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INFLUENCE OF LEARNING MUSICAL INSTRUMENTS ON THE ACADEMIC AND COGNITIVE PERFORMANCE OF LEARNERS

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Abstract

Academic performance and cognitive development remain central concerns in secondary education, prompting growing interest in enrichment programs that may strengthen learners' intellectual outcomes beyond conventional classroom instruction. This study examined the influence of learning musical instruments on the academic and cognitive performance of learners at Dagupan City National High School during the Academic Year 2025–2026. Specifically, it compared the academic performance of learners who actively learn and play musical instruments with those who do not, determined the duration and frequency of musical instrument practice, examined the relationship between musical practice and academic performance, and assessed cognitive skills in terms of memory, concentration, and abstract reasoning after participation in a structured musical instrument learning program. The study employed a quantitative descriptive–comparative and correlational research design involving 150 learner-respondents. Data were gathered through researcher-developed questionnaires, cognitive assessment tools, and official academic records. Results revealed that learners who actively learn and play musical instruments achieved a higher mean academic performance ($M = 88.45$, $SD = 3.62$) than those who do not ($M = 83.12$, $SD = 4.15$), with the difference statistically significant ($t = 4.87$, $p = 0.000$). Learners also reported moderate practice duration (5.6 hours per week) and frequent practice sessions (4.2 per week). Moreover, practice duration ($r = 0.61$, $p = 0.000$) and frequency ($r = 0.58$, $p = 0.001$) were significantly and positively correlated with academic performance. Cognitive skill scores were likewise high in memory, concentration, and abstract reasoning. The findings support the development of an enhanced musical instrument program to improve learners' academic and cognitive performance.

Keywords: Musical Instrument Learning, Academic Performance, Cognitive Performance, Memory, Concentration, Abstract Reasoning, Secondary Learners

1. Introduction

Music education has long been associated with holistic learner development, but its place in contemporary schooling is now being reconsidered in more precise academic and cognitive terms. In the Philippine context, this reconsideration is timely. The Department of Education's revised Music and Arts curriculum frames music learning as highly contextualized and reflective of Filipino identity, while the curriculum standards emphasize creative production, performance, and engagement with cultural traditions. UNESCO likewise states that learning in, through, and with culture and the arts can develop cognitive, social, emotional, and behavioral skills and is essential to comprehensive education. These policy positions suggest that learning music is not merely a peripheral enrichment activity; rather, it can serve as a legitimate educational process linked to broader learner outcomes.

This curricular logic is especially relevant to instrumental music learning because playing an instrument is a demanding form of embodied cognition. It requires the coordination of auditory discrimination, visual decoding, fine motor control, timing, sustained attention, working memory, and self-monitoring. The older K to 12 Music Curriculum Guide explicitly characterizes music as a performance-based discipline in which effective learning occurs through active experience,

participation, performance, interpretation, and creative expression. The newer MATATAG guide similarly highlights cultural anchoring, multisensory learning, differentiated instruction, and the cultivation of higher-order skills through performing and creating. Taken together, these frameworks help explain why instrumental learning is often hypothesized to influence not only musical competence but also broader academic behaviors such as focus, persistence, memory, and disciplined practice.

Empirical research offers substantial support for this possibility, although the evidence is more nuanced than simple advocacy sometimes suggests. A 2022 meta-analysis in *Educational Research Review* found that instrumental musical training in childhood and adolescence was associated with a small benefit in cognitive skills and academic achievement, based on 34 independent samples and 5,998 participants. A 2024 study in the *British Journal of Music Education* likewise reported significant differences between adolescents with and without specialized musical training in working memory, learning strategies, and academic performance. In addition, a longitudinal intervention study in *Frontiers in Psychology* found that one year of music training in school-aged children was designed specifically to examine whether music training could facilitate working-memory development relative to language training and no training. Together, these studies support the argument that structured instrumental learning may confer advantages in the same domains examined in the present thesis, particularly academic performance, memory, and concentration.

At the same time, a credible introduction must also acknowledge that the literature is not unanimously causal in its conclusions. Sala and Gobet's multilevel meta-analysis in *Memory & Cognition* found that claims about the cognitive and academic benefits of music training in children are often overstated. At the same time, Schellenberg and Lima's 2024 review in the *Annual Review of Psychology* concluded that evidence that music training causes nonmusical benefits is weak or nonexistent and that far transfer is likely rare. A related 2025 article in *Cognition* similarly reported that music training improved fine-motor skills and auditory memory but did not causally improve broader cognitive or socioemotional abilities in school-aged children. These cautions do not make the topic less important. On the contrary, they clarify why carefully delimited, context-specific studies are needed: the question is not whether music is universally transformative, but under what conditions, for which learners, and with which outcome variables it is associated with measurable gains.

Recent work also suggests that music learning may affect academic performance indirectly through psychological and motivational pathways. A 2024 *PLOS ONE* study reported that music education improved students' psychological well-being, which in turn improved academic performance, with self-efficacy and self-esteem playing significant mediating roles. This is educationally important because school achievement is rarely shaped solely by cognition. Instrumental learning often requires repeated goal-setting, delayed gratification, disciplined rehearsal, error correction, and performance under pressure. These processes may strengthen confidence, persistence, and engagement, thereby supporting school performance even when direct far-transfer effects are modest. Thus, the literature points to a more defensible interpretation: instrumental music learning may influence academic and cognitive outcomes through a combination of cognitive practice effects, motivational reinforcement, and self-regulatory development rather than through a single, simple mechanism.

It is within this conceptual and empirical landscape that the present study becomes significant. The uploaded thesis shows that the investigation focuses on Dagupan City National High School during Academic Year 2025–2026 and examines the influence of learning musical instruments on learners' academic and cognitive performance. More specifically, it compares the academic performance of learners who actively learn and play musical instruments with those who do not, examines the duration and frequency of musical practice, tests the relationship between practice variables and academic outcomes, and assesses cognitive performance in

terms of memory, concentration, and abstract reasoning after participation in a structured musical instrument learning program. These objectives are well chosen because they move the discussion from broad claims about “the power of music” to measurable school-based evidence. By doing so, the study provides local empirical support for the broader debate on whether structured instrumental learning can serve as an educational strategy to improve both academic achievement and selected cognitive skills among Filipino secondary learners.

2. Method

2.1 Research Design

The study employed a quantitative descriptive–comparative and correlational research design to examine the influence of learning musical instruments on the academic and cognitive performance of learners at Dagupan City National High School. This design was appropriate because the investigation sought to describe existing learner conditions, compare academic outcomes between those who actively learn and play musical instruments and those who do not, and determine the direction and magnitude of the relationships between musical practice variables and academic performance, all without manipulating the natural learning environment of the participants. The descriptive component was used to profile learners’ academic performance, the duration and frequency of musical instrument practice, and cognitive skills in memory, concentration, and abstract reasoning after participation in a structured musical instrument learning program. The comparative component enabled the study to test whether there were significant differences in academic performance between learners with and without musical instrument experience. In contrast, the correlational component was used to determine whether the duration and frequency of practice were significantly associated with academic achievement. In addition, the design incorporated a program-based evaluation by examining learners’ cognitive performance after structured musical engagement and using the findings to develop an enhanced musical instrument program. Overall, the selected design provided a systematic, objective, and data-driven methodological framework for investigating how musical instrument learning may contribute to learners’ academic and cognitive development.

2.2 Participants

The study consisted of 150 learner-respondents from Dagupan City National High School, specifically Grade 10 students officially enrolled during School Year 2025–2026, who were selected to provide a focused, statistically adequate basis for examining the influence of musical instrument learning on academic and cognitive performance. The sample size was derived from an estimated population of approximately 240 Grade 10 learners, using Slovin’s formula with a 5% margin of error, yielding a sample deemed sufficient for reliable statistical analysis and meaningful group comparisons. The participants were organized into two analytically relevant groups: learners who actively learn and play musical instruments and learners who do not engage in musical instrument learning, thereby enabling the study to compare academic performance across differing levels of musical involvement while also examining the cognitive outcomes associated with structured musical engagement. A purposive sampling technique was employed to ensure that all selected respondents met the study’s inclusion requirements and could provide data directly aligned with the research objectives. This participant structure was methodologically appropriate because it allowed the researcher to examine naturally occurring differences in academic achievement, practice habits, and cognitive skill development within a clearly defined secondary-school context, while maintaining coherence between the sample characteristics and the study’s descriptive–comparative and correlational design.

2.3 Instrumentation

The study employed a combination of researcher-designed instruments and official school records to obtain data directly aligned with its statement of the problem. First, official academic records, secured with proper authorization from the school, were used to determine and compare the academic performance of learners who actively learn and play musical instruments and those who do not, thereby providing an objective basis for the comparative component of the study. Second, the researcher administered a researcher-developed questionnaire to learners engaged in musical instrument learning to gather quantitative data on the duration and frequency of musical instrument practice; the questionnaire also included profile items and perception-based indicators related to academic functioning and the perceived influence of music learning. Third, to assess the cognitive dimension of the inquiry, the study used a cognitive skills assessment tool that measured memory, concentration, and abstract reasoning, with each domain designed to capture mental processes considered relevant to structured musical practice. Together, these instruments created a coherent, methodologically appropriate data-gathering system that enabled the researcher to examine academic performance, practice engagement, and cognitive skill outcomes in an integrated manner, while ensuring that both objective school-based evidence and participant-generated responses were represented in the analysis.

2.4 Data Analysis

The study employed a quantitative data analysis framework that combined both descriptive and inferential statistical procedures to ensure an objective and systematic interpretation of the data gathered on learners' academic and cognitive performance and their engagement in musical instrument learning. Descriptive statistics—specifically frequency counts and percentages—were used to summarize the respondents' profile and describe the duration and frequency of musical instrument practice. At the same time, the mean and standard deviation were computed to determine the average levels and variability of learners' academic performance and cognitive skill scores in memory, concentration, and abstract reasoning. For inferential analysis, the study employed the independent-samples t-test to determine whether there was a statistically significant difference in academic performance between learners who actively learn and play musical instruments and those who do not. The Pearson Product-Moment Correlation Coefficient (r) is used to examine the strength and direction of the relationship between the duration and frequency of musical instrument practice and academic performance. In addition, mean score analysis was used to interpret the level of cognitive performance after learners' participation in the structured musical instrument learning program. All inferential tests were evaluated at the 0.05 level of significance, and the encoded data were processed using Statistical Package for the Social Sciences (SPSS) or an equivalent statistical software, thereby strengthening computational accuracy, minimizing error, and enhancing the reliability of the study's conclusions.

3 Results

The study found a clear difference in academic performance between learners who actively learn and play musical instruments and those who do not. Learners engaged in musical instrument learning obtained a mean academic performance of 88.45 with a standard deviation of 3.62, interpreted as Very Satisfactory. In contrast, learners who did not learn musical instruments obtained a lower mean of 83.12 with a standard deviation of 4.15, indicating a Satisfactory level. This descriptive result indicates that the group involved in musical instrument learning demonstrated stronger school performance, suggesting that sustained musical engagement may be associated with better academic discipline, concentration, and motivation in school tasks.

The inferential analysis further strengthened this pattern. The independent samples t-test revealed a significant difference in academic performance between the two groups, with a computed t-value of 4.87 and a p-value of 0.000, leading to the rejection of the null hypothesis. In research terms, this means that the observed gap in academic performance was statistically meaningful rather than a chance variation. The finding supports the study's central proposition that participation in musical instrument learning is linked to stronger academic outcomes among learners, particularly when compared with peers who do not participate in similar musical activities.

The study also examined the practice habits of learners engaged in musical instrument learning. Results showed that they practiced for an average of 5.6 hours per week, interpreted as moderate, and engaged in practice about 4.2 sessions per week, interpreted as frequent. More importantly, both practice variables were significantly related to academic performance. The duration of practice showed a significant positive correlation with academic performance ($r = 0.61$, $p = 0.000$), while the frequency of practice also showed a significant positive correlation ($r = 0.58$, $p = 0.001$). These results indicate that learners who practiced more consistently and for longer periods achieved better academic results, suggesting that the regularity and intensity of musical engagement may be important factors in supporting school achievement.

In addition to academic outcomes, the study revealed that learners who participated in the structured musical instrument learning program demonstrated high levels of cognitive performance across the three domains assessed. The mean score for memory was 89.20, concentration registered 87.65, and abstract reasoning obtained 85.80, yielding an overall mean of 87.55, all interpreted as High. Among the three, memory obtained the highest score, suggesting that musical instrument learning may be particularly supportive of retention and recall. The consistently high results across all domains suggest that musical learning may strengthen cognition by requiring learners to remember patterns, sustain attention, and interpret symbolic structures during practice and performance.

Taken together, the findings present a coherent pattern: learners who engaged in musical instrument learning not only performed better academically, but also practiced with meaningful regularity and demonstrated high levels of memory, concentration, and abstract reasoning. Because these findings converged across descriptive, comparative, and correlational analyses, they served as the basis for the development of an enhanced musical instrument program centered on structured practice schedules, cognitive-focused musical activities, guided instruction, performance-based tasks, and continuous assessment. Thus, the study's results suggest that musical instrument learning can serve as a valuable educational support mechanism for strengthening both academic and cognitive performance among secondary learners.

4. Discussion

The present study found that learners who actively engaged in learning and playing musical instruments achieved higher academic performance than those who did not, and that the group difference was statistically significant. This pattern is broadly consistent with recent literature. Román-Caballero et al. (2022) reported a small but significant overall benefit of instrumental musical training on cognitive skills and academic achievement across 34 samples and 5,998 participants, while also noting that students who self-selected into music training often had a slight baseline advantage before intervention. Likewise, Sepúlveda-Durán et al. (2024) found significant differences between adolescents with and without specialized musical training in working memory, learning strategies, and academic performance. Read alongside the present findings, these studies support the view that instrumental learning can be associated with stronger school performance, but they also suggest that part of the advantage may reflect both training effects and pre-existing learner characteristics such as motivation, family support, or academic readiness.

The study also showed that the duration and frequency of musical practice were positively correlated with academic performance, suggesting that regular and sustained practice matter, not merely participation itself. This interpretation is consistent with the same meta-analysis by Román-Caballero et al. (2022), which specifically focused on learning to play an instrument and found measurable benefits from short-term programs, as well as with the broader logic of deliberate practice in music learning. At the same time, the present study should be interpreted carefully because its design is descriptive-comparative and correlational rather than experimental, meaning it demonstrates association rather than definitive causation. That caution is reinforced by Schellenberg and Lima's (2024) review, which concluded that evidence that music training causes broad nonmusical benefits is weak or nonexistent and that far transfer is rare. Thus, the current findings are strongest when stated modestly: in this school context, sustained instrumental practice co-occurred with higher academic performance, but the exact causal pathway likely includes additional factors beyond music alone.

The study's cognitive findings—high mean scores in memory, concentration, and abstract reasoning, with memory emerging as the highest—are partly corroborated by recent empirical work, especially in domains closer to the demands of musical activity. Sepúlveda-Durán et al. (2024) found better working memory among adolescents with specialized musical training, and Neves et al. (2025) reported that music training improved auditory memory relative to controls. However, it did not improve other broader cognitive abilities. This is an important point for the present discussion. The study's strong scores in memory and concentration align well with the literature, as instrument learning repeatedly engages attention, sequencing, monitoring, and recall. However, the finding on abstract reasoning should be discussed more cautiously, because the strongest recent causal evidence does not consistently support broad transfer to all higher-order cognitive domains. In IMRAD terms, the present results suggest that music learning is plausibly linked to selected cognitive strengths, especially memory-related and attentional functions. In contrast, broader cognitive generalization remains more contested in the literature.

Finally, the study's proposal for an enhanced musical instrument program is well justified by the available evidence, especially if it is framed not as a guaranteed method for boosting all forms of cognition, but as a structured educational environment that can support academic discipline, well-being, and selected cognitive skills. Jiang et al. (2024) found that music education improved students' psychological well-being, which, in turn, enhanced academic performance, with self-efficacy and self-esteem as significant mediators. This helps explain why musical instrument learning may support school outcomes even when far-transfer effects are modest: practice routines, mastery experiences, persistence, and confidence can strengthen the learner's overall academic functioning. Therefore, the present study's recommendation for a more structured school music program is defensible, provided it is presented as a balanced educational intervention—one that supports memory, concentration, motivation, and academic engagement, while remaining careful not to overstate claims about universal cognitive enhancement.

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INTEGRATIVE APPROACHES IN TEACHING MUSIC, ARTS, PHYSICAL EDUCATION, AND HEALTH ON STUDENT ENGAGEMENT AND HOLISTIC DEVELOPMENT IN JUNIOR HIGH SCHOOL

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Abstract

Holistic education in junior high school requires instructional approaches that connect cognitive, physical, emotional, social, artistic, and health-related learning experiences. This study investigated the effects of integrative approaches in teaching Music, Arts, Physical Education, and Health on student engagement, holistic development, and academic performance among junior high school learners in Pangasinan I Schools Division during School Year 2025–2026. Specifically, it determined the perceived effectiveness of integrative approaches as rated by teachers and students, compared the holistic development scores of students exposed and not exposed to integrative MAPEH instruction, examined the extent of integrative approach implementation, assessed academic performance in core subjects, tested the relationship between integration and academic performance, and proposed pedagogical guidelines for improved MAPEH instruction. The study employed a quantitative descriptive-comparative and correlational research design involving 150 junior high school students and 10 MAPEH teachers. Data were gathered using structured survey questionnaires and official academic records, and analyzed using means and standard deviations, independent-samples t-tests, and Pearson correlations. Findings revealed that both teachers and students perceived integrative approaches as highly effective. Students exposed to integrative MAPEH instruction obtained higher holistic development scores than those taught through non-integrative approaches, and the difference was statistically significant. Teachers reported a moderately high extent of integrative implementation. Students exposed to integrative instruction also showed higher academic performance, and the extent of integration was positively correlated with academic achievement. The study concluded that integrative MAPEH instruction enhances engagement, holistic development, and academic performance.

Keywords: Integrative Approaches, MAPEH Instruction, Student Engagement, Holistic Development, Academic Performance, Junior High School

1. Introduction

Holistic education has become an important direction in contemporary basic education because schools are increasingly expected to develop learners not only academically but also physically, socially, emotionally, creatively, and ethically. This expectation is especially relevant in junior high school, where learners are undergoing rapid developmental changes and require learning experiences that support identity formation, peer interaction, self-expression, health awareness, and academic growth. Music, Arts, Physical Education, and Health (MAPEH) is uniquely positioned to contribute to this goal because it combines artistic, physical, cultural, behavioral, and wellness-oriented learning areas. However, when the four components of MAPEH are taught as isolated units, opportunities for meaningful interdisciplinary learning may be reduced. Integrative approaches offer a way to connect these components into more coherent, relevant, and developmentally responsive learning experiences.

Integrative approaches in teaching MAPEH refer to instructional strategies that combine concepts from Music, Arts, Physical Education, and Health into interconnected lessons, activities,

and performance tasks. These approaches may include interdisciplinary projects, movement-based artistic activities, health-related performance tasks, music-supported physical activities, arts-based reflections on wellness, and collaborative outputs that require students to apply learning across multiple MAPEH domains. Such approaches align with the view that learning becomes more meaningful when students connect concepts across disciplines and apply them to real-life contexts. In MAPEH, integration can help learners understand that music, movement, creativity, health practices, teamwork, discipline, and personal well-being are not separate school requirements but interrelated dimensions of human development.

The growing emphasis on culture and arts education supports the relevance of integrative MAPEH instruction. UNESCO (2024) emphasized that culture and arts education help develop creativity, critical thinking, emotional intelligence, well-being, and academic outcomes, while also promoting openness and respect for diversity. Similarly, the Organization for Economic Co-operation and Development reviewed empirical evidence showing that arts education is often associated with creative thinking, communication, cooperation, self-confidence, and other innovation-related skills, although the report also cautioned that evidence on transfer to non-arts academic outcomes should be interpreted carefully (Winner et al., 2013). These perspectives suggest that integrative MAPEH instruction may contribute to holistic learning, but its effects must be examined empirically within specific school contexts.

The performance-based nature of MAPEH also strengthens the need for integrative teaching. Research on performing arts shows that learning in artistic contexts often involves multimodal practices such as rhythm, movement, demonstration, correction, mirroring, cues, collaboration, and repeated performance (Cekaite & Björk-Willén, 2021). These practices are highly compatible with MAPEH because students learn through the body, senses, emotions, and social interaction. When teachers integrate music, arts, physical movement, and health concepts, students may experience richer forms of engagement that go beyond passive listening or written recall. Integrative lessons may therefore increase behavioral engagement through active participation, emotional engagement through enjoyment and relevance, and cognitive engagement through deeper connection-making and reflection.

Physical education and health components also contribute to the rationale for integrative MAPEH instruction. Research on physical activity and academic achievement indicates that physical activity is not detrimental to academic performance and may even be beneficial, especially when implemented consistently and meaningfully in school contexts (Bangsbo et al., 2020). This supports the idea that physical and health-related learning should not be treated as separate from academic development. In an integrative MAPEH, movement, wellness, discipline, creativity, and teamwork can be part of a broader learning environment that supports both student development and school performance. Such integration is particularly important for adolescents, who benefit from learning experiences that connect health habits, social interaction, self-expression, and academic motivation.

Despite the potential value of integrative MAPEH instruction, several gaps remain. Many studies on interdisciplinary learning focus on general curriculum integration, arts education, physical activity, or health promotion, but fewer directly examine the combined use of Music, Arts, Physical Education, and Health within the junior high school curriculum. There is also a need for localized evidence on how teachers and students perceive integrative approaches, whether these approaches are associated with higher student engagement and holistic development, and whether the extent of integration is associated with academic performance in core subjects. These gaps are important because MAPEH is often perceived as a practical or performance-based subject, yet it may have broader developmental value when taught through intentional interdisciplinary strategies.

