very high affective engagement, as well as high levels of behavioral and cognitive engagement. The results indicate that while the control group experienced a minor decline in behavioral and cognitive engagement, the experimental group showed improvements in these aspects; however, the difference between the two groups was not statistically significant. In summary, both groups continued to be similar in all three engagement dimensions such as affective, behavioral, and cognitive, following the intervention.

The decline in engagement among the control group may be attributed to the challenges they encountered in Chemistry lessons, particularly in mastering chemical reactions and equations. As Skinner and Pitzer (2012) noted, students often experience disengagement when academic demands surpass their perceived abilities, which appears to have been the case for the control group. In contrast, the experimental group, despite facing similar academic challenges, was able to sustain high levels of engagement and even increase the proportion of students who remained highly engaged. This reinforces the view of Fredricks, Blumenfeld, and Paris (2004) that engagement is multidimensional and responsive to instructional strategies, with behavioral and cognitive dimensions particularly sensitive to the nature of teaching interventions.

Before the intervention, the control group generally demonstrated higher engagement compared to the experimental group. However, following the intervention, the control group's behavioral and cognitive engagement declined, while the experimental group's engagement increased. Despite these changes, the two groups' overall engagement levels after the intervention remained statistically comparable. This finding highlights that changes in engagement, while observable, do not always translate into significant statistical differences.

In terms of performance, results from the Chemistry Performance Test (CPT) revealed that both groups performed at a low level prior to the intervention, with no significant difference between them. After the intervention, the control group remained at a low level, while the experimental group's mean score improved to the average level. Moreover, the mean and mean gain scores of the two groups were significantly different, suggesting that the experimental group outperformed the control group. This supports the idea that instructional strategies can directly influence achievement outcomes, as suggested by Carini, Kuh, and Klein (2006), who found that engagement alone is not always sufficient to explain differences in academic performance.

Finally, correlation analysis indicated that the relationship between students' engagement and their performance in Chemistry was not statistically significant. Although traces of association were evident, these were not strong enough to establish a meaningful relationship. This aligns with the findings of Osman et al. (2014), who reported that student engagement under an Outcome-Based Education framework did not significantly correlate with academic achievement. The implication here is that high engagement does not automatically guarantee higher performance, nor does strong performance necessarily predict higher engagement. The present findings therefore affirm that while engagement remains an important educational construct, its direct influence on performance is more complex and mediated by instructional strategies, the nature of learning tasks, and the perceived difficulty of subject matter.

5. Conclusion

The findings of this study revealed that both the control and experimental groups demonstrated consistently high levels of engagement in chemistry before and after the intervention. This indicates that students value their learning and are positively involved in the subject regardless of the instructional approach. However, students exposed to the Outcome-Based Instructional Learning Package (OBILP) performed significantly better in chemistry than their counterparts who experienced conventional teaching.

The results further showed no significant relationships between students' engagement and their performance in chemistry, suggesting that a high level of engagement does not necessarily translate into higher academic achievement. Additionally, insights gathered from interviews and journal reflections revealed that many students found chemical reactions and equations particularly challenging. They attributed these difficulties to limited prior knowledge and the complex nature of concepts such as ion formation, chemical bonding, and the properties of elements and compounds.

6. Recommendation

Based on the findings of this study, it is recommended that school administrators, teachers, and policymakers support instructional strategies that enhance students' engagement in chemistry, particularly in the behavioral and cognitive domains where decline was observed, by continually revising and improving learning activity sheets to make lessons more comprehensible. Teachers should ensure that prerequisite concepts are well-taught, address students' learning difficulties through regular reviews, and strengthen their pedagogical competence by participating in relevant seminars and training programs. Furthermore, future researchers are encouraged to replicate and extend this study across different subjects, grade levels, or broader contexts to validate its findings and contribute to the advancement of science education, especially in chemistry, which is recognized as one of the most challenging areas in the physical sciences.

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