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Academic self-efficacy and laboratory engagement of BSEd students major in Science in Occidental Mindoro State College

Francisco, Niki Aira P. ✉
Divine Word College of San Jose, Philippines (francisconikiaira@gmail.com)
Tolentino, Darlyn Joy D.
Divine Word College of San Jose, Philippines (tolentinodarlyn0525@gmail.com)
Pardito, Luigi Miguel D.
Divine Word College of San Jose, Philippines (luigimiguelpardito@gmail.com)
Galay-Limos, Jenny A.
Divine Word College of San Jose, Philippines (jennygalay05@gmail.com)

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Abstract

Academic self-efficacy and laboratory engagement are essential to promote cognitive and psychomotor development among science students. Despite advancements in educational technology, laboratory performance has decreased. This study aims to determine the relationship between academic self-efficacy and laboratory engagement among Bachelor of Secondary Education (BSEd) Science majors at Occidental Mindoro State College. It sought to determine whether there is a significant relationship between students' belief in their academic abilities and active participation in laboratory activities. A quantitative-correlational research design was used. The researcher's questionnaire was distributed to 45 students in three sections to collect data. The weighted mean and Pearson Product-Moment Correlation Coefficient were calculated to determine the strength and significance of the relationship between variables. The study found a significant positive correlation ($r = 0.69$, $p < 0.001$) between academic self-efficacy and laboratory engagement. This suggests that students confident in their academic abilities are more likely to participate in laboratory tasks actively. This emphasizes the importance of self-belief in improving hands-on learning and practical application in science education. The study recommends that educators and administrators use strategies that enhance academic self-efficacy, such as giving constructive feedback, setting attainable goals, and recognizing student achievements. Laboratory activities should be student-centered, collaborative, and geared toward developing critical thinking. Furthermore, integrating laboratory tasks with specific learning objectives and providing mentorship and academic support can improve engagement and overall academic performance.

Keywords: academic self-efficacy, laboratory engagement, science education, academic performance, student motivation

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1. Introduction

A laboratory is designed for experimentation, observation, and practical application within a specific field of study, where student engagement in practical activities enhances skills and reinforces theoretical knowledge (Sshana & Abulibdeh, 2020). Hands-on experience in laboratory settings deepens understanding and highlights the significance of practical learning. Riaz et al. (2023) emphasize that laboratories are essential for fostering active learning, enabling students to engage directly with scientific processes. Developing laboratory skills is crucial for tertiary students, as it enhances their ability to apply theoretical knowledge in practical contexts, leading to a more comprehensive understanding of their fields of study. On the other hand, academic self-efficacy, as defined by Hayat et al. (2020), refers to students' beliefs and attitudes regarding their ability to attain educational success, complete academic tasks, and effectively learn course material. As a crucial element of achievement motivation, self-efficacy affects how students perceive task difficulty, invest effort, and persist. Those with efficacy set ambitious goals, demonstrate effort and perseverance, and often outperform (Honicke et al., 2023). With the introduction of laboratory engagement and academic self-efficacy, it is evident that they are crucial factors in promoting students' cognitive development and psychomotor skills (Niazi et al., 2018) and improving academic performance (Luo et al., 2023). However, despite technological advancements, student performance in laboratory engagements is declining. Kolil et al. (2023) identified low self-efficacy as a significant barrier to success in laboratory practices, as laboratory education, while essential for reinforcing theoretical knowledge and developing practical skills, is often undervalued.

In Occidental Mindoro State College, particularly among Bachelor of Secondary Education majors in Science students, academic self-efficacy and laboratory engagement appear to be affected by challenges such as lack of tools and equipment, poor ventilation, inadequate facilities, persistence in the face of challenges, self-motivation, and others. With these concerns, the researchers aim to investigate the relationship between academic self-efficacy and laboratory engagement to understand better how these factors influence students' laboratory engagement. Specifically, it examines how students' confidence in their academic capabilities impacts their engagement and performance in laboratory activities despite various challenges. Gaining a deeper understanding of this relationship can offer valuable insights for enhancing laboratory-based learning and strengthening students' practical competencies.

Statement of the Problem - This study aims to determine the relationship between academic self-efficacy and the level of laboratory engagement of the BSEd Major in Science at Occidental Mindoro State College. Specifically, the study seeks to answer the following questions: (1) What is the level of academic self-efficacy of BSEd Major in Science students at Occidental Mindoro State College? (2) What is the level of laboratory engagement of a BSEd Major in Science at Occidental Mindoro State College? and (3) Is there a significant relationship between academic self-efficacy and laboratory engagement of BSEd Major in Science students at Occidental Mindoro State College?