Accordingly, the present study investigated the effects of integrative approaches in teaching MAPEH on student engagement and holistic development among junior high school

learners in Pangasinan I Schools Division. Specifically, it determined the perceived effectiveness of integrative approaches as rated by teachers and students, compared the holistic development scores of students who experienced integrative instruction with those who did not, examined the extent of integrative approach implementation in MAPEH classes, assessed students' academic performance in core subjects, and tested the relationship between the extent of integration and academic performance. Based on the findings, the study aimed to propose specific pedagogical guidelines to maximize the use of integrative approaches in MAPEH. Through this inquiry, the study sought to provide empirical support for curriculum improvement, teacher professional development, and more holistic junior high school instruction.

2. Method

2.1 Research Design

The study employed a quantitative research design integrating descriptive, comparative, and correlational approaches to investigate the effects of integrative approaches in teaching MAPEH on student engagement, holistic development, and academic performance among junior high school students. The descriptive component was used to determine the perceived effectiveness of integrative approaches, as rated by teachers and students, and the extent to which they were implemented in MAPEH classes. The comparative component was used to examine whether there were significant differences in holistic development scores between students who experienced integrative MAPEH instruction and those who did not. Meanwhile, the correlational component was used to determine the relationship between the extent of integrative approaches and students' academic performance in core subjects. This design was appropriate because the study sought to measure observable variables, compare learner outcomes across instructional exposure groups, and test statistical relationships without manipulating the classroom environment. Through this quantitative design, the study generated empirical evidence that served as the basis for proposing pedagogical guidelines to strengthen integrative MAPEH instruction and promote student engagement, holistic development, and academic achievement.

2.2 Participants

The study consisted of 150 junior high school students from Grades 7 to 10 and 10 MAPEH teachers from selected public secondary schools in Pangasinan I Schools Division during School Year 2025–2026. The student participants served as the primary sources of data on engagement, holistic development, exposure to integrative MAPEH instruction, and academic performance, while the teacher participants provided information on the perceived effectiveness and extent of implementation of integrative approaches in MAPEH classes. Students were included if they were officially enrolled in a public junior high school within the division, had completed at least one full grading period of MAPEH instruction, and had provided assent with parental or guardian consent. Teachers were included if they were full-time MAPEH teachers, had at least one year of teaching experience in the MAPEH curriculum, and had implemented either integrative or traditional teaching approaches. This participant structure was appropriate because the study required data from both learners who experienced the instructional approaches and teachers who implemented them. By including both student and teacher respondents, the study provided a comprehensive quantitative basis for examining the effects of integrative MAPEH instruction on engagement, holistic development, and academic performance.

2.3 Instrumentation

The study utilized structured quantitative instruments to gather data on integrative MAPEH instruction, student engagement, holistic development, and academic performance. For student respondents, a structured survey questionnaire was administered to measure behavioral,

emotional, and cognitive engagement; holistic development in terms of physical literacy, artistic competence, health awareness, emotional wellness, and social interaction skills; and exposure to integrative MAPEH teaching. For teacher respondents, a separate questionnaire was used to determine the perceived effectiveness of integrative approaches and the extent to which Music, Arts, Physical Education, and Health concepts were integrated in classroom instruction. Both student and teacher questionnaires used a five-point Likert scale to allow numerical interpretation and statistical analysis of responses. Academic performance data were obtained from official school records, particularly students' final grades in core subjects, to provide an objective measure of achievement. Additional school documents, such as class lists, attendance records, and MAPEH teaching schedules, were reviewed to verify participant eligibility and support data accuracy. The instruments were validated by experts in MAPEH and educational research and were pilot-tested prior to full administration to establish clarity, relevance, and reliability. Using these instruments, the study generated systematic, measurable data to examine the effects of integrative approaches on student engagement, holistic development, and academic performance.

2.4 Data Analysis

The data were analyzed using descriptive, comparative, and correlational statistical procedures aligned with the study's objectives. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to summarize the perceived effectiveness of integrative approaches in MAPEH as rated by teachers and students; the extent of integrative approach implementation; students' holistic development scores; and students' academic performance in core subjects. To determine whether there was a significant difference in holistic development scores between students who experienced integrative MAPEH instruction and those who did not, an independent-samples t-test was employed. Pearson product-moment correlation coefficient was used to examine the relationship between the extent of integrative approaches in teaching MAPEH and students' academic performance. The hypotheses were tested at the 0.05 level of significance. These statistical procedures enabled the study to determine the perceived value of integrative instruction, compare developmental outcomes between instructional exposure groups, and establish whether greater use of integrative approaches was significantly associated with higher academic performance. The results served as the empirical basis for proposing pedagogical guidelines to strengthen integrative MAPEH instruction.

3 Results

The results showed that integrative approaches in teaching MAPEH were perceived as highly effective by both teachers and students. Teacher respondents obtained a mean rating of 4.32, while student respondents obtained a mean rating of 4.18, both indicating highly effective performance. These findings indicate that both groups recognized the value of integrating Music, Arts, Physical Education, and Health concepts into meaningful, interconnected learning experiences. The high ratings suggest that integrative MAPEH instruction enhanced lesson clarity, strengthened students' interest, and helped learners connect concepts across the four components of the subject.

The study also revealed that students who experienced integrative MAPEH instruction demonstrated higher holistic development than those who did not. Students exposed to integrative approaches obtained a mean holistic development score of 4.27, indicating high development, while those who experienced non-integrative instruction obtained a lower mean score of 3.81, indicating moderate development. This finding suggests that integrative MAPEH instruction contributed positively to learners' physical literacy, artistic expression, emotional awareness, social interaction, teamwork, and health-related competencies. The result implies that

interconnected MAPEH activities may support more balanced learner development than discipline-separated instruction.

The comparison of holistic development scores between the two groups showed a statistically significant difference. The t-test yielded a t-value of 6.21 and a p-value of $<.001$, indicating that the difference between students exposed to integrative MAPEH instruction and those not exposed was significant. This result confirms that integrative instruction was associated with stronger holistic development outcomes among junior high school learners. It further suggests that when MAPEH concepts are taught through interdisciplinary activities, students are more likely to develop not only subject-related skills but also broader developmental competencies.

In terms of implementation, the extent of using integrative approaches in MAPEH was rated moderately high, with a mean of 3.94. This indicates that MAPEH teachers were already applying integrative strategies in their lessons, although implementation was not yet at the highest level. The finding suggests that teachers may already be combining two or more MAPEH components, designing interdisciplinary performance tasks, and using integrated activities, but there remains a need for more systematic lesson planning, collaboration, training, and instructional support to strengthen consistency in practice.

The academic performance results showed that students exposed to integrative MAPEH instruction achieved a higher mean score of 87.45 than those not exposed to integrative instruction (83.12). Furthermore, the Pearson correlation showed a moderate positive relationship between the extent of integrative approaches and academic performance, with an r-value of .41 and a p-value of $<.001$. This means that greater implementation of integrative approaches was associated with higher academic performance in core subjects. Overall, the findings support the conclusion that integrative MAPEH instruction positively contributes to student engagement, holistic development, and academic achievement, thereby providing a strong basis for developing pedagogical guidelines.

4. Discussion

The finding that both teachers and students perceived integrative approaches in MAPEH as highly effective supports the value of interdisciplinary instruction in creating meaningful and engaging learning experiences. In the study, teachers and students gave high ratings to integrative MAPEH instruction, suggesting that combining Music, Arts, Physical Education, and Health helped make lessons clearer, more relevant, and more connected to real-life applications. This result is consistent with UNESCO's position that culture and arts education contribute to creativity, critical thinking, emotional intelligence, well-being, and academic outcomes (UNESCO, 2024). Since MAPEH naturally involves artistic expression, movement, performance, collaboration, and health awareness, an integrative approach enables learners to experience the subject as a unified, practical field rather than as four separate components.

The higher holistic development scores of students exposed to integrative MAPEH instruction further confirm that interdisciplinary teaching can support multidimensional learner growth. Students who received integrative instruction achieved higher mean scores than those who did not, indicating stronger development in physical literacy, artistic expression, social interaction, emotional awareness, and health-related competencies. This finding aligns with the OECD review of arts education, which explains that arts learning is associated with creative thinking, communication, cooperation, self-confidence, and other skills relevant to holistic learner development (Winner et al., 2013). In the context of the present study, integrative MAPEH instruction appears to provide a learning environment where learners can simultaneously develop cognitive, social, emotional, artistic, and physical competencies.

The significant difference in holistic development between students exposed to integrative MAPEH and those taught through non-integrative approaches provides stronger evidence that

instructional design affects learner outcomes. The significant t-test result indicates that the difference between the two groups was not incidental but statistically meaningful. This finding may be explained by the nature of integrative MAPEH activities, which often involve performance tasks, group outputs, movement-based learning, creative production, health-related decision-making, and reflective activities. Cekaite and Björk-Willén (2021) emphasized that performing arts learning involves multimodal interactions such as demonstration, correction, mirroring, rhythm, movement, and collaboration. These practices are closely aligned with integrative MAPEH instruction and may help explain why learners exposed to integrated lessons demonstrated stronger holistic development.

The result, showing a moderately high level of integrative approach implementation, suggests that MAPEH teachers were already applying interdisciplinary teaching practices, although there remained room for improvement. This finding implies that teachers may be combining two or more MAPEH components, designing interdisciplinary performance tasks, and using integrated activities, but implementation may not yet be consistent across all lessons and classrooms. The moderately high rating indicates a need for more systematic pedagogical support, including collaborative lesson planning, professional development, instructional materials, monitoring tools, and school-level encouragement. Without these supports, integrative instruction may depend largely on individual teacher initiative, leading to uneven implementation.

Finally, the higher academic performance of students exposed to integrative MAPEH instruction and the moderate positive correlation between extent of integration and academic performance suggest that integrative MAPEH may contribute not only to holistic development but also to broader academic achievement. This result supports the view that active, meaningful, and interdisciplinary learning can strengthen learner engagement, motivation, and cognitive involvement. Bangsbo et al. (2020) reported that physical activity is not harmful to academic achievement and may support learning outcomes when implemented meaningfully in school contexts. Similarly, the OECD review noted that arts education may be associated with academic motivation and non-arts learning outcomes, although these relationships should be interpreted with caution, as academic performance is influenced by many factors (Winner et al., 2013). Thus, the present findings justify the development of pedagogical guidelines that promote interdisciplinary lesson planning, collaborative MAPEH activities, integration of health and arts concepts, performance-based learning, and continuous teacher training.

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THE IMPACT OF MUSIC AND ARTS EDUCATION IN JUNIOR HIGH SCHOOL LEARNERS' CREATIVITY AND ACADEMIC PERFORMANCE

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Abstract

Music and Arts education remains an essential component of holistic learning as schools seek to develop learners who are creative, expressive, academically competent, and prepared for the demands of the twenty-first century. This study determined the impact of Music and Arts education on the creativity and academic performance of junior high school learners in selected public and private secondary schools in Dagupan City during the academic year 2024–2025. Specifically, it examined learners' levels of participation in Music and Arts education, their creativity levels, their academic performance, the relationships among participation, creativity, and academic performance, and the impact of Music and Arts education as a basis for an action plan. The study employed a quantitative correlational research design involving 500 junior high school learners. Data were gathered using a researcher-made participation questionnaire, a standardized creativity assessment tool measuring fluency, flexibility, originality, and elaboration, and official school records for Grade Point Average in core subjects. Descriptive statistics, Pearson correlation coefficient, and simple linear regression were used to analyze the data. Results showed that most learners had moderate to low participation in Music and Arts education, moderate creativity levels, and generally satisfactory academic performance. Significant positive relationships were found between participation and creativity, participation and academic performance, and creativity and academic performance. Regression results further indicated that Music and Arts participation significantly predicted creativity and academic performance, with a stronger impact on creativity. The study concluded that Music and Arts education contribute meaningfully to learners' creative development and academic achievement.

Keywords: Music and Arts education, creativity, academic performance, junior high school learners, arts participation, correlational study

1. Introduction

Creativity and academic performance are central outcomes of contemporary basic education, particularly as schools are expected to prepare learners for complex social, technological, and professional environments. Creativity enables learners to generate original ideas, approach problems from multiple perspectives, and communicate meaning through diverse forms of expression. Academic performance, on the other hand, reflects learners' mastery of prescribed competencies and their capacity to apply knowledge across subject areas. In junior high school, these two outcomes are especially important because learners are in a developmental stage marked by increasing cognitive flexibility, identity formation, peer interaction, and exploration of interests. Music and Arts education provides a meaningful context for cultivating these competencies because it engages learners not only intellectually but also emotionally, socially, and aesthetically.

Music and Arts education contribute to holistic learning by providing structured opportunities for self-expression, imagination, discipline, collaboration, and reflective thinking. UNESCO (2024) emphasized that culture and arts education can help develop creativity, critical thinking, emotional intelligence, well-being, and academic outcomes, while also promoting openness, cultural understanding, and respect for diversity. This global policy direction affirms the

value of arts education not as a peripheral activity but as an essential part of learner development. In the Philippine junior high school context, Music and Arts are formally embedded in the MAPEH curriculum, making them accessible channels through which learners may develop creative and academic competencies. However, the extent to which participation in these learning experiences relates to creativity and academic achievement requires systematic empirical examination.

The relationship between arts education and learner outcomes has received sustained scholarly attention. The OECD report *Art for Art's Sake? The Impact of Arts Education* reviewed empirical evidence on arts classes, arts-integrated instruction, and out-of-school arts study, noting that arts education has often been associated with creative thinking, behavioral and social skills, academic motivation, communication, and cooperation (Winner et al., 2013). However, the same report cautioned that causal claims must be interpreted carefully, as evidence varies across art forms and research designs. This distinction is important for the present study because it employs a correlational design, which can identify the direction and strength of relationships but cannot establish that participation in Music and Arts directly causes improvements in creativity or academic performance. Thus, the study provides localized quantitative evidence on these associations among junior high school learners in Dagupan City.

Creativity in adolescence is a complex and developing construct. It is commonly reflected in fluency, flexibility, originality, and elaboration, dimensions often assessed through standardized creativity measures. Said-Metwaly et al. (2021), in a meta-analysis of divergent thinking development among school-age children and adolescents, found that creativity development does not follow a simple linear pattern and may show variations across grade levels, tasks, gender, giftedness, and country contexts. This finding suggests that creativity should be studied in relation to learning environments and educational experiences that may support or constrain its development. Music and Arts education may provide such an environment by encouraging learners to imagine, perform, interpret, improvise, design, evaluate, and revise their outputs. Through these activities, students can practice both divergent and convergent thinking, which are essential in creative production and problem-solving.

Participation is also an important variable because the benefits of arts education may depend on the degree, frequency, and quality of engagement. Learners who participate regularly in music, visual arts, drama, dance, or related school-based programs may have more opportunities to practice creative processes than those with limited or no exposure. Participation may also strengthen academic behaviors such as attention, persistence, self-confidence, discipline, and collaboration. These behaviors may indirectly support academic performance in core subjects. Nevertheless, participation in Music and Arts education does not operate in isolation. Academic achievement may also be influenced by prior performance, socioeconomic background, access to resources, teacher quality, parental support, motivation, and school climate. For this reason, the present study treats Music and Arts participation as one important factor associated with creativity and academic performance rather than as the sole determinant of learner success.

Despite the growing recognition of the educational value of the arts, Music and Arts programs are sometimes perceived as less central than traditional core academic subjects. Such perceptions may reduce instructional time, limit resources, and weaken opportunities for learners to engage meaningfully in artistic activities. This issue is significant because junior high school learners need educational experiences that develop not only academic proficiency but also imagination, confidence, communication, and social-emotional skills. If Music and Arts education is empirically linked with creativity and academic performance, schools and education leaders may have stronger grounds for sustaining, improving, and integrating arts programs within the curriculum.

Accordingly, this study determined the impact of Music and Arts education on junior high school learners' creativity and academic performance. Specifically, it examined learners' levels of

participation in Music and Arts education, their creativity, and their academic performance, as measured by Grade Point Average in core subjects. It also tested the significant relationships between participation and creativity, participation and academic performance, and creativity and academic performance. Furthermore, it assessed the level of impact of Music and Arts education and developed an action plan to enhance learners' creativity and academic performance. By focusing on junior high school learners in selected public and private secondary schools in Dagupan City, the study aimed to generate context-specific evidence that may support curriculum planning, school-based arts programming, teacher practice, and learner-centered interventions. Ultimately, the study positions Music and Arts education as a potentially valuable contributor to holistic learner development in the junior high school setting.

2. Method

2.1 Research Design

The study employed a quantitative correlational research design to examine the relationships among junior high school learners' participation in Music and Arts education, their creativity levels, and their academic performance. This design was appropriate because the study sought to determine the extent and direction of association among naturally occurring variables without manipulating the learners' exposure to music and arts programs. Participation in Music and Arts education was measured through a researcher-designed survey questionnaire that gathered information on learners' involvement in school-based music, visual arts, drama, dance, and related activities. Creativity was assessed using a standardized creativity assessment tool measuring fluency, flexibility, originality, and elaboration, while academic performance was determined through official school records, particularly Grade Point Average in core subjects. The quantitative approach used numerical data and statistical procedures to describe participation, creativity, and academic performance, and to test whether significant relationships existed among these variables. Through Pearson correlation and regression analysis, the design provided empirical evidence on the degree to which Music and Arts participation was associated with creativity and academic achievement among junior high school learners in selected public and private secondary schools in Dagupan City.

2.2 Participants

The study was conducted with 500 junior high school learners enrolled in selected public and private secondary schools in Dagupan City, Ilocos Region, Philippines, during the academic year 2024–2025. The respondents represented learners at the junior high school level, particularly those in the developmental stage during which creativity, academic identity, social engagement, and interest in artistic activities are actively forming. They served as the primary source of data for the study because their level of participation in Music and Arts education, creativity, and academic performance were the central variables under investigation. Data on participation were collected through a researcher-designed survey, while creativity was measured using a standardized creativity assessment tool. Academic performance was determined through official school records, particularly Grade Point Average in core subjects such as Mathematics, Science, English, and Filipino. The inclusion of learners from both public and private schools allowed the study to capture a broader picture of Music and Arts participation and its relationship with creativity and academic achievement within the local educational context. Through this respondent group, the study generated quantitative evidence on how engagement in Music and Arts education was associated with the creative and academic development of junior high school learners.

2.3 Instrumentation

The study utilized three primary instruments to gather quantitative data on learners' participation in Music and Arts education, creativity levels, and academic performance. First, a researcher-designed survey questionnaire was used to determine the respondents' level of participation in school-based Music and Arts activities, including instrumental music, vocal music, visual arts, drama, dance, and related curricular or extracurricular programs. The questionnaire collected information on the type, duration, frequency, and perceived level of learners' involvement in these activities. Second, a standardized creativity assessment tool, such as the Torrance Tests of Creative Thinking or a culturally adapted equivalent, was employed to measure learners' creativity in terms of fluency, flexibility, originality, and elaboration. This instrument provided quantifiable scores that reflected the respondents' creative thinking abilities. Third, academic performance was measured using official school records, particularly the learners' Grade Point Average in core subjects such as Mathematics, Science, English, and Filipino. The use of official records ensured that academic performance data were objective and reliable. Before full administration, the participation questionnaire was pilot-tested to assess clarity, comprehensibility, and content validity. Together, these instruments enabled systematic measurement of the variables and provided the empirical basis for determining the relationships among Music and Arts participation, creativity, and academic performance.

2.4 Data Analysis

The data gathered in the study were analyzed using descriptive and inferential statistical procedures appropriate for a quantitative correlational design. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to determine the respondents' level of participation in Music and Arts education, their creativity levels in terms of fluency, flexibility, originality, and elaboration, and their academic performance based on Grade Point Average in core subjects. Pearson product-moment correlation coefficient was employed to determine the significance, strength, and direction of the relationships between participation in Music and Arts education and creativity, participation in Music and Arts education and academic performance, and creativity and academic performance. To further determine the impact of Music and Arts education, a simple linear regression analysis was used to examine the extent to which participation in Music and Arts education predicted overall creativity and academic performance. The hypotheses were tested at the 0.05 level of significance. Through these statistical procedures, the study generated empirical evidence on the association and predictive influence of Music and Arts participation on the creative and academic development of junior high school learners.

3 Results

The results showed that junior high school learners had varied levels of participation in Music and Arts education. Among the 500 respondents, the largest group demonstrated moderate participation: 180 learners (36.0%) regularly participated in one art form or occasionally engaged in multiple art forms. This was followed by 155 learners (31.0%) with low participation, while 85 learners (17.0%) reported no participation in school-based Music and Arts programs. Only 80 learners, or 16.0%, demonstrated high participation, indicating regular engagement with multiple art forms. These findings suggest that while many learners were exposed to Music and Arts education, sustained and extensive participation remained limited among the respondents.

In terms of creativity, the respondents demonstrated moderate levels across the measured dimensions of fluency, flexibility, originality, and elaboration. The overall creativity index was 144.55, with fluency achieving the highest mean score of 45.20, followed by flexibility (38.75), elaboration (32.50), and originality (28.10). These results indicate that learners were generally capable of producing ideas, shifting perspectives, and developing responses, although originality

appeared to be the least developed dimension. The findings suggest that creativity among junior high school learners may still be strengthened through more consistent exposure to Music and Arts activities that encourage imagination, experimentation, and self-expression.

The respondents' academic performance was generally satisfactory, as evidenced by their Grade Point Average in core subjects. Filipino obtained the highest mean GPA of 86.00, followed by English with 85.30, Science with 84.15, and Mathematics with 82.50. The overall GPA was 84.49, indicating that the learners performed within a satisfactory academic range. These results provide a baseline for understanding the academic standing of the respondents and for examining its association with their participation in Music and Arts education and creativity levels. The relatively consistent GPA scores also suggest that the learners had comparable academic performance across the core subject areas.

