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SELF-REGULATION, PARENTAL INVOLVEMENT, AND ACADEMIC PERFORMANCE IN PHYSICS 1 OF PRE-BACCALAUREATE MARITIME LEARNERS

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Abstract:

This study examined the level of self-regulation and parental involvement and their relationship with academic performance in Physics 1 among Grade 12 Pre-Baccalaureate Maritime Specialization (PBMS) learners in a private maritime school in Bacolod City, Philippines during the first semester of the school year 2024–2025. Employing a descriptive-correlational research design, data were gathered from 110 students selected through stratified random sampling. A validated and reliable researcher-made questionnaire was used to assess self-regulation and parental involvement, while academic performance was based on students' final grades in Physics 1. Descriptive statistics, Kruskal-Wallis H test, Mann-Whitney U test, and Spearman's Rank Correlation were utilized for analysis. Findings revealed that PBMS learners demonstrated high levels of self-regulation and very high levels of parental involvement, regardless of socio-economic status or parents' educational background. However, both self-regulation and parental involvement showed no statistically significant relationship with academic performance in Physics 1. These results suggest that while learners benefit from supportive behavioral and familial factors, other elements—such as instructional quality, cognitive preparedness, and subject-specific strategies—may exert stronger influence on academic outcomes. The study underscores the need for enhanced pedagogical interventions, differentiated instruction, and context-based learning supports to improve academic performance in technical subjects. A peer mentoring enhancement program, Kapit Bisig, is proposed to reinforce collaborative learning. Recommendations are offered for curriculum designers, educators, guidance counselors, and future researchers to address the multifaceted nature of student performance in specialized academic tracks.

Keywords: *self-regulation, parental involvement, academic performance, Physics 1, maritime education, PBMS learners, senior high school, peer mentoring*

Introduction:

Science education plays a pivotal role in cultivating critical thinking, problem-solving abilities, and technological literacy among learners. A robust science education system is vital for fostering scientific reasoning and innovation, especially in a rapidly evolving global landscape (Anamezie et al., 2022; Bao & Koenig, 2019; Assem et al., 2023). Moreover, science education underpins national development, serving both scientific progress and socioeconomic growth (Alberts, 2022). Among the sciences, Physics stands out as a discipline that enhances analytical thinking and contributes to technology and engineering advancements (Vasconcelos & Orion, 2021).

In the Philippine context, Physics has long been recognized as a critical component of senior high school education, particularly within the STEM strand. Despite its importance, students often perceive Physics as abstract and cognitively demanding, resulting in declining enrollment and interest in the subject (Nava & Camarao, 2021; Rogayan Jr. et al., 2021; Ibrahim et al., 2019). While it fosters higher-order thinking and problem-solving skills (Santyasa et al., 2020), Physics is frequently viewed as the least popular science subject among learners due to the mental rigor it requires (Wangchuk et al., 2023).

To address this issue, the Department of Education (DepEd) has implemented reforms such as the K–12 curriculum, which includes Physics 1 as a core subject in the STEM strand (Ariyatun et al., 2024; Marin & Natividad, 2025). One of the specialized programs within this strand is the Pre-Baccalaureate Maritime Specialization (PBMS), developed in partnership with the Maritime Industry Authority (MARINA). The PBMS program integrates essential STEM subjects—including General Physics 1—while tailoring content toward maritime education (Department of Education & Marine Industry Authority, personal communication, 2016).

Physics is especially critical in the maritime field. Its concepts underpin essential skills in ship navigation, sensor development, vessel motion modeling, predictive maintenance, and naval architecture (Alqurashi et al., 2023; Prabowo et al., 2021; Kalafatelis et al., 2025; Schirmann et al., 2022; Souppez, 2021). However, research suggests that many PBMS learners struggle with Physics due to limited foundational knowledge, poor study habits, and lack of learning support systems (Shafer et al., 2024; Tindan & Arthur, 2024).

In light of these challenges, understanding factors that influence academic performance in Physics becomes essential. Among the variables that have gained scholarly attention are self-regulation and parental involvement. Self-regulation refers to a learner's ability to manage behaviors, cognition, and emotions in pursuit of academic goals (Zimmerman, 2008; Brenner, 2022). Numerous studies affirm that self-regulation positively correlates with academic achievement, especially in demanding subjects such as Physics (Akomolafe et al., 2013; Alalwan et al., 2019; Hafnidar et al., 2021).