Significance of the Study - The findings of this study will provide significant benefits to various stakeholders. First, this research will help students gain a better understanding of their perceptions of the educational environment in the Science program. It will also emphasize the relationship of academic self-efficacy to students' engagement in laboratory activities. By examining the relationship between academic self-efficacy and laboratory engagement, this study hopes to provide insights that can improve the overall learning experience of Bachelor of Secondary Education Science students. Second, the study will provide valuable insights to faculty members and educational policymakers, allowing them to contribute to and enhance teaching strategies, curriculum development, and policymaking. The findings could be a foundation for improving academic programs to support student learning and professional development. Lastly, for future researchers, the methodologies used in this study, whether via surveys, interviews, or other research methods, will serve as a reference framework. These methods can be adapted or refined to meet specific research objectives, increasing the efficiency and effectiveness of future studies in related fields.

Scope and Delimitation of the Study - This study was limited to 45 students enrolled in the Bachelor of Secondary Education, Major in Science program for the Academic Year 2024-2025. The participants comprised 14 second-year students, 14 third-year students, and 17 fourth-year students. Students from other specializations were excluded from their study, as their academic programs do not require the exact extent of laboratory work and exposure. The scope of this research focused on examining the relationship between students' academic self-efficacy and their engagement in laboratory activities and the subsequent effects on their academic performance and motivation. The study aimed to identify factors influencing these aspects and propose improvement strategies. These strategies included the development of academic enhancement programs and psychological support initiatives designed to strengthen academic self-efficacy and laboratory engagement. Ultimately, the findings aimed to form a solid foundation for future Science educators.

2. Methodology

Research Design - This study utilized a descriptive-correlational design to describe the respondents' levels of academic self-efficacy and laboratory engagement. Moreover, a correlational design was used to determine the relationship between academic self-efficacy and laboratory engagement among BSEd major in Science students at Occidental Mindoro State College, San Jose Campus.

Respondents of the Study - The respondents of this study consist of the entire population of Bachelor of Secondary Education students majoring in Science who are officially enrolled at Occidental Mindoro State College for the Academic Year 2024-2025. A total of forty-five (45) students participated in the study, comprising fourteen (14) second-year students, fourteen (14) third-year students, and seventeen (17) fourth-year students. The selection of respondents was focused mainly on science majors, as they regularly engage in laboratory activities, which are essential to the focus of this research.

Research Instrument - This study used a researcher-made instrument to gather the needed data. The survey questions were intended to be distributed to respondents through printed forms, where they took the prepared survey questionnaires and provided their answers. The printed questionnaires were divided into two sections: the first, where they wrote general or personal information, and the second, which had a table of questions regarding the independent variable. This determined the level of academic self-efficacy and laboratory participation among Occidental Mindoro State College students majoring in science.

Data Gathering Procedure - The researchers conducted this study during the second Academic Year 2024-2025 semester. Before initiating data gathering, the researchers sought approval from the Dean of the College of Teacher Education Department, advisers, and respondents, who were given letters of request to sign. The data-gathering process was conducted over five days. During this time, the researchers distributed an online survey via Google Forms. The survey link was made available to the Dean of the College of Teacher Education and the advisers of the BSEd major in Science students, who then distributed it to the identified respondents. The form included clear and concise instructions to assist participants in answering questions correctly and consistently. The online format enabled the researchers to track the number of responses in real time and ensure timely collection. Following the survey period, the researchers checked the submitted responses for completeness and accuracy before moving on to the data analysis phase. To assess the accuracy and reliability of this study, all information submitted by respondents was accepted as confidential data and was used according to what they submitted. The researchers did not falsify participant responses but included the exact information provided.

Statistical Treatment of the Data - The data collected in this study were analyzed using statistical methods, specifically the mean and Pearson Product-Moment Correlation. The weighted mean computation was used to determine the level of participants' responses for both academic self-efficacy and laboratory engagement. Pearson Product-Moment Correlation was utilized to assess the strength and direction of the possible relationship between self-efficacy and laboratory engagement. This analysis determined whether a higher level of academic self-efficacy was associated with lower levels of laboratory engagement and, conversely, whether lower self-efficacy was associated with higher levels of laboratory engagement. The results of this analysis provided valuable insights into the nature of the relationship between these two variables. This research also utilized the Likert scale to effectively measure respondents' degree of agreement or disagreement concerning their academic self-efficacy and laboratory engagement. This scale had four response options, ranging from "strongly agree" to "strongly disagree," and was intended to assess the level of agreement or disagreement with each.