Correlation results revealed significant positive relationships among the study's major variables. Participation in Music and Arts education was significantly and positively related to all dimensions of creativity, with the strongest association observed between participation and the overall creativity index. The correlation between participation and overall creativity was moderate, while the relationships with fluency, flexibility, originality, and elaboration ranged from weak to moderate. Participation was also significantly and positively related to academic performance, although the correlations were weak across Mathematics, Science, English, Filipino, and overall GPA. These findings suggest that greater engagement in Music and Arts education was associated with higher creativity and slightly better academic performance among the respondents.

The study further found a significant positive relationship between creativity and academic performance, with overall creativity showing a moderate association with overall GPA. This indicates that learners with higher creativity scores tended to perform better academically. Regression analysis also showed that participation in Music and Arts education significantly predicted both overall creativity and overall GPA. Participation explained 15.1% of the variance in creativity and 7.2% of the variance in academic performance, suggesting that the impact of Music and Arts education was stronger on creativity than on academic achievement. Overall, the results support the conclusion that Music and Arts education contributes meaningfully to the creative development of junior high school learners and has a positive, though modest, association with their academic performance.

4. Discussion

The finding that most junior high school learners demonstrated moderate to low participation in Music and Arts education suggests that exposure to artistic learning opportunities was present but not consistently sustained across the respondent group. This result is important because meaningful arts education depends not only on formal inclusion in the curriculum but also on learners' actual involvement in music, visual arts, drama, dance, and related activities. UNESCO (2024) emphasized that culture and arts education support creativity, critical thinking, emotional intelligence, well-being, and academic outcomes, but these benefits require strengthened access, teacher preparation, and recognition of artistic competencies within education systems. In the context of the present study, the limited number of learners with high participation indicates the need for schools to provide more inclusive, engaging, and sustained Music and Arts opportunities so that more students can experience the developmental benefits of artistic engagement.

The moderate creativity levels of the respondents, particularly in fluency, flexibility, originality, and elaboration, support the view that creativity among adolescents is developmental and can be influenced by educational experience. The study's use of creativity dimensions is consistent with Torrance's framework, which identifies fluency, flexibility, originality, and elaboration as core indicators of creative thinking (Torrance, 1974). The relatively lower score in

originality suggests that, while learners may be able to produce ideas and expand their responses, they may still need more opportunities to generate novel, uncommon ideas. This finding is supported by Said-Metwaly et al. (2021), who explained that divergent thinking development among school-age children and adolescents does not follow a simple linear pattern and may vary across grade level, task type, and context. Therefore, sustained Music and Arts participation may serve as one avenue for strengthening learners' creative thinking, particularly when activities encourage exploration, improvisation, experimentation, and self-expression.

The significant positive relationship between Music and Arts participation and creativity corroborates existing evidence that arts education is associated with creative thinking and innovation-related skills. The OECD report by Winner, Goldstein, and Vincent-Lancrin (2013) noted that arts education has been linked to critical and creative thinking, communication, cooperation, motivation, and other skills relevant to innovation. In the present study, participation showed a moderate positive relationship with overall creativity, indicating that learners who were more engaged in Music and Arts activities tended to have higher creativity scores. This relationship may be explained by the nature of artistic learning, which requires students to interpret, imagine, compose, perform, revise, and present ideas in expressive forms. Such processes provide repeated opportunities for divergent thinking, flexible problem-solving, and idea elaboration, all of which are central to creativity development.

The significant but weak positive relationship between Music and Arts participation and academic performance suggests that arts engagement may contribute to academic achievement, although its influence is more modest than its relationship with creativity. This finding is consistent with the cautious conclusion of Winner et al. (2013), who reported that arts education may be associated with outcomes in non-arts academic areas, but evidence should be interpreted carefully because academic achievement is influenced by many factors. In the present study, participation in Music and Arts education significantly predicted overall GPA but explained only a small portion of its variance. This indicates that while artistic participation may support academic behaviors such as focus, discipline, confidence, engagement, and persistence, academic performance is also shaped by other variables, including prior achievement, socioeconomic background, home support, teacher quality, study habits, and school environment. Thus, Music and Arts education should be viewed as a meaningful contributor to academic development rather than the sole determinant of academic success.

Finally, the significant positive relationship between creativity and academic performance strengthens the argument that creative thinking is relevant to learning across subject areas. Learners who demonstrated higher creativity scores tended to perform better academically, suggesting that creative thinking may support comprehension, problem-solving, communication, and flexible application of knowledge. The regression results further showed that Music and Arts participation had a stronger predictive value for creativity than for academic performance, highlighting the direct relevance of arts education to creative development. These findings justify the proposed action plan to strengthen Music and Arts programs, promote active participation, integrate arts-based strategies across the curriculum, provide teacher training, and raise awareness among parents and school stakeholders. Overall, the study supports the inclusion of Music and Arts education as a valuable component of holistic junior high school learning, particularly for fostering creativity and positively contributing to academic performance.

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IMPACT OF COMBATIVE SPORTS TRAINING ON PHYSICAL FITNESS AND MOTOR SKILLS OF SENIOR HIGH SCHOOL

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Abstract

Senior high school learners increasingly need structured physical activity programs that can address declining fitness levels while also strengthening complex motor skills and positive behavioral attributes. This study examined the impact of structured combative sports training on the physical fitness, motor skills, confidence, and discipline of senior high school learners. Specifically, it determined the mean scores of selected physical fitness components in terms of muscular strength, cardiovascular endurance, and flexibility; assessed motor skills proficiency in balance, agility, coordination, and reaction time; tested the correlation between fitness and motor skill scores; and compared learners' confidence and discipline scores before and after participation in the training program. The study employed a quantitative quasi-experimental one-group pretest-posttest design involving 300 purposively selected senior high school learners from Dagupan City National High School during the first semester of School Year 2025–2026. Data were gathered using standardized physical fitness tests, motor skills proficiency tests, and self-report psychological inventories. Results revealed statistically significant improvements in all physical fitness components after the intervention, particularly in muscular strength, cardiovascular endurance, and flexibility. Significant gains were likewise recorded in balance, agility, coordination, and reaction time, confirming the positive influence of combative sports on motor proficiency. Moreover, a strong positive correlation was found between post-test fitness and motor skill scores ($r = 0.685$, $p < .001$), indicating that improvements in physical capacity were closely associated with gains in motor competence. Confidence and discipline scores also increased significantly after training. The findings support the development of an action plan integrating combative sports into senior high school physical education to enhance learners' physical, motor, and psychosocial development.

Keywords: Combative Sports Training, Physical Fitness, Motor Skills, Confidence, Discipline, Senior High School Learners, Quasi-Experimental Study

1. Introduction

Physical activity during adolescence is not a peripheral concern but a central educational and public health issue. The World Health Organization (WHO) states that physical inactivity is a major risk factor for noncommunicable diseases. It reports that 81% of adolescents aged 11–17 years worldwide do not meet the recommended activity levels. In the Philippine setting, this concern directly intersects with the purpose of school physical education. The K to 12 Physical Education Curriculum Guide identifies fitness and movement education as the core of PE and explicitly states that the curriculum seeks to develop the competence, confidence, and commitment needed for an active life. These policies and health perspectives converge on a single implication: secondary schools need movement programs that are not only participatory but also sufficiently structured, challenging, and developmentally meaningful to produce measurable gains in learners' physical and motor capacities.

This need is especially relevant in Senior High School, where physical education must respond to learners who are undergoing rapid physical, psychological, and social change while also facing intensifying academic demands. The strengthened Senior High School curriculum

for Physical Education 2 (Sports and Dance) emphasizes that Grade 11 and 12 learners should develop physical skills, coordination, and teamwork through sports-based experiences that promote personal well-being and community engagement. At the same time, the broader PE curriculum's logic of "move to learn" and "learn to move" underscores that school PE is not limited to participation alone; it is also expected to build movement competence and self-management. In this context, combative sports are pedagogically attractive because they combine repeated technical practice with high levels of attentional control, bodily coordination, and disciplined movement under changing conditions. Rather than offering undifferentiated activity, they provide an organized framework for developing health-related fitness and movement proficiency together.

Recent empirical work supports this view. In a 2025 longitudinal study, Saraiva et al. found that nine months of Judo and Muay Thai practice improved motor skills in children and adolescents, with gains observed in lateral jumps, platform transfer, and single-leg jump relative to controls. The authors concluded that combat sports practice was effective in improving the motor skills of young participants. Complementing this, Han and Ju's 2025 meta-analysis reported that Taekwondo interventions were effective in enhancing static and dynamic balance, reinforcing the idea that combat-based movement training can target precisely the types of outcomes that many school PE programs aim to develop but do not always measure rigorously. These findings are highly relevant to secondary education because balance, agility, coordination, and reaction time are not isolated athletic traits; they are core dimensions of motor competence that support both sports performance and functional movement in everyday life.

The potential value of combative sports extends beyond motor control to broader physical fitness outcomes. School-based karate research has shown that martial-arts-oriented programming can improve physical fitness in educational settings, including cardiorespiratory fitness and balance, and is feasible within PE lessons. This matters because one ongoing challenge in general physical education is that broad, low-specificity activity exposure does not always provide the repeated overload, coordinated movement demands, and progression needed to elicit robust adaptation. Combative sports, by contrast, typically require repeated bursts of effort, postural control, rapid directional change, flexibility, and technically regulated whole-body action. Such demands make them plausible vehicles for improving muscular strength, cardiovascular endurance, and flexibility—the very components examined in the present study. Thus, the educational question is no longer whether combative sports are merely recreational, but whether they can serve as a legitimate, evidence-based modality for strengthening health-related fitness within the school context.

A second reason the topic warrants focused inquiry is that combative sports may foster psychosocial outcomes highly relevant to adolescence. Moore, Dudley, and Woodcock's 2023 randomized controlled trial found that a school-based martial arts intervention significantly improved total self-efficacy, including academic, social, and emotional self-efficacy, among secondary school students. In parallel, the school-based karate trial led by Pinto-Escalona and colleagues reported improvement in conduct problems, suggesting that martial-arts-based programming may influence behavioral regulation as well as physical outcomes. Although confidence and discipline are conceptually distinct from self-efficacy and conduct, these findings are closely aligned with the broader claim that combative sports can shape how learners regulate effort, respond to challenge, and interpret mastery. This is especially important in Senior High School, where structured opportunities for self-control, perseverance, emotional regulation, and purposeful risk-taking may have developmental value beyond the gymnasium. Accordingly, examining confidence and discipline alongside fitness and motor proficiency is not an artificial expansion of the topic; it is consistent with the multidimensional educational promise of combative sports.

Despite this promising literature, important gaps remain. Much of the available evidence is drawn from children, specialized athletic samples, or interventions focused on only one or two

outcomes, such as balance or self-efficacy. Fewer studies examine an integrated school-based model that simultaneously evaluates health-related fitness, motor skills, and non-cognitive outcomes within a regular secondary-school context, and fewer still do so in the Philippine setting. This gap is precisely where the present study is positioned. The uploaded thesis shows that the investigation focuses on Dagupan City National High School during the first semester of School Year 2025–2026, examining whether a 12-week structured combative sports training program can improve muscular strength, cardiovascular endurance, flexibility, balance, agility, coordination, reaction time, confidence, and discipline among Senior High School learners, and whether fitness and motor-skill gains are significantly related. By addressing these outcomes together, the study contributes local, school-based evidence on whether combative sports can function not only as an engaging PE activity, but also as a purposeful intervention for adolescent physical, motor, and psychosocial development.

2. Method

2.1 Research Design

The study employed a purely quantitative quasi-experimental research design, specifically the one-group pretest–posttest design, to determine the impact of a structured combative sports training program on selected physical, motor, and psychological outcomes among Senior High School learners. This design was considered appropriate because it enabled the researcher to measure change within a single cohort by establishing baseline scores prior to the intervention and then comparing them with post-intervention scores after exposure to the training program over a fixed duration, identified in the thesis as approximately twelve weeks. In the pretest phase, baseline data were collected on muscular strength, cardiovascular endurance, flexibility, balance, agility, coordination, reaction time, confidence, and discipline. Following the intervention, the same instruments and tests were re-administered during the posttest phase to determine the magnitude and statistical significance of the change. The design also incorporated a correlational component by examining the relationship between posttest physical fitness scores and motor skills proficiency measures, thereby allowing the study not only to evaluate improvement over time but also to determine whether gains in physical capacity were associated with higher levels of specialized motor competence. Overall, the chosen design provided a rigorous, structured, and data-driven framework for isolating the educational effects of combative sports training within an authentic school setting.

2.2 Participants

The study was 300 purposively selected Senior High School learners from Dagupan City National High School, specifically students enrolled in Grades 11 and 12 during the first semester of School Year 2025–2026, who served as the sole intervention group in the quasi-experimental investigation. Their selection was guided by the study's methodological requirements, particularly the need for respondents who could safely and consistently participate in the structured twelve-week combative sports training program and complete both the pretest and posttest phases. Accordingly, inclusion criteria required that participants be officially enrolled senior high school learners, possess medical clearance for high-intensity physical activity, and submit both parental or guardian consent and their own assent to full participation throughout the intervention period. The use of purposive sampling was therefore appropriate because the study demanded not only numerical adequacy but also participant commitment, physical readiness, and ethical eligibility, all of which were necessary to preserve the integrity, safety, and continuity of the training-based research process. While this sampling strategy strengthened control over participation quality within a single institutional setting, the thesis also acknowledges that it necessarily limited the broader generalizability of the findings beyond similarly situated school populations.

2.3 Instrumentation

The study employed a multi-instrument quantitative assessment system designed to capture the physical, motor, and psychological effects of the structured combative sports training program among Senior High School learners. For the physical fitness components, the researcher used standardized and widely validated field tests, specifically the push-up test and, where applicable, a handgrip dynamometer for muscular strength; timed cardiorespiratory protocols such as the 3-minute step test or 1-mile run/walk test for cardiovascular endurance; and the sit-and-reach test for flexibility. For motor skills proficiency, the study employed specific time-based and performance-based instruments, including the T-Test for agility, static and dynamic balance protocols such as the Stork Stand Test, the Alternate Hand Wall Toss for coordination, and either an electronic reaction time meter or the ruler drop test for reaction time. To assess the non-cognitive dimensions of the intervention, particularly confidence and discipline, the study utilized a standardized self-report psychological inventory adapted from validated scales such as the Trait Self-Confidence Inventory and the Self-Control Scale; this instrument underwent pilot testing and expert validation to ensure reliability and suitability for Senior High School learners, and responses were gathered through a Likert-type scale and converted into quantitative mean scores for analysis. Collectively, these instruments provided an integrated, objective, and methodologically rigorous measurement framework capable of detecting pretest–posttest changes across the study's core outcome variables.

2.4 Data Analysis

The study employed a quantitative statistical analysis framework, using the Statistical Package for the Social Sciences (SPSS) as the primary software for processing and interpreting data from the pretest and posttest phases of the structured combative sports intervention. At the descriptive level, mean and standard deviation were computed to summarize the learners' scores across all outcome variables, specifically the physical fitness components (muscular strength, cardiovascular endurance, and flexibility), the motor skills proficiency measures (balance, agility, coordination, and reaction time), and the self-reported psychological indicators of confidence and discipline. To determine whether the intervention produced statistically significant changes over time, the study used a paired-samples t-test, which was appropriate because the same group of Senior High School learners was measured before and after exposure to the 12-week training program. In addition, to address the relationship between the two principal performance domains, the study employed the Pearson Product-Moment Correlation Coefficient (r) to examine the strength and direction of the linear association between the mean posttest physical fitness scores and the mean posttest motor skills proficiency scores. All inferential analyses were tested at the 0.05 level of significance, and the resulting statistical outputs served as the basis for hypothesis testing, interpretation of intervention effects, and formulation of the study's conclusions and action plan.

3 Results

The study demonstrated that the structured combative sports training program produced statistically significant improvements in all measured physical fitness components among Senior High School learners. In muscular strength, the mean score increased from 28.52 in the pre-test to 35.18 in the post-test ($t = 15.33$, $p < .001$), indicating a substantial gain in the learners' capacity to generate force after the intervention. Cardiovascular endurance likewise improved markedly, with the mean rising from 68.91 to 75.64 ($t = 12.87$, $p < .001$), while flexibility increased from 3.14 to 5.89 ($t = 11.02$, $p < .001$). These findings collectively show that the twelve-week training regimen was effective in enhancing health-related fitness, suggesting that the repetitive, high-intensity, and technically demanding nature of combative sports provided sufficient

physiological stimulus to produce measurable adaptations in strength, endurance, and range of motion.

A similarly strong pattern of improvement emerged in motor skills proficiency. The post-test mean for balance rose from 18.05 to 24.98 ($t = 18.99$, $p < .001$), indicating that learners became more capable of maintaining equilibrium during static and dynamic tasks. Agility improved as the time required to complete the test decreased from 12.55 seconds to 10.97 seconds ($t = -14.31$, $p < .001$), while coordination increased from 22.10 to 29.75 repetitions ($t = 16.50$, $p < .001$). In reaction time, the mean dropped from 350.11 milliseconds to 280.95 milliseconds ($t = -19.05$, $p < .001$), reflecting faster and more efficient sensorimotor response. These results indicate that combative sports training did not merely improve general physical condition; it also enhanced the learners' ability to execute complex movement tasks requiring speed, control, timing, and precision.

The study further established a strong, positive, and statistically significant relationship between physical fitness and motor skills proficiency. Correlational analysis yielded a Pearson r of 0.685 ($p < .001$), leading to rejection of the null hypothesis. This result indicates that learners who achieved higher post-test fitness scores also tended to demonstrate higher post-test motor skills proficiency. In substantive terms, the finding suggests that gains in muscular strength, endurance, and flexibility were closely associated with gains in balance, agility, coordination, and reaction time. The results therefore support the view that physical fitness and motor competence developed in a mutually reinforcing manner within the context of combative sports, rather than as separate or unrelated outcomes.

Beyond physical and motor variables, the study also revealed notable gains in the learners' psychological outcomes, particularly confidence and discipline. The mean confidence score increased from 3.51 in the pre-test to 4.29 in the post-test ($t = 18.01$, $p < .001$), while the mean discipline score rose from 3.88 to 4.55 ($t = 15.65$, $p < .001$). These findings indicate that the intervention fostered more than bodily development; it also strengthened the learners' self-belief, behavioral regulation, and persistence. The structured, rule-governed, and mastery-oriented environment of combative sports appears to have contributed to these improvements by requiring learners to demonstrate control, commitment, and resilience throughout the training process.

Taken together, the results present a clear and coherent pattern: combative sports training significantly improved physical fitness, motor skills proficiency, confidence, and discipline among Senior High School learners. The intervention was therefore effective not only as a physical conditioning program but also as a holistic developmental strategy that addressed physical, motor, and psychosocial dimensions of learner growth. Because all major indicators showed a statistically significant positive change, and because the relationship between fitness and motor competence was found to be strong and meaningful, the findings provided a solid empirical basis for the proposed action plan to integrate combative sports more deliberately into Senior High School physical education.

4. Discussion

The present study found that a 12-week structured combative sports program significantly improved muscular strength, cardiovascular endurance, and flexibility among Senior High School learners, with all three fitness indicators showing statistically significant pretest–posttest gains. This pattern is consistent with stronger external evidence. In a multi-country cluster-randomized controlled trial, Pinto-Escalona et al. reported that a school-based karate intervention improved cardiorespiratory fitness and balance, with a positive trend in flexibility, compared with regular physical education. Likewise, the current findings align with the literature synthesized in recent work on combat sports in youth, which suggests that martial-arts-based training provides sufficient movement intensity, postural demands, and repetition to stimulate meaningful physical

adaptation. On this basis, the present study's gains in strength, endurance, and flexibility are not isolated results; they align with broader evidence that structured combative sports can serve as a legitimate school-based fitness intervention.

The study also showed significant gains in balance, agility, coordination, and reaction time, indicating that combative sports training enhanced motor skills and health-related fitness. This is strongly corroborated by Han and Ju's 2025 meta-analysis and systematic review, which found that Taekwondo interventions significantly improved both static and dynamic balance, and by Saraiva et al.'s 2025 intervention study, which concluded that nine months of Judo and Muay Thai practice improved several youth motor-skill outcomes relative to controls. These external findings help explain the present thesis results: combative sports repeatedly require learners to stabilize the body, shift weight quickly, coordinate upper and lower limbs, and respond to moving stimuli under time pressure. In school-based terms, that means such training offers a more specific and demanding motor-learning environment than many general PE activities, which helps clarify why the observed posttest gains in balance and reaction time were especially strong.

Another important result of the study was the strong positive correlation between posttest physical fitness and posttest motor skills proficiency ($r = 0.685$, $p < .001$), suggesting that the two outcome domains developed in an interdependent way rather than as separate effects. Although this exact relationship has not been established in precisely the same intervention format, broader school-based evidence points in the same direction. Batez et al. found that motor competence and physical fitness were positively associated in school-aged children, supporting the idea that fitter learners often perform better on coordinated movement tasks and that movement proficiency and physical capacity reinforce one another over time. Read in that light, the current study's correlation is plausible and educationally meaningful: as learners became stronger, more enduring, and more flexible, they also appeared better able to execute balance-, agility-, and coordination-based tasks efficiently. This supports the study's argument that combative sports are especially useful because they integrate conditioning and skill execution rather than treating them as disconnected strands of instruction.

The present study further reported significant increases in confidence and discipline after the intervention. These psychosocial findings are also consistent with recent literature, although the alignment is closer conceptually than instrument-for-instrument. In a randomized controlled trial involving 283 secondary school students, Moore et al. found that a martial-arts-based intervention improved self-efficacy, and those gains were sustained at follow-up. Similarly, Koroğlu et al. reported that a 6-week judo training program improved psychological resilience and one dimension of self-control in a randomized controlled design. While self-efficacy and self-control are not identical to the thesis measures of confidence and discipline, they are clearly related constructs. That makes the current findings credible: the rule-governed, mastery-oriented, and feedback-rich environment of combative sports can reasonably strengthen learners' beliefs in their capability while also reinforcing persistence, behavioral control, and respect for structured routines.