Parental involvement is another factor linked to student success. It encompasses various forms of engagement in a child's academic journey, such as emotional, financial, and educational support (Garcia & De Guzman, 2020; Boonk et al., 2022). Studies show that learners whose parents actively participate in their schooling tend to perform better and exhibit higher motivation (Alexander & Winne, 2006; Robson et al., 2020). Nonetheless, the dynamics of this involvement can be shaped by socioeconomic status and parents' educational attainment (Cuartas et al., 2022; Barry et al., 2022; Li & Zhan, 2023).

Despite the growing body of literature, there remains a gap in understanding how self-regulation and parental involvement intersect with academic performance among maritime learners, particularly those in the PBMS program. Most existing studies focus on general high school populations or college students, rarely addressing the unique context and cognitive demands of Physics 1 for maritime learners (Şahin & Yağbasan, 2012).

Moreover, the influence of socioeconomic factors and parental educational background on these variables remains underexplored in maritime education. Lower SES may limit access to learning resources, while higher SES environments may foster enriched learning (Calderon-Villarreal et al., 2025). Similarly, parents with higher educational attainment may engage more effectively in their children's academic lives, though this relationship is not always linear or consistent (Li & Zhan, 2023).

Given these considerations, this study sought to determine the level of self-regulation, extent of parental involvement, and their relationship with academic performance in Physics 1 among Grade 12 PBMS students in a private maritime school in Negros Occidental. It also investigated whether socioeconomic status and parental education influence these factors. By understanding these relationships, the study aims to offer empirical insights that can inform targeted interventions to improve Physics learning outcomes in maritime senior high school education.

Methodology:

This study utilized a descriptive-correlational research design to investigate the level of self-regulation, extent of parental involvement, and their relationships with academic performance in Physics 1 among Pre-Baccalaureate Maritime Specialization (PBMS) learners. A descriptive-correlational approach is suitable for identifying relationships among variables without establishing causality, and for systematically describing characteristics within a target population (Iranifard & Latifnejad Roudsari, 2022). The design allowed the researcher to examine not only how each variable independently manifests but also how they interrelate, particularly when grouped according to socio-economic status and parental educational background.

The study was conducted at a private maritime school located in Bacolod City, Negros Occidental, Philippines, during the first semester of the academic year 2024–2025. This institution offers a comprehensive Pre-Baccalaureate Maritime Specialization (PBMS) program under its Senior High School department, aimed at preparing learners for maritime careers by integrating STEM core subjects such as Physics 1 with specialized maritime training (Department of Education & Marine Industry Authority, personal communication, 2016). The school was selected due to its consistent track record of producing competent maritime graduates and its capacity to support applied academic research.

The population of the study included all 152 officially enrolled Grade 12 PBMS students. Using stratified random sampling, the researcher ensured fair representation from each section, yielding a total sample of 110 respondents. Stratified sampling was employed to increase the precision of results and ensure that subgroups (i.e., class sections) were proportionately represented. The breakdown of respondents per section was proportionately computed based on total enrollment data obtained from the school registrar.

To gather data, a structured questionnaire composed of three parts was administered. The first part collected demographic information, such as monthly household income (to determine socio-economic status), parental educational attainment, and Physics 1 grades for the first semester. The second part assessed the extent of parental involvement and was based on the instrument developed by Pratama et al. (2023), which includes 15 items addressing emotional, educational, nutritional, and financial support. The third part evaluated the level of self-regulation, using a 15-item Likert-scale instrument adapted from Zimmerman (2002), which reflected learners' goal-setting, time management, self-monitoring, and strategic behavior.

The content validity of the instrument was established through expert review. Ten field experts in education and science evaluated the questionnaire using Lawshe's Content Validity Ratio (CVR), with all items exceeding the minimum required CVR threshold of 0.80. The computed CVR average was 0.820, indicating the tool's validity. Additionally, the instrument's reliability was tested on a pilot group of 30 Grade 12 PBMS students not included in the main study. The resulting Cronbach's alpha coefficient was 0.907, signifying excellent internal consistency.