Ethical Considerations - Several ethical principles were carefully followed while conducting this research to ensure the rights of participants and the study's integrity. Voluntary participation was strictly enforced, ensuring all participants willingly participated in the survey without being forced or pressured. Before data collection, participants were given detailed information about the research's purpose, procedures, and potential risks, allowing them to provide informed consent and understand their involvement. Moreover, confidentiality and anonymity were maintained throughout the study to protect participants' identities and personal data. All data were anonymized, and participant responses were securely stored, accessible only to the researchers. Fair sampling practices were also utilized to ensure that participants were chosen based on relevant criteria without discrimination or bias, enhancing the generalizability and fairness of the findings. The researchers took deliberate measures to protect participants from any form of physical, emotional, or psychological harm by fostering a safe and respectful environment where they could openly share their thoughts. In addition, the researchers adhered to ethical standards in reporting the findings, ensuring that issues such as plagiarism, data fabrication, and falsification were strictly avoided. To uphold the credibility and academic integrity of the study, all sources were properly acknowledged, data were presented accurately and honestly, and the results were communicated with complete transparency. Continuous monitoring and overseeing the identified ethical considerations are being implemented to proactively address any emerging ethical issues and, if necessary, revise or adjust the research design and procedures to ensure ongoing compliance with the study's ethical guidelines.

3. Results and Discussions.

Table 1

Mean Level of Academic Self-efficacy of BSEd Major in Science students

Indicators	Weighted Mean	Verbal Description
I am confident in completing any task assigned by my instructors.	3.33	Very High Level
I am well-prepared and perform well in all my reports.	3.18	High Level
I am motivated to complete assignments.	3.18	High Level
I am ingenious in providing learning resources for all subjects.	3.18	High Level
I managed to excel in every exam in different subjects.	2.87	High Level
I always stay focused on mastering challenging concepts.	3.02	High Level
I have no difficulty comprehending the context of a specific notion.	2.78	High Level
I always perform a thorough investigation and research before solving a given problem.	3.11	High Level
I am confident in my ability to perform well on each quiz.	2.93	High Level
I can apply numerous learning theories in real-life circumstances within our classroom.	2.96	High Level
Composite Mean	3.05	High Level

Legend: 1.00–1.74 = Very Low Level, 1.75–2.49 = Low Level, 2.50–3.24 = High Level, 3.25–4.00 = Very High Level

Based on the data presented in Table 1, the overall composite mean of 3.05 was verbally interpreted as High Level, indicating that students generally regard themselves as academically capable and confident in handling academic tasks. Indicating a strong belief in their ability to meet academic requirements, the highest weighted mean of 3.33 indicates a Very High Level of confidence in completing academic responsibilities. This is an essential indicator of high self-efficacy. The positive outlook correlates with Renninger and Hidi's (2019) findings, which concluded that students with higher academic self-efficacy are more motivated, persistent, and likely to achieve better educational outcomes. Moreover, several other areas with weighted means of 3.18 indicated a consistently high level of self-efficacy, demonstrating that students maintain positive attitudes toward preparedness, motivation, and resourcefulness, all of which are necessary for long-term academic success. This finding is consistent with Kristensen et al. (2023), who pointed out that higher levels of academic self-efficacy are strongly associated with increased engagement, persistence, and proactive use of learning strategies, all of which contribute significantly to students' academic achievement and personal development.

Meanwhile, the lowest recorded weighted mean was 2.78, which still falls into the High Level category. This suggests that some students find it more difficult to understand complex concepts, but it does not significantly impact their overall academic self-confidence. This finding is consistent with Putwain et al. (2012), who discovered that students with high self-efficacy can acknowledge difficulties without losing motivation and engagement in learning activities.

Table 2

Mean Level of Laboratory Engagement among BSEd major in Science students

Indicators	Weighted Mean	Verbal Description
I actively participate in laboratory activities and experiments.	3.31	Very High Level
I feel confident in performing laboratory tasks without constant supervision.	3.00	High Level
I collaborate effectively with my classmates during laboratory activities.	3.38	Very High Level
I can apply theoretical concepts learned in class to laboratory activities.	3.16	High Level
I prepare thoroughly before attending laboratory sessions.	3.18	High Level
I am comfortable using laboratory equipment and materials.	3.31	Very High Level
I seek clarification from my instructor or peers when encountering laboratory difficulties.	3.44	Very High Level
I can follow laboratory procedures and safety protocols accurately.	3.33	Very High Level
I take the initiative to explore and conduct additional experiments beyond the required tasks.	3.07	High Level
I find laboratory activities engaging and motivating.	3.49	Very High Level
I reflect on the outcomes of my laboratory activities to improve my performance.	3.38	Very High Level
I am confident in my ability to resolve issues during laboratory experiments.	3.18	High Level
I contribute ideas and solutions when working on group laboratory tasks.	3.24	High Level
I allocate sufficient time to study and understand laboratory-related concepts.	3.16	High Level
Laboratory activities enhance my understanding of science concepts.	3.53	Very High Level
Composite Mean	3.28	Very High Level