At the same time, the discussion should remain methodologically careful. The thesis itself acknowledges that the study used a one-group pretest–posttest design without a control group, which limits the ability to attribute all observed gains exclusively to the intervention because maturation, outside activity, sleep, or other contextual factors may also have contributed. For that reason, the most defensible interpretation is not that combative sports alone caused every improvement, but that the observed changes are consistent with what stronger external studies and recent syntheses have found. In other words, the present study adds useful local evidence from Dagupan City National High School, and its results are more persuasive because they align with randomized trials, intervention studies, and meta-analytic work on karate, judo, Muay Thai, and Taekwondo.

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FAITH, GRACE, AND MOTION: ANALYZING THE MOVEMENTS OF KARAKOL DANCE IN CAVITE

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Abstract

Indigenous dances in Cavite continue to serve as living expressions of faith, cultural identity, and communal memory, yet many remain insufficiently documented for systematic preservation and instruction. This study investigated the process of analyzing the movements and developing enhanced dance literature for the Karakol dance in Cavite. Specifically, it determined the dancers' level of proficiency in executing choreographed movements, the frequency of community participation and engagement in documentation and preservation, the perceived level of cultural identity and pride, the duration of involvement in terms of hours of practice and sessions attended, and the respondents' knowledge of the historical and cultural significance of the dance. The study employed a quantitative descriptive-correlational research design involving sixty dancers, cultural practitioners, and community members who participated in Karakol-related workshops, rehearsals, performances, and documentation activities. Data were gathered through a structured survey questionnaire and dance proficiency evaluation rubric, then analyzed using descriptive statistical measures. Findings revealed that respondents demonstrated high proficiency in performing the dance, frequent participation in documentation and preservation activities, high cultural identity and pride, moderate to high duration of involvement, and high knowledge of the dance's historical and cultural significance. These results indicated that sustained community participation contributed to the effective transmission of movement knowledge and strengthened appreciation of heritage. Based on the findings, the study proposed an enhanced Karakol dance literature comprising movement descriptions, choreographic structures, cultural annotations, historical background, and instructional guides. The study concluded that systematic documentation can support the preservation, promotion, and intergenerational transmission of the Karakol dance.

Keywords: Karakol Dance, Dance Literature, Cultural Preservation, Community Participation, Cultural Identity, Indigenous Dance

1. Introduction

In many Philippine communities, indigenous and devotional dances remain living cultural archives through which faith, collective memory, identity, and local history are transmitted across generations. As intangible cultural heritage, dance is preserved not only through objects or written records but through repeated performance, communal participation, embodied knowledge, and intergenerational transmission. The Convention for the Safeguarding of the Intangible Cultural Heritage defines intangible heritage as practices, expressions, knowledge, and skills that communities recognize as part of their cultural heritage and that provide a sense of identity and continuity (UNESCO, 2003). In the Philippine context, Republic Act No. 10066, or the National Cultural Heritage Act of 2009, affirms the State's responsibility to protect, conserve, develop, promote, and popularize the nation's cultural heritage and artistic creations (Republic Act No. 10066, 2010). These mandates underscore the need for community-based studies that do not merely describe traditional practices but also develop systematic means to document, teach, and sustain them.

Among the culturally significant ritual dances in Cavite, Karakol occupies an important place as a communal expression of devotion and celebration. Recent scholarship describes Karakol as a ritual dance performed in Cavite during the feast of a patron saint, or “Poon,” usually during chapel- or parish-based celebrations (Dioso & Demeterio, 2025). The dance brings together religious faith, procession, music, bodily movement, and community gathering, making it more than a performative event. It functions as a social and spiritual practice through which participants enact gratitude, belonging, and continuity. However, Dioso and Demeterio (2025) observed that Karakol has undergone changes in music, steps, and performance style, producing differing responses between those who favor traditional forms and those who view innovation as a way to encourage youth participation. This tension between preservation and adaptation underscores the need to document the dance without reducing it into a rigid or lifeless artifact.

Documentation is increasingly recognized as a critical process for safeguarding dance traditions, because movement is temporal, embodied, and vulnerable to alteration when transmitted solely through memory and imitation. Digital cameras, audiovisual archives, motion capture, and computational media have changed how dance can be recorded, analyzed, and transmitted, making embodied practices more accessible as cultural and pedagogical resources (Ravetto-Biagioli, 2021). In dance research and education, transcription and notation also support the identification of movement patterns, sequences, rhythm, posture, and performance structure. Multimedia-based transcription studies of classical dance demonstrate that formal documentation can assist preservation, tutoring, annotation, and later reconstruction of movement systems (Mallick et al., 2020). Although such technological approaches may not always be available in community settings, the principle remains relevant: dance preservation requires systematic, accurate, and culturally sensitive recording of movement and meaning.

The challenge, however, is that cultural documentation is never a purely technical activity. It involves questions of ownership, authority, authenticity, and community participation. UNESCO (2003) emphasizes the widest possible participation of communities, groups, and individuals in the creation, maintenance, and transmission of intangible cultural heritage. Philippine heritage scholarship likewise shows that community participation can strengthen safeguarding efforts, but it must be handled carefully because heritage work may involve competing claims, memories, and interpretations (Gonzalez, 2017). For Karakol, this means that the process of developing dance literature should not be limited to an outsider’s written description of steps. It should consider the experiences of dancers, cultural practitioners, and community members who participate in rehearsals, workshops, performances, and documentation activities. Their involvement provides the empirical and cultural basis for determining how the dance is learned, practiced, understood, and valued.

Despite growing interest in intangible cultural heritage, several gaps remain in documenting local dance traditions. Many studies emphasize historical description, festival performance, or cultural interpretation, while fewer examine how participation, practice duration, proficiency, cultural knowledge, and identity formation may be measured together. In the case of Karakol, the existing literature confirms its ritual and communal significance, but there remains a need for studies that translate movement practice into usable dance literature while also examining the cultural outcomes of participation. This gap is important because preservation is not achieved solely by recording steps; it also depends on whether dancers understand the dance’s historical and cultural significance, whether they develop pride in the tradition, and whether community engagement is strong enough to sustain transmission.

Accordingly, the present study investigated the process of analyzing the movements of the Karakol dance in Cavite as a basis for developing enhanced dance literature. Specifically, it examined the dancers’ level of proficiency in executing choreographed movements, the frequency of community participation and engagement in documentation and preservation, the perceived level of cultural identity and pride among respondents, the duration of involvement in terms of

hours of practice and number of sessions attended, and the respondents' knowledge of the historical and cultural significance of the dance. By linking movement analysis with community participation and cultural outcomes, the study positioned Karakol documentation as both a technical and socio-cultural undertaking. The intended output may serve as a structured reference for educators, dancers, cultural workers, and local institutions seeking to preserve Karakol while respecting its living, communal, and devotional character. Through empirical assessment and culturally grounded documentation, the study aims to support the continued transmission of Karakol as a living tradition of Cavite.

2. Method

2.1 Research Design

The study employed a quantitative descriptive-correlational research design to examine the movement analysis and development of enhanced dance literature for the Karakol dance in Cavite. This design was considered appropriate because the study sought to describe measurable characteristics of the respondents, including their level of dance proficiency, frequency of community participation and engagement, duration of involvement, perceived cultural identity and pride, and knowledge of the historical and cultural significance of the dance. The descriptive component enabled the researcher to determine the prevailing levels of these variables through numerical summaries such as means, frequencies, and descriptive interpretations. Meanwhile, the correlational component provided a framework for examining the degree of association among participation, duration of involvement, and dance proficiency without manipulating the study environment or introducing experimental treatment. The study was also cross-sectional, as data were collected from respondents at a single point in time, allowing the researcher to capture existing patterns of engagement, performance, and cultural awareness within the Karakol dance community. Through this design, the study generated empirical evidence that served as the basis for proposing enhanced dance literature intended to support the documentation, preservation, and continued transmission of the Karakol dance as a culturally significant community practice.

2.2 Participants

The study consisted of 60 individuals actively involved in Karakol dance activities in selected communities in Cavite. They included dancers, cultural practitioners, and community members who participated directly in workshops, rehearsals, performances, and documentation or preservation-related activities. The selection of participants was guided by their actual engagement in the cultural practice to ensure that the data reflected informed experiences and authentic involvement in the transmission and preservation of the dance. To qualify for inclusion, participants had to be at least 18 years old, have attended at least 3 Karakol practice sessions, and have voluntarily consented to participate in the study. Individuals who only observed performances, were below the required age, or failed to complete the research instruments were excluded from the final data set. This participant profile was appropriate for the study because the investigation required respondents who could provide reliable information on dance proficiency, frequency of participation, duration of involvement, cultural identity and pride, and knowledge of the historical and cultural significance of the Karakol dance. Through this purposive selection of culturally engaged respondents, the study generated context-specific, relevant data aligned with the objective of developing enhanced dance literature for preservation and instructional use.

2.3 Instrumentation

The study employed structured, researcher-developed quantitative instruments to generate measurable data aligned with the investigation's objectives. A dance proficiency

evaluation rubric was used to assess respondents' execution of the choreographed movements of the Karakol dance, including accuracy, rhythmic timing, coordination, spatial awareness, posture, and overall performance quality. Each criterion was rated on a numerical scale to compute individual and group proficiency scores. In addition, a structured survey questionnaire was administered to collect data on community participation and engagement in documentation and preservation activities; the duration of involvement, in terms of hours of practice and number of sessions attended; knowledge of the historical and cultural significance of the Karakol dance; and perceived cultural identity and pride. The questionnaire utilized closed-ended items and Likert-scale statements to ensure uniformity of responses and suitability for statistical treatment. Prior to data collection, the instruments underwent content validation by experts in dance education, cultural studies, and quantitative research to establish clarity, relevance, and contextual appropriateness. Through these instruments, the study obtained systematic, comparable, and analyzable data necessary for developing an enhanced dance literature for the preservation and instructional transmission of the Karakol dance.

2.4 Data Analysis

The quantitative data were analyzed using descriptive and correlational statistical procedures consistent with the study's objectives. Descriptive statistics, including frequency, percentage, weighted mean, and grand mean, were used to summarize the respondents' level of dance proficiency, frequency of community participation and engagement, duration of involvement, perceived cultural identity and pride, and knowledge of the historical and cultural significance of the Karakol dance. The computed means were interpreted using a five-point scale to determine the descriptive level of each variable. For the correlational component, appropriate inferential statistics were used to examine whether significant relationships existed among community participation, duration of involvement, and dance proficiency, with a significance level of 0.05. This analytical approach enabled the study to present both the prevailing conditions of Karakol dance participation and the statistical associations among the variables under investigation. The analysis results served as the empirical basis for developing an enhanced dance literature intended to support the documentation, preservation, and instructional transmission of the Karakol dance in Cavite.

3 Results

The results showed that the respondents demonstrated a generally high level of proficiency in executing the choreographed movements of the Karakol dance. The grand mean of 4.20 indicated that the dancers performed the required movements with notable accuracy, timing, coordination, spatial awareness, and overall execution. Among the indicators, coordination had the highest mean, suggesting that the respondents had developed sufficient bodily control and movement synchronization through repeated rehearsals and performances. This finding implies that the Karakol dance had been effectively transmitted within the community through practice-based learning, observation, and collective performance.

Regarding community participation and engagement, the respondents frequently participated in activities related to documentation and preservation, as reflected in the grand mean of 4.05. Preservation activities had a slightly higher mean than documentation activities, indicating that the community was more actively engaged in sustaining the dance through performance, participation, and practice continuity than in formal recording or written documentation. This result suggests that while the Karakol tradition remains active in the community, there is still a need to strengthen systematic documentation efforts to ensure that movement patterns, cultural meanings, and performance practices are preserved in a more organized and accessible form.

The respondents also reported a high perceived level of cultural identity and pride after participating in the documentation and performance of the Karakol dance, with a grand mean of

4.31. The highest mean was observed in pride in the local dance tradition, indicating that participation in Karakol strengthened the respondents' sense of cultural belonging and appreciation of their community heritage. This result suggests that the dance functioned not only as a performative activity but also as a meaningful cultural experience that reinforced identity, emotional attachment, and motivation to preserve local traditions. The findings further indicate that community-based dance practices can serve as effective vehicles for cultural affirmation and intergenerational transmission.

Regarding the duration of involvement, the respondents showed a moderate to high level of engagement, with a grand mean of 3.96. The number of sessions attended had a higher mean than the hours of practice, suggesting that participation was sustained through repeated attendance at formal rehearsals, workshops, or community activities. This finding implies that consistent participation may have contributed to the respondents' proficiency and cultural awareness. Regular exposure to the dance enabled participants to internalize movement sequences, understand performance expectations, and become familiar with the cultural context of Karakol.

Finally, the respondents demonstrated a high level of knowledge of the historical and cultural significance of the Karakol dance, with a grand mean of 4.22. Understanding of cultural meaning obtained the highest mean, indicating that the respondents were aware not only of the movement structure but also of the values, traditions, and meanings associated with the dance. Taken together, the findings provided a strong empirical basis for proposing an enhanced Karakol dance literature composed of movement documentation, choreographic structure, cultural annotations, historical background, and instructional guides. These components may support the preservation, teaching, and continued promotion of Karakol as a living cultural and devotional practice in Cavite.

4. Discussion

The study's results affirm that the Karakol dance in Cavite remains a viable cultural practice sustained through embodied learning, communal participation, and repeated performance. The high level of dance proficiency among the respondents suggests that movement knowledge was effectively transmitted through practice-based engagement, observation, and collective rehearsal. This finding is consistent with the view that dance is a multimedia and embodied form of knowledge that unfolds through time, space, rhythm, and bodily execution; thus, its analysis requires attention to posture, sequence, movement structure, and performance context (Mallick et al., 2019). In the present study, the respondents' ability to execute the choreographed movements with accuracy, timing, coordination, spatial awareness, and overall quality indicates that Karakol has not only been retained as a ritual performance but has also remained teachable within the community. Such proficiency provides a strong foundation for the development of enhanced dance literature, as accurate movement documentation must be anchored in dancers who can consistently perform and demonstrate the choreographic patterns of the tradition.

The respondents' frequent participation in documentation and preservation activities further underscores the significance of community engagement in sustaining intangible cultural heritage. UNESCO (2003) emphasizes that intangible cultural heritage includes practices, representations, expressions, knowledge, and skills that communities recognize as part of their heritage and transmit from generation to generation. The same convention highlights the widest possible participation of communities, groups, and individuals who create, maintain, and transmit such heritage. In this regard, the study's finding that respondents frequently participated in Karakol-related activities indicates that preservation was not limited to institutional action but was actively carried by the community itself. This corroborates the principle that living heritage is best

safeguarded when cultural bearers are not passive subjects of documentation but active participants in identifying, transmitting, and managing their cultural expressions.

The high perceived level of cultural identity and pride among respondents is likewise supported by existing heritage frameworks. The UNESCO Convention explains that intangible cultural heritage provides communities with a sense of identity and continuity while promoting respect for cultural diversity and human creativity (UNESCO, 2003). Similarly, Republic Act No. 10066, or the National Cultural Heritage Act of 2009, affirms the mandate to protect, conserve, develop, promote, and popularize the nation's cultural heritage and resources (Republic Act No. 10066, 2010). Within this policy and cultural context, the respondents' strong sense of belonging, pride, appreciation, and motivation to preserve Karakol reflects the affective value of participation in traditional dance. The finding suggests that Karakol functions not merely as a performance activity but as a cultural mechanism through which community members affirm identity, religious devotion, local belonging, and continuity with past generations.

The moderate-to-high duration of involvement, measured in terms of hours of practice and the number of sessions attended, also helps explain the respondents' high level of proficiency and cultural knowledge. Sustained exposure to rehearsals, workshops, and performances allows participants to internalize not only the physical sequence of the dance but also its symbolic and historical meanings. This is particularly relevant to Karakol because recent scholarship describes it as a ritual dance performed in Cavite during the feast of a patron saint or "Poon," while also noting that the tradition has experienced changes in music, steps, and performance style (Dioso & Demeterio, 2025). The present findings, therefore, suggest that continuous involvement can help balance preservation and adaptation: participants become familiar with traditional movement forms while also understanding how the dance may continue to evolve in response to contemporary community life.

Finally, the high level of knowledge of Karakol's historical and cultural significance strengthens the justification for developing enhanced dance literature as the major output of the study. Dance documentation is important because movement traditions are vulnerable to loss, distortion, or fragmentation when transmitted only through memory and informal imitation. Studies on dance automation and movement analysis show that documentation, notation, sequence recognition, and digital representation can support heritage preservation, e-learning, tutoring, and the reconstruction of movement systems (Joshi & Jadhav, 2019; Mallick et al., 2019). Although the present study is community-based rather than technology-driven, its findings point to the same implication: Karakol should be documented through movement descriptions, choreographic structure, cultural annotations, historical background, and instructional guides. Such enhanced dance literature may serve as a culturally grounded and pedagogically useful resource for dancers, educators, cultural workers, and local institutions seeking to preserve Karakol as a living devotional and communal tradition.

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THE BENEFITS OF OUTDOOR PHYSICAL ACTIVITY ON STRESS REDUCTION AND WELL-BEING

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Abstract

Stress has become a common concern in modern life, making accessible and sustainable activities for improving well-being increasingly important. This study examined the benefits of outdoor physical activity for stress reduction and well-being among individuals who regularly engage in outdoor activities. Specifically, it examined the perceived benefits of outdoor physical activity for stress reduction, assessed its effects on participants' well-being, identified challenges to regular participation, and proposed innovative strategies to improve engagement and outcomes. The study employed a quantitative descriptive-correlational research design involving 300 respondents selected through purposive sampling. Participants included individuals who had engaged in outdoor physical activities such as walking, running, cycling, hiking, or outdoor fitness programs for at least three months. Data were gathered using a structured survey questionnaire that measured perceived benefits, well-being effects, challenges, and suggested strategies. Findings revealed that respondents perceived outdoor physical activity as highly beneficial, particularly in physiological, social, emotional, and psychological dimensions. The effects on well-being were also highly evident, with physiological and social benefits receiving the highest ratings. Outdoor physical activity contributed to improved fitness, emotional relief, stress management, mindfulness, social connection, and overall quality of life. However, respondents also encountered moderate challenges, including physical strain, limited access to outdoor spaces, unfavorable weather, limited time, and safety concerns. The study concluded that outdoor physical activity is an effective way to reduce stress and enhance well-being. It recommended community-based programs, improved green spaces, outdoor wellness initiatives, and inclusive strategies to encourage sustained participation.

Keywords: Outdoor Physical Activity, Stress Reduction, Well-Being, Green Exercise, Physical Health, Mental Health

1. Introduction

Stress has become a persistent concern in contemporary life as individuals increasingly face pressures associated with work, school, family obligations, financial responsibilities, digital connectivity, and changing social environments. When stress is prolonged or poorly managed, it may affect physical health, emotional regulation, cognitive functioning, productivity, and overall life satisfaction. In this context, the search for accessible, low-cost, and sustainable strategies for stress reduction has become an important public health and wellness priority. Outdoor physical activity has emerged as a promising approach because it combines the established benefits of bodily movement with the restorative qualities of natural environments.

Physical activity is widely recognized as a contributor to physical and mental health. The World Health Organization (2024) states that regular physical activity provides significant physical and mental health benefits, including the prevention and management of noncommunicable diseases, the reduction of symptoms of depression and anxiety, the enhancement of brain health, and the improvement of overall well-being. Outdoor physical activity extends these benefits by placing movement within open-air or natural settings, such as parks, trails, gardens, beaches, sports grounds, and community spaces. Activities such as walking, running, cycling, hiking,

outdoor yoga, and group fitness sessions may therefore support both physiological functioning and psychological recovery.

The distinct value of outdoor physical activity lies in its integration of exercise, environmental exposure, and sensory experience. Natural environments may offer visual, auditory, and spatial qualities that help reduce mental fatigue and promote relaxation. Attention Restoration Theory explains that natural settings can support cognitive recovery by providing “soft fascination,” or effortless attention, which allows directed attention to rest and recover (Ohly et al., 2016). This is particularly relevant for individuals exposed to sustained mental demands from academic, occupational, or domestic responsibilities. When outdoor exposure is combined with movement, the body and mind may experience simultaneous benefits through improved circulation, endorphin release, emotional regulation, and cognitive restoration.

Research on nature-based walking and green exercise supports the mental health benefits of outdoor activity. Ma et al. (2024), in a systematic review of nature-based walking interventions, reported that such interventions improved mood, optimism, mental well-being, and nature connectedness, while reducing stress, anxiety, and negative rumination. These findings suggest that outdoor physical activity may be especially beneficial for stress reduction because it engages both behavioral and environmental mechanisms. The activity component supports physical fitness and stress regulation, while the outdoor setting may enhance calmness, mindfulness, and emotional relief. In this way, outdoor physical activity functions as a holistic intervention rather than a purely fitness-oriented practice.

Outdoor activity may also support well-being through social interaction and community participation. Activities such as group walking, cycling clubs, outdoor exercise classes, hiking groups, and community wellness events provide opportunities for companionship, belonging, and shared motivation. Social connection is an important dimension of well-being because supportive relationships can help reduce feelings of isolation and improve emotional resilience. Outdoor physical activities also encourage routine formation, exposure to sunlight, and engagement with community spaces, all of which may contribute to improved mood, self-confidence, and quality of life. For individuals who experience stress from indoor confinement, sedentary habits, or excessive screen time, outdoor activity may be a practical way to reconnect with the body, the environment, and others.

Despite these benefits, participation in outdoor physical activity is not always easy or consistent. Individuals may encounter physical strain, time constraints, limited access to safe and suitable outdoor spaces, unfavorable weather conditions, transportation concerns, safety risks, and a lack of motivation. These challenges can reduce participation even among individuals who recognize the value of outdoor exercise. In urban or resource-limited communities, limited green spaces and poorly maintained recreational areas may further discourage regular outdoor activity. Therefore, research on outdoor physical activity should not only describe its benefits but also identify barriers and propose strategies that make participation more accessible, inclusive, safe, and sustainable.