Data collection was carried out in classroom settings with prior approval from school administrators. Students were oriented about the research objectives, assured of confidentiality, and provided with informed consent forms, co-signed by their parents or guardians due to their minor status. The questionnaires were administered simultaneously during a scheduled session and completed within approximately 30 minutes. Completed forms were checked for completeness before encoding the responses for analysis.

Data were analyzed using descriptive and inferential statistics through SPSS software. For mean and standard deviation, the study interpreted the levels of self-regulation, parental involvement, and academic performance based on pre-established guides: Pascua (2022) for self-regulation, Epstein and Sheldon (2019) for parental involvement, and DepEd Order No. 8 s. 2015 for academic performance grading. To determine differences in self-regulation and parental involvement across socio-economic strata, the Kruskal-Wallis H test was used. Differences based on parental educational background were assessed using the Mann-Whitney U test. To test for relationships between self-regulation and academic performance, and between parental involvement and academic performance, the Spearman's Rank Correlation Coefficient was applied, as the data did not meet assumptions for parametric testing. Ethical principles of respect, beneficence, and justice guided the research process. The study received prior clearance from the institution, and data privacy was upheld in accordance with the Data Privacy Act of 2012. All participants were informed of their rights, including the right to withdraw from the study at any point. To ensure transparency, the researcher disclosed the study's intent and upheld objectivity in all data analysis and reporting. The researcher, a graduate student in General Science and a faculty member of the host maritime school, declared no conflict of interest and independently financed the conduct of the study.

Results:

This study sought to determine the level of self-regulation, the extent of parental involvement, and the academic performance in Physics 1 of pre-baccalaureate maritime specialization (PBMS) learners. It also examined whether significant differences exist in self-regulation and parental involvement across socio-economic status and parents' educational background, and whether self-regulation and parental involvement significantly relate to academic performance.

Findings revealed that the overall level of self-regulation among PBMS learners was high, with a mean score of 4.23 and a standard deviation of 0.48. When disaggregated by socio-economic status, all groups—ranging from poor to upper-middle income households—exhibited high levels of self-regulation, with mean scores between 4.12 and 4.27. Similarly, no observable variation in self-regulation was found based on parental educational attainment; learners whose parents had either completed high school or college both recorded an identical mean score of 4.23. These results indicate that the PBMS learners are generally self-directed, motivated, and capable of managing their learning with only occasional support.

With regard to parental involvement, results indicated a very high level of engagement, with a mean score of 4.23 and a standard deviation of 0.51. This suggests that the learners perceived their parents to be consistently supportive of their academic and personal development, providing assistance through regular communication, involvement in school activities, and emotional and material support. The low variation among scores suggests a shared experience of active parental involvement across the student population.

In terms of academic performance, the average Physics 1 grade among the learners was 82.92, with a standard deviation of 5.24. This falls within the "satisfactory" range based on DepEd's grading scale. While most learners achieved average or above-average performance, the standard deviation indicates that there was considerable variation, with some students scoring notably higher or lower than the mean. These differences suggest a diverse range of learning needs and capacities among the respondents.

Statistical tests were performed to determine whether socio-economic status or parental educational background significantly influenced learners' self-regulation. Using the Kruskal-Wallis H test, the comparison across socio-economic groups yielded a p-value of 0.791, indicating no statistically significant difference in self-regulation. Likewise, the Mann-Whitney U test for differences based on parental educational background returned a p-value of 0.944, confirming that educational attainment of parents did not significantly affect learners' self-regulation levels. Similarly, tests to examine differences in the extent of parental involvement across socio-economic status and parental education levels also found no significant differences. The Kruskal-Wallis H test for socio-economic status produced a p-value of 0.791, while the Mann-Whitney U test for parental education yielded a p-value of 0.334. These

results suggest that parental involvement was perceived to be uniformly high regardless of the household's income level or the parent's educational attainment.

To determine the relationship between self-regulation and academic performance, Spearman's rank correlation was computed. The resulting p-value of 0.179 indicated no significant relationship, although a negligible positive trend was observed. This suggests that while self-regulation is commonly associated with academic success, in this specific context, other factors may play a more influential role in Physics 1 performance.