Legend: 1.00–1.74 = Very Low Level, 1.75–2.49 = Low Level, 2.50–3.24 = High Level, 3.25–4.00 = Very High Level

Based on the results in Table 2, the composite mean of 3.28 indicates a Very High Level of Engagement. This suggests that students are firmly committed to participating in laboratory-related activities, demonstrating active involvement and an integration of practical experiences into their learning. The highest recorded weighted mean of 3.53, classified as Very High Level, illustrates the importance of laboratory activities in deepening students' scientific understanding. This finding is consistent with Forcino's (2013) findings, which showed that students who participated in laboratory-integrated courses improved significantly more in their conceptual knowledge than those who only received lecture-based instruction. The study highlighted that engaging in laboratory activities enables students to translate theoretical ideas into hands-on practice, strengthening their understanding of scientific concepts and enhancing the depth of their learning.

Additionally, the weighted mean of 3.49 indicates high student interest in laboratory tasks, which aligns with Mesghina's findings (2024). Her research showed that cooperative learning environments in the classroom improve academic performance while providing metacognitive and social-affective benefits. These settings increase students' motivation and emotional investment, resulting in deeper engagement and better learning outcomes. Conversely, the lowest weighted mean of 3.00, although still interpreted as High Level, indicates the need for further development in students' confidence to perform laboratory tasks independently. This finding is consistent with the views of Surpless et al. (2014), who emphasized the importance of structured exposure to scientific processes, active participation, and the use of research-grade instrumentation in strengthening students' scientific skills and encouraging greater independence in laboratory work. The comparatively lower mean score in our study indicates that although students exhibit significant engagement, improved opportunities that foster autonomous practice and skill mastery remain necessary, as supported by Surpless et al.'s findings.

Table 3

Correlation Coefficients and p-values for Hypothesis Testing

Variables	Correlation Coefficient	Effect Size (r^2)	Critical Value	t-value	*p*-value	Interpretation
Academic Self-Efficacy → Laboratory Engagement	0.69	0.48	1.680	6.275	0.001	Highly Significant

Legend: p-value < 0.05 Significant

As shown in Table 3, the correlation analysis reveals a strong positive relationship between academic self-efficacy and laboratory engagement of primary science students, with a correlation coefficient of 0.69. This implies that students with higher confidence in their academic capabilities are more likely to engage in laboratory activities. Meanwhile, with a coefficient of determination (r^2) of 0.48, academic self-efficacy accounts for almost 48% of the variation in laboratory engagement. However, the p-value of 0.001 implies that it is significantly below the typical significance level of 0.05, and the t-value of 6.275 exceeded the required value of 1.680, suggesting that the correlation is statistically significant. This study aligns with research conducted by Schunk and DiBenedetto (2019), which shows that students' beliefs about their academic capabilities influence their academic motivation, self-regulation, and achievement. Honicke and Broadbent (2015) also supported this, stating that students with higher academic self-efficacy achieve higher grades and academic aspirations than those who doubt their academic capabilities.

4. Conclusions

The study revealed that the level of academic self-efficacy among BSEd Science majors at Occidental Mindoro State College, with an overall composite mean of 3.05, is interpreted as high. This indicates that students generally perceive themselves as capable and confident in accomplishing academic tasks. Additionally, the level of laboratory engagement yielded a composite mean of 3.28, which falls under the very high category. This suggests that students are highly engaged in laboratory-related activities and can integrate practical applications into their learning process. Furthermore, the results show a statistically significant positive relationship between academic self-efficacy and laboratory engagement, with a correlation coefficient of 0.69 and a p-value of 0.001. This implies that students with higher confidence in their academic abilities are more likely to participate actively in laboratory activities, demonstrating how self-belief contributes to practical engagement in science education.

Recommendations - Based on the results and conclusions of the study, the researchers draw out some recommendations: Teachers may use feedback, encouragement, and acknowledgment to help students develop academic self-efficacy. Teachers may use active learning approaches such as collaborative projects and hands-on experiments to increase student involvement, particularly in laboratory activities. Future researchers may conduct a similar study focusing on laboratory engagement and various science concepts like biology and chemistry to determine whether it varies across subjects. Future researchers may use a more diverse sample of students from other schools to verify the results of this study.

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