In the Philippine context, outdoor physical activity is relevant to schools, workplaces, communities, local governments, and families because it can be incorporated into wellness programs, recreational initiatives, community events, and daily routines. Schools may use outdoor activities to support students' mental health and physical fitness; workplaces may develop nature-based wellness programs to reduce burnout; local governments may improve parks, trails, and open spaces; and families may use outdoor activities to strengthen health and relationships. However, localized evidence is needed to understand how participants perceive the benefits of outdoor physical activity, how these activities affect their well-being, and the challenges they face in maintaining regular participation.

Accordingly, the present study determined the benefits of outdoor physical activity on stress reduction and well-being. Specifically, it examined the perceived benefits of outdoor

physical activity on stress reduction, determined the effects of outdoor activity on participants' well-being, tested whether significant differences existed between perceived stress-reduction benefits and well-being effects, identified challenges faced by participants in regular outdoor physical activity, and proposed innovative strategies to address these challenges and improve well-being. Using a quantitative, descriptive-correlational approach, the study aimed to generate empirical evidence on the psychological, physiological, emotional, and social dimensions of outdoor physical activity. The findings may guide public health officials, educational institutions, workplaces, community organizations, fitness professionals, families, and individuals in promoting outdoor activity as a practical strategy for stress management and holistic well-being.

2. Method

2.1 Research Design

The study employed a quantitative descriptive-correlational research design to determine the benefits of outdoor physical activity on stress reduction and well-being. The descriptive component was used to assess respondents' perceived benefits of outdoor physical activity across psychological, physiological, emotional, and social dimensions, as well as the effects of these activities on overall well-being and the challenges encountered in regular participation. The correlational component provided a framework for examining the relationship between outdoor physical activity, stress reduction, and well-being outcomes, while also allowing the study to determine whether significant differences existed between perceived stress-reduction benefits and well-being effects. A cross-sectional approach was used because data were collected from respondents at a single point in time via a structured questionnaire. This design was appropriate because the study sought to generate numerical evidence from individuals who regularly engaged in outdoor physical activities and to describe how such activities contributed to stress management, emotional relief, physical health, social connection, and overall life satisfaction. Through this design, the study provided empirical support for the development of innovative strategies to strengthen participation in outdoor physical activity and enhance well-being.

2.2 Participants

The study was conducted with 300 respondents who regularly engaged in outdoor physical activities such as walking, running, cycling, hiking, or participating in outdoor fitness programs. They were selected through purposive sampling to ensure that all respondents had relevant experience in outdoor activity and could provide meaningful responses regarding stress reduction, well-being, and challenges encountered. To qualify for inclusion, participants must have engaged in outdoor physical activity for at least three months prior to data collection. The respondents were drawn from parks, fitness centers, recreational groups, community organizations, and outdoor activity settings where physical activities were commonly practiced or promoted. The sample included individuals from diverse demographic backgrounds in terms of age, gender, and activity preferences, enabling the study to gain a broader understanding of the perceived psychological, physiological, emotional, and social benefits of outdoor physical activity. This participant profile was appropriate because the study required respondents with direct, sustained exposure to outdoor physical activity and the ability to evaluate its influence on stress management, well-being, and quality of life.

2.3 Instrumentation

The study used a structured survey questionnaire as the primary instrument to collect quantitative data on outdoor physical activity, stress reduction, well-being, and participation challenges. The questionnaire was organized into several sections aligned with the study's objectives. The first section gathered demographic information, including age, gender, frequency

of outdoor physical activity, and type of activity most frequently performed. The second section measured the perceived benefits of outdoor physical activity on stress reduction across psychological, physiological, emotional, and social dimensions using Likert-scale statements. The third section assessed the effects of outdoor activity on well-being, focusing on emotional well-being, stress management, social connectedness, mindfulness, and physical health. The fourth section identified challenges participants faced, including physical strain, limited access to outdoor spaces, unfavorable weather conditions, limited time, and safety concerns. The final section gathered respondents' suggestions for innovative strategies to improve access, participation, and well-being outcomes. Prior to full administration, the questionnaire was pilot-tested with a small group of respondents to establish clarity, comprehensiveness, and appropriateness of the items. Through this instrument, the study generated systematic, measurable data to analyze the perceived benefits, effects, challenges, and possible improvements related to outdoor physical activity.

2.4 Data Analysis

The data gathered from the structured survey questionnaire were analyzed using quantitative statistical procedures aligned with the study's objectives. Descriptive statistics, including frequencies, percentages, means, and overall mean, were used to summarize respondents' demographic characteristics, perceived benefits of outdoor physical activity for stress reduction, effects on well-being, and challenges encountered in regular participation. The computed means were interpreted using the prescribed Likert-scale descriptors to determine the level of perceived psychological, physiological, emotional, and social benefits, as well as the extent of well-being outcomes and participation barriers. To examine whether significant differences existed between the perceived benefits of outdoor physical activity on stress reduction and its effects on well-being, appropriate inferential statistical procedures were applied at the 0.05 level of significance. The results were organized and presented in tabular form to ensure clarity and objectivity in reporting. Through this analytical approach, the study generated empirical evidence on how outdoor physical activity contributed to stress reduction and well-being, while also identifying challenges that served as the basis for proposing innovative strategies to improve participation and wellness outcomes.

3 Results

The results showed that respondents perceived outdoor physical activity as highly beneficial for reducing stress. Among the categories, physiological benefits had the highest mean score of 4.5, followed by social benefits (4.4), emotional benefits (4.3), and psychological benefits (4.2). The overall perceived benefit score was 4.1, indicating that respondents generally recognized outdoor physical activity as a meaningful strategy for managing stress. These findings suggest that activities such as walking, running, cycling, hiking, and outdoor fitness programs helped participants experience physical relaxation, improved fitness, emotional relief, and better social connections.

Regarding effects on well-being, the results indicated that outdoor physical activity had a strong positive influence on respondents' overall well-being. The physiological dimension had the highest mean of 4.6, followed by the social dimension at 4.5, the psychological dimension at 4.3, and the emotional dimension at 4.2. The overall well-being mean was 4.4, indicating that outdoor physical activity contributed positively to participants' physical health, emotional stability, social relationships, and stress management. This implies that regular outdoor activity not only reduces stress but also supports broader well-being outcomes.

The comparison of perceived benefits and well-being effects showed that ratings of well-being were slightly higher than those of stress-reduction benefits across most dimensions. The physiological category remained the strongest area in both perceived benefits and well-being

effects, suggesting that participants most strongly associated outdoor physical activity with improved physical health, fitness, energy, and body functioning. The social dimension also received consistently high ratings, indicating that outdoor activities provided opportunities for interaction, companionship, and support. These findings highlight the holistic value of outdoor physical activity, which addresses both individual health and social well-being.

The study also identified challenges participants faced in engaging in regular outdoor physical activity. The highest challenge score was observed in the physiological category, with a mean of 3.4, followed by social challenges (3.3), psychological challenges (3.2), emotional challenges (3.1), and an overall challenge mean of 3.0. These results indicate that, while participants experienced barriers such as physical strain, limited access to suitable outdoor spaces, unfavorable weather conditions, time constraints, and safety concerns, the level of challenge was moderate and manageable. The findings suggest that these obstacles did not outweigh the perceived benefits of outdoor activity.

Overall, the findings support the conclusion that outdoor physical activity plays an important role in reducing stress and enhancing well-being. Respondents reported high perceived benefits and strong well-being effects, particularly in the physiological and social dimensions. Although challenges were present, they were not severe enough to prevent the recognition of outdoor physical activity as a beneficial wellness practice. These results provide a basis for proposing innovative strategies, such as community-based outdoor programs, improved access to green spaces, organized group activities, safety measures, and flexible wellness initiatives, to encourage more consistent participation in outdoor physical activity.

4. Discussion

The study's findings confirm that respondents perceived outdoor physical activity as highly beneficial for stress reduction, particularly in the physiological, social, emotional, and psychological dimensions. The high physiological rating suggests that participants strongly associated outdoor activity with improved fitness, reduced physical tension, increased energy, and better body functioning. This finding is supported by the World Health Organization (2024), which emphasizes that regular physical activity provides significant physical and mental health benefits, including reduced anxiety and depression symptoms, improved brain health, and enhanced overall well-being. In the context of the present study, activities such as walking, running, cycling, hiking, and outdoor fitness programs appear to serve as accessible, practical strategies for stress management, as they combine physical movement with exposure to open-air environments.

The strong effect of outdoor physical activity on well-being further supports the idea that movement in outdoor environments contributes to holistic wellness. Respondents reported high well-being effects, particularly in physiological and social dimensions, indicating that outdoor activities improved not only physical health but also social connectedness. This result is consistent with Ma et al. (2024), who found that nature-based walking interventions improved mood, optimism, mental well-being, and nature connectedness while reducing stress, anxiety, and negative rumination. The present findings suggest that outdoor activity supports well-being through multiple pathways: the physical benefits of exercise, the restorative qualities of natural settings, and the emotional satisfaction derived from meaningful and enjoyable movement.

The emotional and psychological benefits reported by respondents may be explained by Attention Restoration Theory, which states that natural environments can help restore depleted cognitive resources and reduce mental fatigue. Ohly et al. (2016) explained that exposure to natural environments may support attention restoration by allowing individuals to experience effortless engagement with their surroundings. In the present study, respondents' positive ratings in psychological and emotional dimensions indicate that outdoor activity may provide mental refreshment, emotional relief, mindfulness, and a temporary break from daily pressures. This

supports the view that outdoor physical activity is not merely a fitness behavior but also a restorative experience that helps individuals recover from stress and improve emotional balance.

The findings also corroborate research on green exercise, which emphasizes the additional benefits of performing physical activity in natural environments. Barton and Pretty (2010) reported that green exercise improved self-esteem and mood, even with brief exposure. This aligns with the present study's finding that outdoor physical activity was associated with high stress-reduction and well-being ratings. The social dimension also emerged as an important benefit, suggesting that outdoor physical activity may strengthen interpersonal relationships, group participation, and a sense of community belonging. Activities such as group walks, cycling, outdoor fitness sessions, and recreational events may reduce isolation while improving motivation and emotional support.

Although the benefits were strongly perceived, the study also identified moderate challenges that may affect regular participation. These included physical strain, limited access to suitable outdoor spaces, unfavorable weather conditions, lack of time, and safety concerns. These challenges indicate that outdoor physical activity programs must be supported by practical and inclusive strategies. Community-based wellness programs, accessible parks and trails, safe outdoor facilities, organized group activities, flexible schedules, and public awareness campaigns may help reduce barriers and sustain participation. Overall, the findings suggest that outdoor physical activity is a valuable and accessible approach for stress reduction and well-being enhancement, but its benefits can be maximized only when communities, institutions, and policymakers address the barriers that limit regular engagement.

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PLANT-POWERED ATHLETES: A COMPARATIVE STUDY OF NUTRITIONAL INTAKE AND PHYSICAL OUTPUT PERFORMANCE

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Abstract

The increasing adoption of plant-based diets among competitive athletes has intensified interest in whether such dietary patterns can sustain high-level performance without compromising nutritional adequacy. This study compared the nutritional intake and physical performance of 300 competitive athletes in Metro Manila, divided equally into plant-powered and omnivorous groups. Using a comparative, quantitative, cross-sectional design, data were collected through 7-day food records, 24-hour dietary recalls, food frequency questionnaires, and standardized performance assessments of endurance, strength, and speed. Descriptive statistics, independent-samples t-tests, and Pearson correlation were applied at the 0.05 level of significance. Findings showed significant differences in dietary intake between groups. Plant-powered athletes consumed a higher proportion of carbohydrates, whereas omnivorous athletes consumed a higher proportion of protein and had markedly higher intakes of vitamin B12 and omega-3 fatty acids. Iron intake was slightly higher among plant-powered athletes. Despite these nutritional differences, no statistically significant differences were found in VO₂max, squat 1-repetition maximum ratio, or 100-meter sprint time, indicating comparable endurance, strength, and speed outcomes across dietary patterns. Correlation analysis further revealed that higher carbohydrate intake was positively associated with VO₂max, protein intake with strength, and omega-3 intake with time-to-exhaustion, while vitamin B12 showed a significant negative correlation with sprint time. The study concludes that a well-planned plant-based diet can support athletic performance comparable to that of an omnivorous diet, provided that key micronutrient gaps are addressed through careful dietary planning and appropriate supplementation.

Keywords: Plant-Powered Athletes, Nutritional Intake, Physical Output Performance, Endurance, Strength, Micronutrient Adequacy

1. Introduction

The rapid expansion of plant-based eating patterns has reshaped contemporary discussions in health, sustainability, and human performance. In recent years, vegetarian and vegan dietary patterns have moved beyond lifestyle preference and entered mainstream clinical and athletic discourse, prompting renewed interest in whether these diets can adequately sustain the physiological demands of competitive sport. Current professional guidance indicates that appropriately planned vegetarian dietary patterns can be nutritionally adequate for adults and may support long-term health; however, athletic populations represent a distinct nutritional context because training, recovery, and competition place unusually high demands on energy availability, protein turnover, glycogen restoration, and micronutrient sufficiency. As a result, the question is no longer whether plant-based diets are generally healthful, but whether they can consistently support high-level physical output under competitive conditions.

Athletes require a dietary pattern that does more than prevent deficiency; it must optimize adaptation to training, maintain lean tissue, and sustain repeated bouts of high-intensity effort. Protein intake is especially critical in this regard. The International Society of Sports Nutrition states that most exercising individuals need approximately 1.4 to 2.0 g of protein per kilogram of body weight per day to support training adaptations, recovery, and maintenance of fat-free mass.

Carbohydrate availability is equally central because it underpins muscle glycogen replenishment and supports prolonged or intense exercise. Thus, nutritional adequacy in athletes must be evaluated not only in terms of total intake, but also in terms of the quality, bioavailability, and performance relevance of specific nutrients across different dietary patterns.

Plant-based diets appear attractive in sport for several reasons. They are typically richer in complex carbohydrates, dietary fiber, polyphenols, and antioxidant-rich foods than conventional omnivorous diets, characteristics that may support glycogen stores, cardiometabolic health, and recovery from training stress. At the same time, the current evidence base does not support simplistic claims that vegan diets automatically enhance performance. A recent review of nutritional considerations for vegan athletes concluded that athletes can follow a vegan diet without an unavoidable detriment to performance. However, the available evidence does not show a consistent ergogenic advantage of vegan diets over omnivorous diets. This position suggests that dietary pattern alone is not the primary determinant of athletic success; rather, performance depends on whether the diet is carefully structured to meet sport-specific nutrient needs.

One of the most persistent criticisms of plant-based sports nutrition concerns protein quality. Compared with many animal-source proteins, single-source plant proteins often contain lower proportions of certain essential amino acids, particularly leucine, and may show lower digestibility. These characteristics have historically raised concern about whether plant-based athletes can support muscle protein synthesis, strength development, and recovery as effectively as omnivorous athletes. However, newer controlled evidence complicates this assumption. In a resistance-training trial comparing a high-protein plant-based diet with a protein-matched omnivorous diet, no significant between-group differences were found in strength or body composition outcomes when total protein intake was adequate. Such findings suggest that the practical issue is not whether protein comes from plants or animals per se, but whether total intake, amino acid composition, meal planning, and training context are sufficient to meet anabolic demands.

Micronutrient sufficiency remains the more delicate issue in plant-based athletic diets. Vitamin B12 is a particularly important concern because it is not naturally present in plant foods unless they are fortified, and recent reviews emphasize that oral supplementation is the safest strategy for maintaining adequate B12 status in plant-based populations. Iron is another critical nutrient because exercise increases iron demands, while the bioavailability of nonheme iron in vegetarian diets is lower than that of heme iron from mixed diets. The National Institutes of Health notes that vegetarians may need substantially more dietary iron than non-vegetarians due to these differences in iron absorption. Long-chain omega-3 fatty acids, especially DHA and EPA, also merit attention, although vegetarian-compatible algal oil supplements provide a viable source. For athletes, these micronutrients are not merely markers of general wellness; they are linked to oxygen transport, neuromuscular function, recovery, inflammation control, and overall training readiness.

Despite the growth of sports-nutrition literature, important gaps remain. Much of the available evidence has emphasized either endurance or resistance outcomes, often in small or highly controlled samples, and many studies do not simultaneously examine actual dietary intake alongside direct measures of athletic performance. This limitation matters because performance cannot be interpreted fully without understanding what athletes are actually consuming. A plant-based athlete with inadequate B12, iron, or total protein intake is nutritionally distinct from a plant-based athlete following a carefully planned, supplemented, high-protein regimen; similarly, an omnivorous athlete may consume animal products without necessarily achieving optimal sport nutrition. Comparative research that integrates macronutrient intake, key micronutrients, and objective performance metrics is, therefore, essential for generating practically useful conclusions rather than ideological ones.

The present study addresses this need by comparing the nutritional intake and physical output performance of plant-powered and omnivorous athletes in Metro Manila. Specifically, it examines dietary intake of macronutrients and selected micronutrients and relates these nutritional patterns to measurable indicators of endurance, strength, and speed. By doing so, the study extends the current debate from generalized claims about the superiority of vegans or omnivores toward a more evidence-based assessment of nutritional sufficiency and performance non-inferiority. It is particularly relevant in a setting where athletes, coaches, and sports dietitians require locally grounded evidence to guide dietary planning under real training conditions.

Ultimately, this inquiry is significant for both science and practice. Scientifically, it contributes to the growing body of literature evaluating whether dietary patterns predict performance independently of nutrient adequacy. In practice, it may help clarify whether plant-powered athletes can achieve comparable physical output to omnivorous athletes when dietary intake is appropriately managed, and identify the nutritional variables most strongly associated with performance. In this sense, the study does not frame plant-based and omnivorous diets as opposing ideologies, but rather as competing nutritional systems whose effectiveness depends on how well they meet the biological requirements for athletic performance.

2. Method

2.1 Research Design

This study employed a non-experimental, comparative quantitative research design to determine whether meaningful differences existed in nutritional intake and physical output performance between plant-powered athletes and omnivorous athletes. More specifically, the investigation adopted a cross-sectional approach because all dietary, anthropometric, and performance-related data were collected within a defined period rather than across multiple time points. This design was appropriate because the principal independent variable, namely dietary pattern, could not be manipulated or randomly assigned on ethical and practical grounds, given that participants had already been adhering to their respective diets for an extended period prior to recruitment. The comparative design enabled direct statistical examination of group differences in macronutrient and micronutrient intake, as well as in endurance, strength, and speed performance indicators. In this sense, the design was well-suited to the study's central purpose, which was not to establish causality in an experimental sense but to generate empirical evidence on whether dietary patterns were associated with measurable variation in athletic nutrition and performance outcomes under naturally occurring conditions.

2.2 Participants

The study participants were 300 competitive adult athletes from Metro Manila, composed of 150 plant-powered and 150 omnivorous athletes. They were selected through non-probability purposive sampling because the study required respondents who met highly specific inclusion criteria related to both training status and long-term dietary adherence. Eligible participants were between 18 and 40 years old, actively engaged in high-intensity training, and involved in competitive sports such as running, weightlifting, and team sports. To ensure stable dietary adaptation, participants in the plant-powered group were required to have consistently followed a strict vegan or plant-based diet for at least 1 year. In contrast, those in the omnivorous group were expected to have maintained a regular diet including animal products over the same period. Recruitment was facilitated through athletic clubs, university sports teams, and online athlete communities in Metro Manila, and each prospective participant underwent screening to verify compliance with the study criteria. The equal distribution of respondents across the two dietary groups strengthened the comparability of the dataset and improved the robustness of the inferential statistical procedures used in the investigation.

2.3 Instrumentation

The study utilized a multi-instrument quantitative protocol to capture both nutritional intake and physical output performance with sufficient rigor and comparability. Nutritional intake data were gathered through a structured 7-day food record, a 24-hour dietary recall, and a standardized food frequency questionnaire, all administered with the assistance of a registered dietitian to improve reporting accuracy and to verify long-term dietary patterns. These dietary records were subsequently encoded into a validated nutritional analysis software package to determine the mean daily intake of the major macronutrients. They selected key micronutrients, including vitamin B12, iron, and omega-3 fatty acids. For physical performance assessment, the study relied on calibrated and standardized testing equipment. Endurance was measured through VO2max and time-to-exhaustion procedures using laboratory-based metabolic testing equipment and a stationary bicycle; strength was assessed through 1-repetition maximum testing on major compound lifts using calibrated free weights; and speed was measured through standardized sprint trials using electronic timing gates on an athletic track. The use of these instruments ensured that both self-reported and performance-based variables were systematically captured and consistent with the study's comparative objectives.

2.4 Data Analysis

The collected data were processed and analyzed quantitatively using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, particularly means and standard deviations, were first employed to summarize the nutritional and performance profiles of the two dietary groups. To test whether statistically significant differences existed between plant-powered and omnivorous athletes in daily nutrient intake and physical performance scores, the study used an independent-samples t-test at the 0.05 level of significance. In portions of the methodology draft, analysis of variance was also indicated as part of the inferential framework for testing differences in means where appropriate. In addition, Pearson's Product-Moment Correlation was used to determine the magnitude and direction of the relationship between selected nutritional variables and performance outcomes, thereby allowing the study to examine whether higher or lower nutrient intake was associated with better endurance, strength, or speed metrics. Through this analytical structure, the study addressed both its comparative and relational research objectives in a statistically coherent manner.