Likewise, the correlation between parental involvement and academic performance also proved to be statistically insignificant, with a p-value of 0.655. The correlation was slightly negative but negligible. This indicates that, despite high levels of parental involvement, such engagement did not translate into higher academic performance in Physics 1 among the PBMS learners.

Overall, the findings show that both self-regulation and parental involvement are present at desirable levels among PBMS learners, yet these do not significantly explain variations in academic performance. Socio-economic status and parental education did not result in notable differences in the measured variables. These results underscore the complexity of factors influencing academic achievement, suggesting that interventions beyond family background and learner behavior may be needed to improve learning outcomes in Physics.

Discussion:

The findings of this study provide valuable insights into the levels of self-regulation, parental involvement, and academic performance in Physics 1 among pre-baccalaureate maritime learners. While the study hypothesized that both self-regulation and parental involvement might positively influence academic outcomes, the data did not reveal statistically significant relationships. This outcome invites a nuanced reflection on the multifaceted nature of academic performance, especially within a technical learning context such as maritime education.

The consistently high level of self-regulation observed across all respondents, regardless of socio-economic status or parental educational attainment, suggests that PBMS learners possess generally strong metacognitive and behavioral skills. These results align with studies emphasizing the role of structured academic environments, discipline, and student motivation in fostering self-regulated learning (De La Fuente et al., 2020; Lapez & Guhao, 2024). However, the lack of significant differences across background variables implies that school-based factors—rather than family characteristics—may play a more substantial role in shaping self-regulation. This finding resonates with Robson et al. (2020), who argue that institutional practices can mitigate disparities typically attributed to socio-economic disadvantage.

On the other hand, the uniformly very high parental involvement across respondents is noteworthy. Despite prevailing assumptions that socio-economic or educational background influences the degree of parental engagement (Barry et al., 2022; Calderon-Villarreal et al., 2025), this study found no significant variation. This outcome challenges traditional deficit models, supporting more recent perspectives that emphasize the cultural and attitudinal factors influencing family involvement in education (Garcia & De Guzman, 2020; Thomas et al., 2019). It may also reflect the maritime school's proactive communication policies or a community culture that values education regardless of material or educational capital.

However, the absence of a significant relationship between self-regulation and academic performance in Physics 1 diverges from earlier findings in the literature that posit a positive correlation between the two (Suan, 2023; Morosanova et al., 2022). A possible explanation for this discrepancy lies in the unique cognitive and technical demands of Physics within the maritime context. While learners may demonstrate high self-regulation in general academic behavior, these skills might not fully translate into mastery of Physics content, which often requires abstract reasoning, spatial analysis, and strong mathematical foundations (Bao & Koenig, 2019; Wangchuk et al., 2023). This suggests a potential misalignment between self-regulation as measured and the competencies directly contributing to Physics success.

Similarly, the study found no significant correlation between parental involvement and academic performance, with a negligible negative trend. This counterintuitive result mirrors findings by Peng et al. (2023), who observed that excessive parental pressure or control might negatively impact academic outcomes, especially among adolescents seeking autonomy. The PBMS learners, being in their final year of senior high school and preparing for rigorous maritime careers, may benefit more from peer mentorship, teacher guidance, or experiential learning than from parental monitoring.

Taken together, these findings highlight the complexity of academic performance, which cannot be reduced solely to behavioral or familial factors. While self-regulation and parental involvement are important, they may not serve as dominant predictors in specialized educational settings. This calls for a broader pedagogical approach that includes

differentiated instruction, targeted content remediation, and contextualized teaching strategies in Physics (Schneider et al., 2022).

Moreover, the results affirm the importance of maintaining inclusive school cultures that foster both learner autonomy and parent engagement. The Kapit Bisig peer mentoring program proposed in this study reflects this inclusive ethos by enabling students to support one another in learning Physics through structured peer collaboration. Even if self-regulation and parental involvement do not significantly predict academic performance, these qualities may still be leveraged to promote engagement and motivation, especially when complemented by responsive teaching practices (Craig et al., 2021; Li et al., 2021).