3 Results

The analysis of nutritional intake revealed clear, statistically significant differences between plant-powered and omnivorous athletes. In terms of macronutrients, the plant-powered group derived a significantly greater proportion of energy from carbohydrates ($M = 62.1\%$, $SD = 4.5$) than the omnivorous group ($M = 54.0\%$, $SD = 5.1$), with a computed t-value of 7.15 and a p-value of $< .001$. By contrast, omnivorous athletes obtained a significantly higher percentage of energy from protein ($M = 22.3\%$, $SD = 2.8$) than plant-powered athletes ($M = 18.5\%$, $SD = 2.1$), $t = -5.89$, $p < .001$. Total caloric intake also differed significantly, with omnivorous athletes reporting higher daily energy intake ($M = 3120$ kcal, $SD = 350$) than plant-powered athletes ($M = 2950$ kcal, $SD = 310$), $t = -3.51$, $p < .001$. These findings indicate that the two dietary groups were nutritionally distinct, with the plant-powered pattern characterized by stronger carbohydrate emphasis and the omnivorous pattern by greater protein density. The thesis interprets this pattern as consistent with contemporary sports nutrition thinking, which holds that high carbohydrate availability supports endurance work, whereas protein distribution remains central to muscular adaptation.

Likewise, marked differences were observed in key micronutrients. Plant-powered athletes reported substantially lower vitamin B12 intake ($M = 1.1$ µg, $SD = 0.8$) than omnivorous athletes ($M = 3.5$ µg, $SD = 1.2$), with $t = -12.90$ and $p < .001$. A similarly pronounced gap appeared in omega-3 fatty acid intake, with plant-powered athletes consuming 45 mg ($SD = 35$) compared

with 210 mg (SD = 55) among omnivorous athletes, yielding $t = -9.44$ and $p < .001$. Interestingly, iron intake was slightly but significantly higher in the plant-powered group ($M = 17.8$ mg, $SD = 3.2$) than in the omnivorous group ($M = 15.5$ mg, $SD = 3.5$), with $t = 2.11$ and $p = .035$. The study discussed this result cautiously, noting that higher reported iron intake does not necessarily indicate better iron status, as plant-derived non-heme iron is generally less bioavailable than heme iron. Accordingly, the results suggest that plant-powered diets may successfully provide carbohydrate-rich fueling. However, they also require deliberate attention to micronutrients that are commonly limited in the absence of animal-source foods.

Despite these nutritional differences, the two groups demonstrated highly comparable physical output performance. Plant-powered athletes recorded a mean VO_{2max} of 58.1 mL/kg/min ($SD = 4.5$), while omnivorous athletes posted 57.5 mL/kg/min ($SD = 4.8$), with no significant difference between groups, $t = 0.98$, $p = .328$. Strength performance was likewise similar, as measured by squat 1-RM to body weight ratio, where the plant-powered group obtained a mean of 1.95 ($SD = 0.21$) and the omnivorous group 1.98 ($SD = 0.20$), with $t = -0.65$ and $p = .517$. Speed outcomes followed the same trend: the 100-meter sprint times of plant-powered athletes ($M = 11.85$ s, $SD = 0.40$) and omnivorous athletes ($M = 11.79$ s, $SD = 0.42$) did not differ significantly, $t(1) = -1.11$, $p = .267$. These findings led to the retention of the second null hypothesis and support the thesis's central conclusion that a well-managed plant-powered diet does not inherently compromise endurance, strength, or speed in competitive athletes.

The correlation analysis offered a more nuanced interpretation, showing that athletic performance was more strongly associated with specific nutrient variables than with the dietary label alone. Carbohydrate intake showed a significant positive correlation with VO_{2max} ($r = .285$, $p = .001$), indicating that greater carbohydrate availability was associated with greater aerobic capacity. Protein intake, in grams per kilogram of body weight, also correlated positively with the squat 1-RM ratio ($r = .352$, $p < .001$), reinforcing the importance of adequate protein provision for strength performance. In addition, omega-3 fatty acid intake was positively associated with time-to-exhaustion ($r = .211$, $p = .015$), while vitamin B12 intake showed a significant negative correlation with 100-meter sprint time ($r = -.188$, $p = .038$), suggesting that higher B12 intake was linked to faster sprint performance. The thesis interpreted these findings to mean that nutrient adequacy, rather than dietary identity, is the more decisive factor in optimizing athletic performance.

Taken together, the results demonstrate that plant-powered and omnivorous diets produce distinct nutritional profiles, yet these differences do not automatically translate into inferior or superior overall performance. Instead, the findings indicate that performance parity is achievable when athletes meet the physiological demands of training through appropriate nutrient planning. For plant-powered athletes, this implication is especially important: the diet can support competitive performance, but only when attention is given to protein sufficiency, strategic carbohydrate intake, and targeted micronutrient support, particularly for vitamin B12 and omega-3 fatty acids. Thus, the study advances an evidence-based position that athletic success is determined less by whether the diet is plant-based or omnivorous and more by whether it is nutritionally adequate, sport-specific, and consistently implemented.

4. Discussion

The present study's finding that plant-powered athletes consumed a higher proportion of carbohydrates but a lower proportion of protein than omnivorous athletes is well supported by current sports-nutrition literature. Contemporary reviews consistently describe vegetarian and vegan dietary patterns as richer in complex carbohydrates, fiber, and plant phytochemicals, while also requiring more deliberate attention to protein density, amino acid distribution, and total energy intake. Luna et al. (2024) concluded that well-planned vegetarian diets can meet athletic requirements, but only when macronutrient planning is intentional. Similarly, West et al. (2023)

emphasized that vegan athletes can perform without detriment, although spontaneous or poorly structured vegan diets may produce suboptimal intakes of protein and selected nutrients. The Academy of Nutrition and Dietetics likewise states that appropriately planned vegetarian and vegan patterns can be nutritionally adequate. However, they require individualized meal planning to reduce the risk of nutrient inadequacies (Raj et al., 2025). Thus, the nutritional profile observed in the present study is not anomalous; rather, it reflects a pattern already documented in the broader literature on plant-based sport nutrition.

The present study's significantly lower vitamin B12 and omega-3 intakes in the plant-powered group, together with slightly higher iron intake, also corroborate the current evidence base. Reviews focused on plant-based athletes identify vitamin B12, iron, calcium, vitamin D, zinc, and omega-3 fatty acids as nutrients most often requiring careful monitoring because their sources are limited in plant-based diets or their absorption is less efficient. Ayaz et al. (2024) and West et al. (2023) both stress that vitamin B12 and, in many cases, omega-3 fatty acids are difficult to obtain adequately from unsupplemented plant-based diets, while the lower bioavailability of non-heme iron complicates iron adequacy. Importantly, Nebl et al. (2019) found that recreational runners following vegetarian and vegan diets could maintain adequate vitamin B12, vitamin D, and iron status when supplementation and careful planning were used. This helps explain why the present study found higher reported iron intake in plant-powered athletes without assuming superior physiological iron status. In other words, the current study aligns with the literature, indicating that plant-based athletes may meet adequate intake targets. However, micronutrient sufficiency is more dependent on planning, fortification, and supplementation than in omnivorous diets.

The most important finding of the present study, however, is that there was no statistically significant difference between plant-powered and omnivorous athletes in endurance, strength, or speed. This result strongly agrees with existing comparative evidence. In a randomized crossover trial, Roberts et al. (2022) found no significant differences in running or strength outcomes between predominantly plant-based and omnivorous diets when protein intake remained within recommended ranges. Nebl et al. (2019) likewise reported no differences in exercise capacity among vegan, lacto-ovo-vegetarian, and omnivorous recreational runners. In resistance-focused contexts, Hevia-Larraín et al. (2021) showed that a high-protein plant-based diet supported comparable strength and muscle adaptations to a protein-matched omnivorous diet, and Monteyne et al. (2023) reached a similar conclusion for myofibrillar protein synthesis and hypertrophy during high-volume resistance training. More recently, López-Moreno et al. (2025) synthesized randomized trials and concluded that plant-based diets do not compromise upper-body, lower-body, or overall muscular strength compared with omnivorous diets. Taken together, these studies reinforce the interpretation that the absence of performance differences in the present investigation is consistent with the strongest available evidence: plant-based diets can support athletic performance when nutrient intake is sufficient.

The correlation results in the present study also align with established physiological principles, although they should be interpreted carefully. The positive association between carbohydrate intake and VO₂max is biologically plausible because carbohydrate remains the primary fuel for moderate-to-high-intensity exercise and supports glycogen availability during endurance work. The positive link between protein intake and strength likewise aligns with evidence showing that high-protein diets, especially above 1.6 g/kg/day, support resistance-training adaptation when paired with progressive overload. At the same time, the relationships between omega-3 intake and time-to-exhaustion, and between vitamin B12 intake and sprint time, should be discussed with nuance. Current reviews suggest that omega-3 fatty acids may help reduce post-exercise inflammation and muscle damage, but direct performance improvements remain inconsistent. Similarly, vitamin B12 is clearly relevant to red blood cell formation and nervous system function. However, athletic outcomes are better interpreted in relation to actual

biomarker status and supplementation practices than intake alone. Accordingly, the present study's correlations are best understood as physiologically credible associations that support careful nutrient management, rather than as proof that any single nutrient alone determines performance.

Overall, the present study is corroborated by the contemporary consensus in sports nutrition: dietary pattern matters, but nutrient adequacy matters more. The literature now consistently rejects the assumption that plant-powered athletes are inherently disadvantaged. Instead, it shows that performance comparability is achievable when energy intake, carbohydrate availability, protein quantity and quality, and high-risk micronutrients are appropriately managed. This makes the practical contribution of the present study especially valuable. It demonstrates, within a Metro Manila cohort, that plant-powered diets can support competitive endurance, strength, and speed outcomes, while also making clear that such diets require more structured nutritional planning than omnivorous diets. Therefore, the study contributes to an increasingly evidence-based view that athletic performance depends less on whether food is plant- or animal-derived and more on whether the diet is adequately designed to meet sport-specific physiological demands.

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IMPACT OF DIGITAL TOOLS INTEGRATION ON LEARNING OUTCOMES IN PHYSICAL EDUCATION

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Abstract

The growing integration of technology in education has transformed teaching and learning processes, including the delivery of Physical Education in contemporary schools. This study investigated the impact of digital tools integration on the learning outcomes of junior high school students in Physical Education. Specifically, it examined the effects of digital tool use on physical fitness, skill acquisition, and knowledge retention. It compared the outcomes of students exposed to digital-enhanced instruction with those taught through traditional methods. The study employed a quantitative quasi-experimental pre-test/post-test control-group design with an experimental and a control group. Standardized assessments were used to measure physical fitness through the FITNESSGRAM, skill acquisition through performance-based assessments, and knowledge retention through teacher-made pre- and post-tests. Findings revealed that students exposed to digital tools demonstrated significantly greater improvement across all measured outcomes than those who received traditional instruction. The experimental group obtained higher post-test mean scores in cardiovascular endurance ($M = 51.5$, $SD = 7.8$), muscular strength ($M = 42.3$, $SD = 6.5$), skill acquisition ($M = 82.7$, $SD = 7.3$), and knowledge retention ($M = 78.9$, $SD = 8.5$). Moreover, significant positive correlations were found between the frequency of digital tool usage and improvements in fitness ($r = 0.62$, $p < .001$), skill acquisition ($r = 0.55$, $p < .001$), and knowledge retention ($r = 0.48$, $p < .001$). The study concluded that integrating digital tools in Physical Education significantly enhances student learning outcomes and supports more engaging, data-driven, and effective instruction.

Keywords: Digital Tools, Physical Education, Learning Outcomes, Physical Fitness, Skill Acquisition, Knowledge Retention, Quasi-Experimental Study

1. Introduction

Physical education (PE) occupies a distinctive place in the school curriculum because it addresses learning through the body as well as through the mind. UNESCO defines quality physical education as a form of learning that develops rounded skills and supports physical, social, emotional, and psychosocial well-being. At the same time, the World Health Organization (WHO) maintains that children and adolescents need regular physical activity for significant health benefits. These two positions are important for contemporary schooling because they frame PE not as an auxiliary subject, but as a core educational space in which health, movement competence, self-regulation, and lifelong activity habits are cultivated. In the 21st century, however, PE is being reshaped by the same digital turn that has transformed other learning areas. The 2023 UNESCO Global Education Monitoring report notes that technology now affects education through multiple channels and that its educational value depends on how appropriately it is used within specific teaching contexts. In the Philippines, this shift is also reflected in policy: DepEd Order No. 016, s. 2023 states that the Department of Education Computerization Program aims to provide public schools and offices with appropriate, quality, and equitable technologies that enhance teaching and learning. These developments create a strong policy and pedagogical basis for examining how digital tools may improve learning outcomes in PE.

The promise of digital integration in PE is especially compelling because the subject depends heavily on feedback, movement observation, repetition, and active engagement. Unlike primarily text-based disciplines, PE requires students to see, perform, refine, and internalize motor actions in real time. A recent systematic review by Zhong et al. (2025) found that digital-intelligent technologies in PE have been used across the instructional cycle through adaptive learning platforms, virtual simulation tools, multimodal assessment systems, and health-behavior monitoring. The same review explains that these technologies can address long-standing constraints in traditional PE, including delayed feedback, time and space limitations, and restricted access to individualized guidance. Similarly, Martín-Rodríguez and Madrigal-Cerezo (2025), in a review of 151 studies, concluded that technology-enhanced pedagogy in PE is associated with stronger motivation, engagement, motor skill development, tactical understanding, and cognitive learning. Such findings suggest that digital tools are not merely decorative additions to PE classes; when instructionally aligned, they can serve as pedagogical mediators, making feedback more immediate, assessment more objective, and learning more personalized.

Evidence from recent intervention studies further strengthens this position. In *Computers & Education*, Hsia et al. (2025) reported that a gamified intelligent tutoring and instant-feedback system improved students' performance and learning engagement in yoga compared with a conventional digital system, showing that the design of feedback-rich, motivationally informed technologies can enhance performance in PE. In a secondary school setting, Ghorbel et al. (2026) found that a blended PE model combining digital content with face-to-face teaching significantly improved both motor learning and knowledge retention in gymnastics compared to a traditional approach. These studies matter because they align closely with the key outcomes often targeted in school PE: physical performance, skill acquisition, and cognitive understanding. They also support broader review evidence that digital tools can strengthen not only participation and motivation but also measurable learning outcomes when used systematically rather than incidentally. For PE teachers, this means that wearables, video analysis, learning platforms, and gamified applications may offer more than novelty; they may also support more precise instruction and deeper student learning.

At the same time, the literature does not support an uncritical embrace of technology. UNESCO's 2023 report cautions that digital technology does not automatically transform education and that its effects remain uneven across contexts. This caution is highly relevant to PE, where embodiment, movement space, and access to equipment directly shape whether a tool helps or distracts. Zhong et al. (2025) identified persistent implementation problems in PE, including algorithmic limitations, data privacy concerns, and unequal access to digital resources. Martín-Rodríguez and Madrigal-Cerezo (2025) similarly note barriers such as digital inequality, insufficient teacher training, and ethical questions surrounding student data collection. These concerns are not peripheral. In PE, where devices may gather movement, biometric, or participation data, schools must consider instructional value alongside fairness, privacy, and feasibility. The literature therefore points to a balanced conclusion: digital tools can enrich PE, but their success depends on pedagogical fit, teacher readiness, ethical safeguards, and equitable infrastructure.

A second reason this topic deserves focused inquiry is that the existing evidence base still has clear gaps. Zhong et al. (2025) found that most empirical studies on digital-intelligent PE were concentrated in higher education, while only a small share addressed secondary education. The same review also reported that most applications were implemented in offline PE classes, with comparatively limited work in online and blended environments. This matters because the realities of junior high school differ substantially from those of universities in terms of developmental stage, school structure, teacher workload, and access to technology. Findings from higher education cannot be transferred directly to younger learners without testing.

Moreover, the Philippine school context adds another layer of urgency. Although national policy supports technology provision and educational modernization, local evidence is still needed to show whether digital integration in PE actually improves outcomes that matter to schools, such as physical fitness, skill execution, and knowledge retention.

In this context, the present study is timely and significant. The uploaded thesis shows that the study investigates the impact of integrating digital tools into PE instruction on the learning outcomes of junior high school students, with particular attention to physical fitness, skill acquisition, and knowledge retention. It also compares students exposed to digital-enhanced instruction with those taught through traditional methods and considers perceived benefits and challenges as bases for intervention. This focus is educationally important because it shifts the discussion from general enthusiasm about educational technology to a more exact question: whether digital integration in PE produces measurable gains in core learning outcomes under actual school conditions. By examining this issue through a quasi-experimental framework, the study responds directly to current calls for context-sensitive, school-based evidence on how technology can be used to strengthen quality physical education.

2. Method

2.1 Research Design

The study employed a quantitative quasi-experimental research design, specifically a pre-test/post-test control group design, to determine the impact of digital tool integration on the learning outcomes of junior high school students in physical education. This design was appropriate because it enabled the researcher to compare changes in student performance across two groups—an experimental group receiving digitally enhanced PE instruction and a control group taught through traditional methods—while maintaining a structured, measurable intervention framework. Both groups were assessed before and after the intervention using the same standardized instruments, thereby allowing the researcher to establish baseline equivalence, measure learning gains over time, and isolate the instructional effect of digital tool integration on key outcome variables such as physical fitness, skill acquisition, and knowledge retention. The intervention period was standardized in terms of PE session duration and frequency for both groups to minimize extraneous influences and strengthen internal validity. To further enhance the rigor of the design, the study used statistical procedures such as independent-samples t-tests, paired-samples t-tests, and analysis of covariance (ANCOVA), while also considering effect sizes and correlational patterns within the experimental group. Overall, the chosen design provided a robust and empirically defensible framework for evaluating whether digital tools could significantly improve student learning outcomes in physical education under authentic school conditions.

2.2 Participants

The study was junior high school students drawn from a specific grade level within the selected school setting, chosen to maintain relative homogeneity in age, developmental stage, and prior educational exposure. Using convenience sampling, the researcher recruited eligible learners and carefully assigned them to two comparison groups: an experimental group that received physical education instruction enriched with digital tools and a control group that followed the same standardized physical education curriculum through traditional teacher-led methods without digital integration. This grouping structure was essential to the quasi-experimental design because it enabled the study to compare the effects of the intervention across learners exposed to different instructional conditions while preserving comparability in curricular content, session frequency, and school context. The selected participants were therefore appropriate for the study's aim of determining whether integrating digital tools could produce measurable differences

in physical fitness, skill acquisition, and knowledge retention among junior high school learners in physical education.

2.3 Instrumentation

The study employed a multi-instrument quantitative assessment system designed to capture the effects of digital tool integration on the three core learning outcomes of physical education: physical fitness, skill acquisition, and knowledge retention. For physical fitness, the researcher used the FITNESSGRAM, which generated objective measures of cardiovascular endurance, muscular strength and endurance, flexibility, and body composition, and this was further supplemented by heart rate monitors to record real-time physiological responses during selected activities. Skill acquisition was measured through performance-based assessments supported by standardized rubrics and observational checklists, while video recordings analyzed through movement analysis software and compared against expert models were used to increase precision in evaluating motor performance. Knowledge retention, meanwhile, was assessed using researcher-prepared pre-tests and post-tests composed of multiple-choice, true/false, and short-answer items aligned with the physical education curriculum, with digital journals also serving as supplementary evidence of students' theoretical understanding. In addition, the study gathered digital tool usage logs, standardized observation forms, and questionnaires on perceived usefulness and ease of use among students in the experimental group, thereby producing a comprehensive, triangulated, and methodologically robust set of instruments suitable for evaluating the instructional effectiveness of digital tools in physical education.

2.4 Data Analysis

The study employed a comprehensive quantitative data analysis framework to determine the effect of digital tools integration on students' learning outcomes in physical education. Using appropriate statistical procedures, the researcher first computed descriptive statistics, including means, standard deviations, and frequencies, to summarize the respondents' demographic characteristics and establish the central tendencies and dispersions of the key variables. To determine whether significant differences existed between the experimental group and the control group on the dependent variables, the study utilized independent samples t-tests; at the same time, analysis of covariance (ANCOVA) was applied to control for relevant covariates such as pre-test scores and selected demographic variables, thereby improving the precision of the group comparisons and minimizing the influence of extraneous factors. To examine changes in performance over time within each group, the study also used repeated measures ANOVA, which enabled the researcher to track learning gains from pre-test to post-test across the intervention period. In addition, effect size estimates, particularly Cohen's d, were computed to determine the practical magnitude of the intervention's impact beyond statistical significance. At the same time, Pearson's r was used within the experimental group to explore the association between the frequency and type of digital tool use and the measured learning outcomes. Finally, reliability and validity analyses were conducted on the assessment instruments to ensure their consistency and accuracy, thereby strengthening the rigor, objectivity, and interpretive credibility of the study's quantitative findings.

3 Results

The study found that integrating digital tools consistently produced stronger learning outcomes in physical education than traditional instruction. In the domain of physical fitness, the experimental group posted marked gains across all FITNESSGRAM indicators from pre-test to post-test. Cardiovascular endurance improved from 40.2 ± 8.5 to 51.5 ± 7.8 , muscular strength from 35.1 ± 7.2 to 42.3 ± 6.5 , muscular endurance from 38.7 ± 6.9 to 45.9 ± 6.1 , and flexibility

from 25.4 ± 5.8 to 30.1 ± 5.2 . Body composition also showed a favorable change, decreasing from 22.8 ± 3.1 to 21.5 ± 2.9 . By contrast, the control group demonstrated only modest improvements across the same indicators, suggesting that digitally enriched physical education was more effective in promoting measurable fitness development than conventional teacher-led methods alone.

A similarly strong pattern emerged in skill acquisition. Students in the experimental group achieved substantially higher post-test scores in all three measured skill areas than their pre-test levels and than the control group's post-test performance. For Skill A, the experimental group rose from 65.2 ± 8.1 to 82.7 ± 7.3 , while the control group moved only from 66.0 ± 8.5 to 71.3 ± 8.0 . For Skill B, the experimental group increased from 68.9 ± 7.5 to 85.1 ± 6.8 , whereas the control group improved from 69.5 ± 7.8 to 73.2 ± 7.6 . In Skill C, the experimental group advanced from 63.5 ± 9.0 to 80.2 ± 8.2 , compared with the control group's smaller gain from 64.0 ± 9.3 to 68.1 ± 9.1 . These results indicate that the use of video analysis software and mobile skill-development applications supported more substantial refinement of motor performance than traditional instructional approaches.