Ultimately, the findings suggest that improving Physics achievement among PBMS learners requires more than enhancing individual learner traits or family participation. It necessitates systemic interventions grounded in curriculum design, instructional methods, and academic support structures. Future studies might further explore cognitive variables (e.g., prior achievement, reasoning ability), classroom climate, or teacher effectiveness as predictors of success in Physics and other STEM disciplines.

Conclusion:

This study set out to examine the level of self-regulation and parental involvement among Grade 12 Pre-Baccalaureate Maritime Specialization (PBMS) learners and to determine whether these variables significantly influenced academic performance in Physics 1. The results revealed that while both self-regulation and parental involvement were perceived at consistently high and very high levels, respectively, neither demonstrated a statistically significant relationship with learners' academic performance in the subject. Furthermore, no significant differences were observed in self-regulation and parental involvement when grouped according to socio-economic status or parental educational attainment.

These findings suggest that while self-regulation and parental support are important developmental attributes, they do not directly predict academic performance in a cognitively demanding and highly specialized subject like Physics. The uniformity of self-regulation and parental involvement across background variables highlights the influence of school-based structures, cultural expectations, and student motivation in fostering these behaviors. However, the lack of significant impact on academic performance calls attention to other potential determinants, such as prior knowledge, instructional quality, learning strategies, and student aptitude in science and mathematics.
Overall, the study underscores the complexity of academic achievement and the need for holistic educational strategies that go beyond learner characteristics and family background. Improving performance in Physics may require targeted pedagogical interventions, differentiated instruction, context-specific learning supports, and enhanced teacher capacity. While self-regulation and parental involvement remain important, their role should be viewed as complementary to a broader array of academic and institutional factors that collectively shape student success.

Recommendations:

In light of the study's findings, several actionable recommendations are proposed for various educational stakeholders to support Pre-Baccalaureate Maritime Specialization (PBMS) learners in improving their academic performance in Physics 1. First, curriculum experts are encouraged to integrate structured learning modules that promote goal-setting, time management, metacognitive reflection, and strategic learning. These elements should be embedded across disciplines, especially in science subjects, to sustain and further develop students' self-regulation skills, even if such traits did not directly predict academic performance in this study.

School administrators should consider implementing institutional policies and enrichment programs that promote learner autonomy and engagement in technical subjects like Physics. This can include the creation of peer mentoring initiatives, flexible academic support structures, and teacher development programs focusing on differentiated and maritime-contextualized instruction. Providing professional learning communities for Physics teachers could also enhance content delivery and address students' diverse cognitive needs.

For teachers, it is recommended to routinely assess students' learning styles, conceptual understanding, and academic difficulties through formative assessments and self-evaluation tools. Teachers can use these insights to apply more adaptive instructional strategies such as scaffolded learning, performance feedback, and maritime-related applications of Physics to improve relevance and learner motivation. Moreover, teachers should support student-led initiatives like the proposed Kapit Bisig Peer Mentoring Program, which encourages collaborative learning and reinforces student comprehension through peer teaching and feedback.

PBMS learners are encouraged to take ownership of their learning by actively participating in peer mentoring, seeking feedback, and using available academic resources. They should also engage in reflective practices and self-assessment to monitor their understanding of Physics concepts and identify areas for improvement. These habits,

though not found to have a statistically significant correlation with grades, still contribute to long-term learning success and resilience.

School guidance counselors can offer specialized sessions that help students develop both academic and emotional coping strategies, especially in subjects that learners find intellectually demanding. Counseling programs could also include workshops on study habits, stress management, and career preparation to help learners navigate the academic expectations of the PBMS curriculum and future maritime careers.

For future researchers, it is recommended to explore other variables that may influence academic performance in Physics, such as teaching practices, prior academic achievement, cognitive ability, learning environments, or classroom climate. Longitudinal or mixed-method designs may yield deeper insights into the interplay between learner behaviors, instructional factors, and performance outcomes. Expanding the scope to include multiple institutions or regions would also increase the generalizability of findings.

Finally, for the researcher, it is recommended to refine future studies based on the insights gained from this work, particularly focusing on more specific constructs within self-regulation (e.g., metacognitive awareness, persistence) and types of parental involvement (e.g., autonomy-supportive versus controlling). By narrowing the scope and using more sensitive measures, future research may uncover more nuanced relationships that were not evident in this study.

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