The findings were equally notable in knowledge retention. The experimental group's mean score increased from 60.5 ± 9.2 in the pre-test to 78.9 ± 8.5 in the post-test, while the control group showed only a limited improvement from 61.0 ± 9.5 to 65.2 ± 9.0 . This result indicates that digital integration not only enhanced physical and psychomotor outcomes but also strengthened students' cognitive understanding of physical activity, health, and fitness concepts. The magnitude of the increase in the experimental group suggests that online learning platforms, interactive modules, and digitally mediated review activities were more effective in reinforcing theoretical content than traditional delivery alone.

Beyond the test scores, the study also revealed generally positive student and teacher perceptions of digital tool integration. Students reported increased motivation and engagement, greater enjoyment of physical activity, more meaningful self-monitoring, and clearer personalized feedback. Teachers, in turn, identified benefits such as improved data tracking, more individualized instruction, stronger student participation, wider access to teaching resources, and greater efficiency in record keeping. At the same time, both groups recognized several challenges, including device malfunctions, internet connectivity issues, data privacy concerns, the learning curve associated with unfamiliar technologies, the need for technical training, and the possibility of increased workload. These findings indicate that while digital tools enhanced learning, their successful use still depended on adequate infrastructure, teacher preparation, and institutional support.

Taken together, the results present a coherent pattern: students exposed to digitally enhanced physical education outperformed those in traditional classes in physical fitness, skill acquisition, and knowledge retention, while also reporting more engaging and responsive learning experiences. The evidence therefore supports the study's central argument that digital tools can serve as effective pedagogical supports in PE when systematically integrated into instruction. At the same time, the identified technical and implementation issues suggest that the benefits of digital integration will be maximized only when schools provide sufficient resources, training, and policy support for both teachers and learners.

4. Discussion

The findings of this study showed that students exposed to digitally enhanced physical education achieved stronger gains in physical fitness than those taught through traditional methods, particularly in cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. This pattern is well supported by recent literature. Zhong et al. (2025) concluded in their systematic review that digital-intelligent technologies in physical education now support real-time process visualization, data-driven evaluation, and health-

behavior monitoring, thereby enabling more personalized and data-informed instruction. Similarly, Martín-Rodríguez and Madrigal-Cerezo (2025) found that technology-enhanced pedagogy in physical education is associated with stronger engagement, improved motor development, and better cognitive learning when the tools are aligned with instructional goals. Read against the present findings, these studies suggest that the fitness gains observed in the experimental group were not incidental; rather, they likely emerged because wearable and interactive tools made effort, feedback, and progress more visible and actionable for learners during physical activity.

The study also found that skill acquisition improved more substantially in the experimental group than in the control group. This result strongly aligns with recent evidence on technology-supported motor learning. Hsia et al. (2025) reported that a gamified, intelligent tutoring and instant-feedback system in physical education significantly improved performance and learning engagement in yoga, underscoring the instructional value of immediate, personalized feedback. In a secondary-school setting, Ghorbel et al. (2026) likewise found that a blended-learning model in gymnastics significantly outperformed a traditional approach in motor learning, demonstrating that multimedia-enhanced instruction can improve movement execution under authentic PE conditions. These studies help explain why the present study's use of video analysis software and mobile skill-development applications was effective: such tools slow movement, make errors observable, and allow repeated, feedback-rich refinement, all of which are central mechanisms in motor-skill acquisition.

A parallel pattern emerged in knowledge retention, where the experimental group showed markedly greater post-test improvement than the control group. This result is consistent with Ghorbel et al. (2026), who found that their blended PE intervention improved not only motor learning but also knowledge retention, indicating that digital and hybrid resources can strengthen the cognitive dimension of physical education as well as the psychomotor one. It is also supported by Martín-Rodríguez and Madrigal-Cerezo (2025), who identified gains in cognitive learning across technology-enhanced PE studies. In this light, the present findings suggest that online learning platforms, interactive modules, and digital review activities likely enhanced retention by enabling repeated exposure, self-paced access, and multimodal presentation of content. Thus, the study reinforces an important IMRAD-level implication: when digital tools are used pedagogically rather than merely administratively, they can deepen students' conceptual understanding of physical activity, health, and fitness alongside their physical performance.

The generally positive student and teacher perceptions reported in the study—especially increased motivation, personalized feedback, better engagement, and more efficient tracking—are likewise corroborated by the broader literature. However, the identified implementation challenges are equally important. Martín-Rodríguez and Madrigal-Cerezo (2025) found that technology in PE tends to enhance motivation and engagement. Yet, they also highlighted digital inequality, insufficient teacher training, and ethical concerns over student data. Zhong et al. (2025) similarly identified data privacy, unequal access to digital resources, and technical constraints as persistent barriers. At the system level, UNESCO's 2023 GEM Report stressed that the educational value of technology depends on access, governance, and teacher preparation, rather than on device availability alone. These sources closely mirror the present study's findings on technical difficulties, privacy concerns, workload, and the need for training and support. Taken together, the discussion indicates that digital integration in PE is most effective when it is accompanied by infrastructure, teacher capability-building, and clear ethical safeguards; without these, even promising tools may yield uneven or unsustainable outcomes.

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OCCUPATIONAL STRESSORS AND COPING MECHANISMS AMONG TEACHERS OF MUSIC, ARTS, PHYSICAL EDUCATION AND HEALTH IN SECONDARY SCHOOLS

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Abstract

The teaching profession has become increasingly demanding, exposing educators to multiple occupational stressors that may affect their coping capacity and overall well-being. This study examined the occupational stressors and coping mechanisms among Music, Arts, Physical Education, and Health (MAPEH) teachers in secondary schools during the School Year 2025–2026. Specifically, it determined the perceived severity of occupational stressors in terms of workload, student discipline, and administrative demands; assessed the frequency of coping mechanisms in terms of problem-focused, emotion-focused, and social-support strategies; examined the relationship between occupational stressors and coping mechanisms; and compared the well-being outcomes of teachers who frequently used adaptive coping mechanisms and those who used less adaptive strategies. The study employed a quantitative descriptive-correlational design involving 40 MAPEH teachers from Dagupan City National High School and Moncada National High School. Data were gathered through a structured survey questionnaire and analyzed using mean, standard deviation, Pearson's correlation coefficient, and an independent samples t-test. Results showed that occupational stressors were generally high, with administrative demands and workload emerging as the most severe sources of stress. MAPEH teachers frequently used coping mechanisms, with problem-focused coping as the most common strategy. A significant moderate positive correlation was found between occupational stressors and coping mechanisms. Moreover, teachers who frequently used adaptive coping mechanisms demonstrated significantly higher levels of work balance and job satisfaction than those who used less adaptive strategies. The findings underscore the importance of institutional support programs that reduce occupational stress and strengthen adaptive coping among MAPEH teachers.

Keywords: Occupational Stressors, Coping Mechanisms, MAPEH Teachers, Work Balance, Job Satisfaction, Secondary Schools

1. Introduction

The quality of schooling depends not only on curriculum coverage and instructional competence but also on the conditions under which teachers perform their work. Recent international evidence has made this point increasingly urgent. UNESCO reported that the world will need 44 million primary and secondary teachers by 2030, with secondary education accounting for a particularly large share of that need, underscoring the importance of retaining a healthy and effective teaching workforce (UNESCO, 2025). In the same vein, the OECD conceptualized teacher well-being as a multidimensional construct encompassing physical, mental, cognitive, subjective, and social dimensions, all of which are shaped by school- and system-level working conditions (OECD, 2020). Within this broader landscape, occupational stress has emerged as a major concern because sustained work pressure can undermine teacher motivation, satisfaction, and longevity in the profession (Hascher & Waber, 2021; Madigan & Kim, 2021).

Educational research has consistently shown that teacher stress is not a vague or incidental experience; rather, it is tied to identifiable work demands. Workload, documentation, accountability pressures, lesson preparation, and classroom discipline repeatedly appear as

prominent stressors in the literature (Aloe et al., 2019; Pressley, 2021; Toropova et al., 2021). More recent OECD evidence is especially revealing: across participating education systems in TALIS 2024, general administrative work was the most frequently reported source of stress, cited by 52% of teachers, while excessive teaching load, lesson preparation, and classroom discipline also remained significant stressors (OECD, 2025). These findings suggest that teacher stress is produced not only by instruction itself but also by the accumulation of non-instructional and compliance-related demands that compete for time, energy, and professional focus.

These pressures become even more complex for teachers of Music, Arts, Physical Education, and Health (MAPEH). Unlike single-focus academic subjects, MAPEH requires teachers to move across artistic performance, health instruction, psychomotor learning, and activity-based classroom management. This interdisciplinary and performance-oriented nature expands the scope of preparation, materials management, safety monitoring, rehearsal organization, and co-curricular supervision. Recent evidence from physical education research likewise indicates that PE-related teaching roles involve distinctive occupational pressures, including behavior management during active classes, extracurricular organization, and physically demanding instructional routines (Li et al., 2025). In practical terms, MAPEH teachers operate within a professional space where instructional complexity and logistical responsibility intersect, making them especially vulnerable to cumulative workplace strain.

At the same time, the consequences of occupational stress are mediated by how teachers cope with it. Contemporary stress research treats coping as a set of cognitive and behavioral responses mobilized when work demands are appraised as taxing or overwhelming. In the teaching profession, problem-focused coping strategies such as planning, prioritizing, and taking concrete action have been associated with stronger resilience and better professional functioning (Herman et al., 2020). Social-support coping has likewise been linked with greater morale and adaptability, particularly when colleagues and school leaders provide practical and emotional support (Collie et al., 2020). By contrast, emotion-focused coping may be helpful in some situations but produces more variable outcomes depending on context and frequency of use (MacIntyre et al., 2020). Recent evidence further shows that stress coping is closely tied to teachers' emotional health, reinforcing the view that coping is not peripheral but central to teacher well-being (Emeljanovas et al., 2023).

The policy environment in the Philippines further strengthens the relevance of examining teacher stress and coping. Republic Act No. 4670, or the Magna Carta for Public School Teachers, explicitly provides for regulated teaching hours and recognizes the need to protect teachers' working conditions; Section 13 states that teachers engaged in classroom instruction should not be required to render more than six hours of actual teaching daily, with additional teaching compensated accordingly (Republic of the Philippines, 1966). Republic Act No. 11036, or the Mental Health Act, also requires employers to develop appropriate mental health policies and programs, thereby extending workplace mental health responsibilities into institutional practice (Republic of the Philippines, 2018). Consistent with these legal principles, DepEd Order No. 005, s. 2024 was issued to rationalize teachers' workloads in public schools and address concerns about overload. Together, these measures show that teacher welfare is not merely a personal issue but a policy and organizational concern within the Philippine education system.

From a research standpoint, however, important gaps remain. Much of the literature still treats teachers as a relatively uniform occupational group, despite major differences in subject specialization, classroom ecology, and work demands. Systematic review evidence has affirmed that multiple interacting factors, including classroom management, school climate, and professional support, influence teacher occupational well-being. However, subject-specific analyses remain comparatively limited (Nwoko et al., 2023). This is especially problematic for MAPEH teachers, whose work combines artistic, athletic, and health-related responsibilities that are not fully captured in generalized teacher-stress models. Moreover, while some studies

examine stressors and others examine coping, fewer investigations integrate occupational stressors, coping mechanisms, and well-being outcomes within a single quantitative design. The need, therefore, is not only for more teacher well-being research but also for more differentiated, context-sensitive, and program-oriented inquiry.

This gap is particularly relevant in secondary schools where MAPEH teachers often carry multiple preparations and school-related responsibilities beyond regular classroom instruction. In the uploaded study, the rationale and scope identify workload, student discipline, and administrative demands as the focal occupational stressors, while problem-focused, emotion-focused, and social-support coping are treated as the principal coping mechanisms. The same study also frames work-life balance and job satisfaction as key well-being outcomes, signaling concern not only with stress exposure but also with the professional quality of teachers' daily lives. Such framing is methodologically sound because it allows the study to move from description to relationship testing and, ultimately, to the development of an institutional support program grounded in evidence rather than assumption.

Against this background, the present study examines the occupational stressors and coping mechanisms among MAPEH teachers in secondary schools during School Year 2025–2026, specifically in Dagupan City National High School and Moncada National High School. It seeks to determine the perceived severity of workload, student discipline, and administrative demands; assess the frequency of problem-focused, emotion-focused, and social-support coping; test the relationship between occupational stressors and coping mechanisms; and compare well-being outcomes in terms of work balance and job satisfaction between teachers who frequently use adaptive coping strategies and those who use less adaptive ones. In doing so, the study responds to a practical educational need and to a policy imperative recognized by WHO, which recommends organizational interventions that directly address workplace psychosocial risks and working conditions (World Health Organization, 2024). Thus, the investigation is positioned not only to describe a problem but also to inform institutional action for teacher well-being.

2. Method

2.1 Research Design

This study employed a quantitative descriptive-correlational research design to examine the occupational stressors and coping mechanisms among secondary school MAPEH teachers. The descriptive dimension was used to determine the mean perceived severity of occupational stressors in terms of workload, student discipline, and administrative demands, as well as the frequency of utilization of coping mechanisms classified as problem-focused, emotion-focused, and social-support strategies. The correlational component enabled the study to test the statistical relationship between occupational stressors and coping mechanisms. At the same time, the comparative aspect was applied to determine whether significant differences existed in self-reported well-being outcomes, particularly work balance and job satisfaction, between teachers who frequently utilized adaptive coping mechanisms and those who used less adaptive strategies. This design was appropriate because the study sought to generate numerical evidence from naturally occurring professional conditions without manipulating variables or introducing experimental treatment. Using a structured survey questionnaire, the investigation produced standardized data that were analyzed using descriptive and inferential statistics, specifically the mean, standard deviation, Pearson's correlation coefficient, and an independent-samples t-test. As a cross-sectional and non-experimental inquiry, the design ensured objectivity, statistical rigor, and methodological alignment with the study's aim of generating evidence for a proposed institutional support program for MAPEH teachers.

2.2 Participants

The study was 40 licensed MAPEH teachers currently employed at two secondary schools during the first semester of School Year 2025–2026, namely Dagupan City National High School in Dagupan City, Pangasinan, and Moncada National High School in Moncada, Tarlac. Of the total respondents, 30 were from Dagupan City National High School, and 10 were from Moncada National High School. The participants were selected based on their availability and willingness to participate in the study at the time of data collection. To ensure that the respondents possessed sufficient professional exposure to the variables under investigation, the study included only teachers who were actively handling at least one MAPEH component—Music, Arts, Physical Education, or Health—and who had rendered at least one year of teaching service. Excluded from the study were teachers not assigned to MAPEH during the specified academic year, administrative personnel without classroom teaching functions, substitute or part-time teachers with less than one year of experience, and individuals who failed to complete the survey instrument. This participant profile was considered appropriate because it ensured that the respondents had direct and sustained experience with the occupational stressors, coping mechanisms, and work-related well-being examined in the study, thereby strengthening the relevance and credibility of the data.

2.3 Instrumentation

The study used a structured, self-administered questionnaire as the principal research instrument to collect quantitative data from respondents. The instrument was designed to operationalize the major variables in the study, namely occupational stressors, coping mechanisms, and well-being outcomes among MAPEH teachers. It was organized into four major sections: the first gathered demographic information such as years of teaching experience and subject components handled; the second measured the perceived severity of occupational stressors in terms of workload, student discipline, and administrative demands; the third assessed the frequency of utilization of coping mechanisms categorized into problem-focused, emotion-focused, and social-support strategies; and the fourth measured self-reported well-being outcomes, specifically work balance and job satisfaction. All items were presented using Likert scales to ensure responses could be quantified and analyzed statistically. To establish content validity, the draft questionnaire was reviewed by experts in educational management, psychology, and research methodology, who evaluated its clarity, relevance, and alignment with the constructs under study. Their recommendations were incorporated through item revision and refinement of scale descriptors. The instrument was then pilot-tested among teachers who were not included in the final sample, and its reliability was assessed using Cronbach's alpha, which yielded acceptable internal consistency. These procedures established the questionnaire as a valid, reliable, and appropriate instrument for measuring the variables investigated in the study.

2.4 Data Analysis

The data gathered in this study were analyzed using both descriptive and inferential statistical techniques to ensure an objective and systematic interpretation of the quantitative responses. After the retrieval of the completed questionnaires, each instrument was reviewed for completeness and consistency, and all valid responses were encoded into a statistical software program using numerical codes assigned to each response option for easier tabulation and computation. Descriptive statistics, specifically the mean and standard deviation, were used to determine levels of occupational stressors, the frequency of coping mechanism use, and respondents' self-reported well-being outcomes. To test the study hypotheses, inferential statistical tools were likewise applied. Pearson's correlation coefficient was used to assess the strength and direction of the relationship between perceived occupational stressors and coping mechanisms, and the independent-samples t-test was used to determine whether significant

differences existed in work-life balance and job satisfaction between teachers who frequently used adaptive coping mechanisms and those who used less adaptive strategies. These statistical procedures were appropriate because they allowed the study to describe the central tendencies of the measured variables, establish significant associations, and compare group outcomes with rigor and precision, thereby generating reliable empirical evidence for the proposed institutional support program.

3 Results

The results revealed that MAPEH teachers experienced occupational stressors at an overall high level, with an overall mean of 3.91. Among the dimensions measured, administrative demands registered the highest mean ($M = 4.32$, $SD = 0.45$), interpreted as very high, followed by workload ($M = 4.15$, $SD = 0.48$), interpreted as high. At the same time, student discipline obtained the lowest mean ($M = 3.25$, $SD = 0.62$), interpreted as moderate. These findings indicate that MAPEH teachers were most burdened not by classroom behavior concerns alone, but by the combined weight of compliance-related tasks, documentation, reporting requirements, and extensive teaching responsibilities. In the context of MAPEH, such demands are unsurprising, as the subject area requires the simultaneous management of theoretical instruction, performance-based assessment, practical demonstrations, and co-curricular activities. The findings suggest that the complexity of the MAPEH teaching role extends beyond classroom delivery and is significantly shaped by organizational and administrative expectations.

This pattern of results affirms the broader argument that teacher stress is often intensified by institutional workload structures rather than by instructional tasks alone. The very high rating for administrative demands suggests that teachers may be devoting substantial time and energy to paperwork, reports, and compliance functions that compete with preparation for actual teaching. Meanwhile, the high workload score reflects the multifaceted nature of MAPEH, where teachers often handle multiple components, prepare varied instructional materials, and supervise school-related events and practical activities. Although student discipline remained a relevant concern, its comparatively lower mean implies that classroom management challenges were less overwhelming than systemic workload pressures in the present setting. This interpretation is consistent with the study's own discussion, which found that administrative overload and instructional preparation together constituted the dominant sources of occupational strain among respondents.

Regarding coping mechanisms, the results showed that MAPEH teachers generally demonstrated a strong tendency to employ adaptive responses to stress, with an overall mean of 4.02, indicating they are frequently used. Among the three categories, problem-focused coping obtained the highest mean ($M = 4.42$, $SD = 0.38$), interpreted as very frequently used, followed by social-support coping ($M = 3.95$, $SD = 0.44$), interpreted as frequently used, and emotion-focused coping ($M = 3.68$, $SD = 0.52$), also interpreted as frequently used. These findings indicate that when confronted with work-related stressors, teachers were more likely to respond through planning, prioritizing tasks, reorganizing schedules, and seeking concrete solutions rather than relying primarily on internal emotional regulation. The relatively high use of social-support coping further suggests that collegial interaction, consultation, and interpersonal support played a meaningful role in helping teachers manage occupational pressures. Collectively, the results portray MAPEH teachers as professionally active and solution-oriented in responding to workplace stress.

The inferential analysis further demonstrated that occupational stressors and coping mechanisms were significantly related. It showed a significant, moderate positive correlation between occupational stressors and coping mechanisms ($r = 0.58$, $p = 0.002$), indicating that as perceived stress severity increased, teachers reported more frequent use of coping strategies. This result suggests that coping mechanisms were activated in response to

heightened occupational demands rather than functioning independently of them. In other words, teachers who experienced greater workload, administrative strain, and discipline-related pressures were also more likely to engage in problem-solving, emotional regulation, and support-seeking behaviors. The positive direction of the relationship implies that coping among these teachers was not absent under stress; rather, it intensified as professional demands became more pronounced. It should be noted, however, that the uploaded manuscript contains a minor inconsistency in the narrative sentence preceding Table 3, where a different correlation value is mentioned; the table itself reports $r = 0.58$, and this tabulated value was used here as the basis for interpretation.

Finally, the comparative results underscored the importance of adaptive coping for teacher well-being. Teachers who frequently used adaptive coping mechanisms reported higher mean scores in work balance ($M = 4.12$) and job satisfaction ($M = 4.35$) than those who used fewer adaptive strategies, whose mean scores were 2.85 and 3.10, respectively. These differences were confirmed by an independent-samples t -test, which showed statistically significant differences for work balance ($t = 5.42$, $p = 0.001$) and job satisfaction ($t = 6.81$, $p = 0.001$). These findings indicate that adaptive coping mechanisms served as protective factors, enhancing teachers' capacity to maintain equilibrium between professional and personal demands and to derive fulfillment from their work despite occupational stress. Substantively, the results support the view that while stress may be unavoidable in complex teaching environments, its negative effects can be moderated when teachers possess constructive coping resources. This empirical pattern also justifies the proposed institutional support program in the study, particularly its emphasis on workload rationalization, administrative streamlining, peer-support structures, and professional development on stress management.

4. Discussion

The present study found that occupational stressors among MAPEH teachers were generally high, with workload and administrative demands emerging as the most pronounced sources of strain. At the same time, student discipline was rated at a comparatively lower level. This pattern is strongly corroborated by international evidence showing that excessive workload and administrative responsibilities are among the most persistent stressors in teaching. OECD data from TALIS 2024 showed that administrative work was the most frequently cited source of stress across participating education systems, with lesson preparation, teaching load, and classroom discipline also ranking prominently among teachers' reported pressures. Likewise, Hascher and Waber's systematic review concluded that teacher well-being is deeply affected by organizational demands, workload accumulation, and school-based stress conditions rather than by instructional tasks alone. The convergence between the present findings and these studies suggests that the stress experienced by MAPEH teachers is not isolated or incidental; rather, it reflects a broader structural pattern in which institutional expectations and compliance-related tasks substantially shape teachers' work lives.

The finding that workload constitutes a major source of occupational stress is particularly consistent with the literature on subject areas that require performance-based, activity-oriented, and multifaceted instructional responsibilities. Research on physical education teachers, whose professional demands overlap with several components of MAPEH teaching, has shown that occupational stress is positively associated with burnout and emotional strain, especially when teachers face high-intensity instructional expectations and frequent task switching. Li et al. found a robust positive relationship between occupational stress and burnout among primary and secondary school physical education teachers, highlighting the psychological costs of sustained professional pressure. This corroborates the present study because MAPEH teachers, like PE teachers, often operate in learning environments that require simultaneous management of content delivery, student movement, performance assessment, and event-related obligations.

The implication is that the elevated stress observed in the current study may stem not only from the volume of work but also from the complex, interdisciplinary nature of the subject area.

The study further revealed that MAPEH teachers frequently used coping mechanisms, with problem-focused coping registering the highest level, followed by social-support coping. This finding aligns closely with prior evidence that adaptive coping strategies are more common among teachers who remain functionally engaged under stress. Emeljanova et al. reported that coping strategies are meaningfully associated with teachers' emotional health and that more constructive coping patterns are associated with better psychological functioning. Relatedly, the literature on physical education teachers has shown that coping strategies play an important mediating role in the stress-burnout process, with more adaptive and self-regulatory responses linked to healthier professional functioning. These findings support the interpretation that the respondents in the present study did not passively absorb occupational stress; instead, they actively responded through planning, organization, and support-seeking. The high use of problem-focused coping in particular suggests professional resilience and a tendency toward action-oriented adaptation in the face of work demands.

The significant positive relationship found between occupational stressors and coping mechanisms in the present study is likewise corroborated by existing research. Rather than suggesting that coping eliminates stress, this positive association indicates that teachers activate coping responses more frequently when stress intensifies. Emeljanovas et al. similarly found meaningful relationships between stress coping and teachers' emotional health, indicating that coping is part of the response system teachers mobilize under demanding conditions. From a broader theoretical perspective, research grounded in the Job Demands-Resources framework has shown that teacher job demands and job resources jointly shape well-being, work engagement, and retention-related outcomes. Admiraal et al. found that distress and barriers to professional development function as major job demands, while collaborative and participative school culture serve as vital resources linked to stronger professional outcomes. In this light, the correlation found in the present study is consistent with the view that coping mechanisms are not detached from workplace pressures; they are dynamic responses triggered by the intensity of those pressures and shaped by the resources available in the school environment.

Finally, the study's finding that teachers who frequently used adaptive coping mechanisms reported significantly better work balance and job satisfaction is well supported by the literature. Toropova et al. demonstrated that teacher job satisfaction is strongly associated with school working conditions, indicating that the quality of teachers' professional environments and their ability to manage job demands are central to satisfaction. More recent international evidence likewise shows that job demands and resources have a decisive influence on teachers' satisfaction with both the profession and their school career. In addition, a systematic review by Dreer found that teacher well-being is significantly linked with desirable professional outcomes, including retention-related and school-functioning variables. Taken together, these studies reinforce the current finding that adaptive coping serves as a protective factor. The significant differences in work-life balance and job satisfaction observed in the present study, therefore, support a practical conclusion: when teachers are equipped with effective coping strategies and supported by healthier working conditions, they are more likely to sustain professional satisfaction and psychological equilibrium despite occupational stress.

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THE EFFECTIVENESS OF DIFFERENTIATED INSTRUCTION ON ENHANCING MAPEH PERFORMANCE AMONG LEARNERS WITH DIVERSE LEARNING STYLES

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Abstract

Differentiated instruction has become increasingly relevant in MAPEH classrooms where learners demonstrate varied readiness levels, interests, abilities, and learning styles. This study determined the effectiveness of differentiated instruction in enhancing the MAPEH performance of junior high school learners with diverse learning styles. Specifically, it compared the average MAPEH final grades of learners who received differentiated instruction and those who received traditional instruction, determined the significant difference between the two groups, identified the differentiated teaching strategies used by MAPEH teachers, examined the relationship between learners' MAPEH test scores and differentiated teaching strategies, and proposed an action plan to address learners' needs. The study employed a quantitative quasi-experimental design with a non-equivalent pretest-posttest control group. Data were gathered from learners exposed to differentiated and traditional instruction through academic records, standardized MAPEH assessments, and structured teacher surveys. Descriptive statistics, an independent-samples t-test, and Pearson's correlation were used to analyze the data. Findings revealed that learners who received differentiated instruction obtained a higher mean MAPEH grade than those who received traditional instruction. The difference between the two groups was statistically significant, indicating that differentiated instruction produced better academic outcomes. The most commonly used differentiated strategies were scaffolding, flexible grouping, and multimedia integration. The correlation results further showed positive, significant relationships between differentiated strategies and learners' MAPEH test scores, with scaffolding showing the strongest association. The study concluded that differentiated instruction is an effective approach for improving MAPEH performance and recommended an action plan focused on teacher training, curriculum flexibility, technology integration, continuous monitoring, and sustained instructional support.

Keywords: Differentiated Instruction, MAPEH Performance, Diverse Learning Styles, Scaffolding, Flexible Grouping, Multimedia Integration

1. Introduction

Learner diversity has become one of the most pressing realities in contemporary education, requiring teachers to move beyond uniform instruction and adopt teaching approaches that respond to students' varied readiness levels, interests, abilities, and learning preferences. In inclusive classrooms, learners do not enter with the same background knowledge, motivation, skill level, or information-processing style. This diversity is especially visible in Music, Arts, Physical Education, and Health (MAPEH), a subject that integrates cognitive understanding, physical performance, creative expression, health literacy, and values formation. Because MAPEH requires students to learn through listening, movement, visual production, performance, collaboration, and reflection, a single instructional approach may not sufficiently address the needs of all learners.

Differentiated instruction has emerged as an important pedagogical response to this challenge. It is commonly understood as a teaching approach in which teachers adjust content, process, product, and the learning environment based on learners' readiness, interests, and learning profiles. Tomlinson (2000) explained that teachers may differentiate what students learn,

how students make sense of content, how they demonstrate learning, and how the classroom functions to support learning. In practical terms, differentiated instruction may involve scaffolding, flexible grouping, tiered assignments, learning stations, multimedia integration, varied assessment formats, and opportunities for student choice. These strategies are intended to help learners access the same essential competencies through different routes while maintaining high expectations for achievement.

The importance of differentiated instruction is strongly connected to the global movement toward inclusive and equitable quality education. UNESCO (2020) emphasized that education systems must respond to learner differences and remove barriers that exclude students from meaningful participation and achievement. This principle is highly relevant to Philippine classrooms, where learners often differ in language background, socioeconomic condition, learning pace, confidence, skill level, and access to learning support. In MAPEH, these differences may affect learners' ability to perform a dance routine, interpret musical elements, create an artwork, participate in physical activity, or understand health concepts. Differentiated instruction therefore, offers a framework for making MAPEH instruction more responsive, accessible, and learner-centered.

Recent empirical literature provides support for the potential benefits of differentiated instruction, although the strength of evidence varies across contexts and implementation models. A systematic review of differentiated instruction in secondary education found that it has generally shown small to moderate positive effects on student achievement, while noting that the evidence base remains limited and context-dependent (Smale-Jacobse et al., 2019). Similarly, AM, Hadi, Istiyono, and Retnawati (2023), in a systematic review and meta-analysis of 49 primary studies, found a significant positive effect of differentiated instruction on student learning outcomes compared with control-group instruction. These findings suggest that differentiated instruction can improve learning when carefully designed, consistently implemented, and aligned with learners' needs. However, they also indicate the need for localized studies that examine how specific differentiated strategies function in actual classroom settings.

In MAPEH, differentiated instruction may be particularly useful because the subject demands multiple forms of competence. Some learners may excel in physical performance but struggle with written tests; others may perform well in health concepts but need support in artistic or musical expression. Scaffolding can help learners gradually master complex skills by providing step-by-step support until they become more independent. Flexible grouping allows teachers to organize learners according to readiness, interest, task, or skill need, enabling peer support and targeted instruction. Tiered assignments allow students to work on tasks of varying complexity while addressing the same learning goals. Learning stations can provide varied activity centers suited to different learning modalities, while multimedia integration may support visual, auditory, and kinesthetic learners through videos, demonstrations, digital resources, and interactive materials. These strategies are well-suited to MAPEH because they allow instruction to be adapted across music, arts, physical education, and health domains.

Despite the growing body of research on differentiated instruction, gaps remain in relation to its use in integrated and performance-oriented subjects. Much of the existing literature focuses on language, mathematics, science, or general classroom instruction. There is less localized empirical evidence on how differentiated instruction affects MAPEH performance, particularly among learners with diverse learning styles in Philippine junior high school classrooms. Moreover, studies often examine the overall effect of differentiated instruction without identifying which specific strategies are most commonly used or most strongly associated with student performance. This gap is important because teachers need evidence not only that differentiated instruction works, but also which practices are most relevant and feasible in their subject area.

Accordingly, the present study examined the effectiveness of differentiated instruction in enhancing MAPEH performance among learners with diverse learning styles. Specifically, it

compared the average final MAPEH grades of learners who received differentiated instruction with those who received traditional instruction. It also determined whether a significant difference existed between the two groups, identified the differentiated teaching strategies used by MAPEH teachers, and examined the relationship between learners' MAPEH test scores and differentiated teaching strategies. By employing a quasi-experimental non-equivalent pretest-posttest control group design, the study generated quantitative evidence on the academic contribution of differentiated instruction in MAPEH. The findings served as the basis for proposing an action plan focused on teacher professional development, curriculum flexibility, technology integration, continuous monitoring, and sustained support for differentiated MAPEH instruction.

2. Method

2.1 Research Design

The study employed a quasi-experimental research design, specifically the non-equivalent pretest-posttest control group design, to determine the effectiveness of differentiated instruction in enhancing learners' MAPEH performance. This design was appropriate because the study compared two intact groups of learners: the experimental group, which received MAPEH instruction using differentiated strategies, and the control group, which received traditional instruction. Both groups were assessed before and after the intervention to determine changes in their MAPEH knowledge and skills. The pretest established the learners' baseline performance, while the posttest and final MAPEH grades measured their performance after the instructional period. Since random assignment was not feasible in the school setting, intact classes were used, and statistical procedures were applied to account for possible pre-existing differences between groups. The design enabled the researcher to compare the academic outcomes of learners exposed to differentiated instruction and those taught through traditional methods, while also examining the relationship between specific differentiated teaching strategies and MAPEH test scores. Through this approach, the study generated empirical evidence on the effectiveness of differentiated instruction as a learner-responsive strategy for improving performance in Music, Arts, Physical Education, and Health.

2.2 Participants

The study was conducted with junior high school learners enrolled in MAPEH classes in selected secondary schools, grouped according to the instructional approach they received during the intervention period. The experimental group consisted of 150 learners who received differentiated instruction, while the control group consisted of 150 learners who received traditional instruction. Intact classes were utilized because random assignment of individual learners was not feasible within the existing school setting. The learners represented diverse learning styles and performance levels, making them appropriate participants for examining the effectiveness of differentiated instruction in a subject that integrates Music, Arts, Physical Education, and Health. MAPEH teachers also served as data sources in identifying the differentiated instructional strategies used in the classroom, particularly scaffolding, flexible grouping, tiered assignments, learning stations, and multimedia integration. The inclusion of learners exposed to both differentiated and traditional instruction enabled the study to compare academic performance outcomes between the two groups, while teacher-provided data allowed examination of the relationship between specific differentiated strategies and learners' MAPEH test scores. This participant structure supported the quasi-experimental nature of the study and provided the empirical basis for developing an action plan to address the needs of MAPEH learners.

2.3 Instrumentation

The study utilized instruments to gather data on learners' MAPEH performance and the differentiated instructional strategies employed by teachers. Academic records served as the primary source of data for learners' final MAPEH grades, allowing comparison between those who received differentiated instruction and those who received traditional instruction. In addition, standardized MAPEH assessments were administered before and after the intervention to measure learners' knowledge and skills in Music, Arts, Physical Education, and Health. These assessments aligned with the prescribed MAPEH curriculum competencies and were used to assess changes in learners' performance throughout the instructional period. A structured teacher survey was also administered to identify the differentiated strategies used in MAPEH instruction, including scaffolding, flexible grouping, tiered assignments, learning stations, and multimedia integration. The survey used Likert-scale items to quantify the frequency and extent of strategy utilization. To ensure validity and reliability, the instruments underwent content validation by MAPEH experts and pilot testing prior to full implementation. The use of these instruments provided objective, measurable, and statistically analyzable data necessary for determining the effectiveness of differentiated instruction and its relationship with learners' MAPEH test scores.

2.4 Data Analysis

The data gathered in the study were analyzed using descriptive and inferential statistical procedures appropriate for a quasi-experimental design. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to summarize the average MAPEH final grades of learners who received differentiated instruction and those who received traditional instruction, as well as the frequency of differentiated strategies used by MAPEH teachers. To determine whether a significant difference existed in MAPEH performance between the experimental and control groups, an independent-samples t-test was employed; analysis of covariance was used when pretest scores were included to control for baseline differences between groups. The hypotheses were tested at the 0.05 level of significance. Pearson product-moment correlation coefficient was also used to determine the relationship between learners' MAPEH test scores and the differentiated instructional strategies used by teachers, including scaffolding, flexible grouping, tiered assignments, learning stations, and multimedia integration. Effect sizes were computed to assess the practical magnitude of the observed difference between instructional groups. These statistical procedures enabled the study to determine the effectiveness of differentiated instruction, identify the strategies most strongly associated with improved MAPEH performance, and provide empirical support for the development of an action plan responsive to learners' diverse learning styles.

3 Results

The results showed that learners who received differentiated instruction achieved higher final MAPEH grades than those who received traditional instruction. The differentiated instruction group had a mean grade of 85.67 and a standard deviation of 4.23, while the traditional instruction group had a mean grade of 80.45 and a standard deviation of 5.12. This finding indicates that learners exposed to differentiated instruction demonstrated better academic performance in MAPEH. The lower standard deviation in the differentiated instruction group also suggests that learner performance was more consistent, implying that differentiated instruction may have helped reduce performance gaps among students with diverse learning styles.

The comparison of average MAPEH grades further revealed a statistically significant difference between the two instructional groups. The t-test yielded a t-value of 6.38 and a p-value of 0.000, indicating that the difference in performance was significant at the 0.05 level. This result led to the rejection of the null hypothesis, confirming that differentiated instruction had a measurable effect on learners' MAPEH performance. The finding suggests that adapting

instruction to students' readiness, interests, and learning profiles can yield better academic outcomes than uniform traditional instruction, especially in an integrated, performance-based subject such as MAPEH.

The study also identified the differentiated instructional strategies commonly used by MAPEH teachers. Scaffolding was the most frequently used strategy, with a utilization rate of 80%, followed by flexible grouping at 75% and multimedia integration at 70%. Tiered assignments were used by 62.5% of the teachers, while learning stations were used by 50%. These results show that MAPEH teachers employed a variety of strategies to respond to diverse learner needs. The frequent use of scaffolding suggests that teachers commonly provide step-by-step support to help learners gradually develop mastery. Meanwhile, flexible grouping and multimedia integration allowed teachers to accommodate varied learning preferences, skill levels, and modes of engagement.

Correlation results showed positive and significant relationships between differentiated instructional strategies and learners' MAPEH test scores. Among the strategies, scaffolding showed the strongest correlation with MAPEH test scores ($r = 0.602$, $p = 0.000$). This was followed by multimedia integration (r -value = 0.559) and flexible grouping (r -value = 0.523). Tiered assignments also showed a positive correlation with test scores ($r = 0.487$), while learning stations showed a weaker correlation ($r = 0.418$). These findings indicate that greater use of differentiated strategies was associated with higher learner performance in MAPEH.

Overall, the results provide empirical support for the effectiveness of differentiated instruction in enhancing MAPEH performance among learners with diverse learning styles. The higher mean grades, significant group difference, and positive correlations between differentiated strategies and test scores suggest that differentiated instruction can improve learner outcomes when applied systematically. The findings also point to scaffolding, multimedia integration, and flexible grouping as particularly useful strategies in MAPEH instruction. These results served as the basis for proposing an action plan focused on professional development, curriculum flexibility, technology integration, continuous monitoring, and sustained support for the effective implementation of differentiated instruction in MAPEH classrooms.

4. Discussion

The finding that learners who received differentiated instruction achieved higher MAPEH final grades than those who received traditional instruction supports the value of learner-responsive teaching in integrated, performance-oriented subjects. MAPEH requires students to demonstrate knowledge and skills in Music, Arts, Physical Education, and Health; therefore, learners may vary greatly in their readiness, interests, strengths, and preferred learning styles. The higher mean grade of the differentiated instruction group suggests that adapting instructional content, processes, activities, and assessment opportunities helped learners access MAPEH competencies more effectively. This finding is consistent with Tomlinson's view that differentiated instruction responds to learner differences in readiness, interest, and learning profile by providing varied pathways toward common learning goals. It also supports the inclusive education principle that schools must respond to learner diversity rather than expect all students to learn successfully through the same method.

The statistically significant difference between the differentiated instruction and traditional instruction groups further confirms that the instructional approach matters in improving learner performance. The significant t-test result indicates that the observed difference in MAPEH grades was not due to chance but was associated with the type of instruction learners received. This is supported by Smale-Jacobse, Meijer, Helms-Lorenz, and Maulana (2019), who reviewed differentiated instruction in secondary education and reported that DI provides a pedagogical starting point for addressing students' diverse learning needs, although its effectiveness depends on the quality of its design and implementation. Similarly, AM, Hadi, Istiyono, and Retnawati

(2023) found through a systematic review and meta-analysis that differentiated instruction had a positive effect on student learning outcomes compared with control-group instruction. In the present study, the positive result suggests that DI is particularly useful in MAPEH because it allows learners to engage with lessons through different modalities, including movement, visual representation, performance, collaboration, and guided practice.

The study also found that scaffolding, flexible grouping, and multimedia integration were the most commonly used differentiated instructional strategies among MAPEH teachers. This finding indicates that teachers tended to use practical, classroom-feasible methods to address diverse learning needs. Scaffolding allows teachers to provide temporary support until learners can perform tasks independently, which is essential in MAPEH activities that require gradual skill development, such as musical performance, artwork production, physical movement, and health decision-making. Flexible grouping enables learners to work with peers based on readiness, interest, or task requirement, while multimedia integration supports visual, auditory, and kinesthetic learning through videos, demonstrations, digital presentations, and interactive resources. These strategies align with inclusive education expectations because they provide multiple access points for learners who may struggle under uniform instruction.

The significant positive correlations between differentiated strategies and MAPEH test scores further strengthen the argument that specific DI practices are associated with improved performance. Among the strategies, scaffolding showed the strongest correlation with test scores, followed by multimedia integration and flexible grouping. This suggests that learners may benefit most when teachers provide structured guidance, demonstrations, feedback, and gradual release of responsibility. The result also suggests that technology-supported, visually rich instruction may be useful in MAPEH, where learners often need to observe, imitate, analyze, and perform skills. However, because the relationship is correlational, the findings should be interpreted carefully. The results show an association rather than absolute causation, and other factors, such as teacher expertise, learner motivation, class size, school resources, and prior achievement, may also influence MAPEH performance.

Overall, the findings corroborate the claim that differentiated instruction can enhance student learning when it is systematically implemented and aligned with learners' needs. The results justify the proposed action plan, emphasizing professional development, curriculum flexibility, technology integration, continuous monitoring, and sustained instructional support. The action plan is necessary because differentiated instruction requires more than individual teacher effort; it requires school-level support, access to materials, collaborative planning time, and training in evidence-based strategies. In MAPEH, strengthening differentiated instruction may help teachers create more inclusive, engaging, and performance-oriented classrooms that support learners with diverse learning styles toward improved academic achievement and holistic development.

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OCCUPATIONAL STRESSORS, BURNOUT AND COPING MECHANISM AMONG MUSIC, ARTS, PHYSICAL EDUCATION, AND HEALTH TEACHERS IN SECONDARY SCHOOLS

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Abstract

Music, Arts, Physical Education, and Health teachers in secondary schools continue to encounter demanding instructional, behavioral, and administrative conditions that may heighten occupational stress and contribute to burnout. This study examined the occupational stressors, burnout levels, and coping mechanisms of MAPEH teachers at Mangaldan National High School during the 2025–2026 academic year. Specifically, it determined the extent of perceived occupational stressors in terms of workload, student discipline, and administrative demands; assessed burnout in terms of emotional, physical, and mental exhaustion; identified coping mechanisms categorized as problem-focused, emotion-focused, and social support; and tested the relationships between stressors, coping mechanisms, and burnout. The study employed a quantitative, descriptive-correlational design and used a total enumeration of 30 MAPEH teachers. Data were gathered through a structured Likert-scale survey questionnaire and analyzed using descriptive statistics and Pearson's correlation coefficient. Findings revealed that MAPEH teachers experienced high occupational stress, with workload as the most prominent stressor. Burnout was also high, particularly in emotional and mental exhaustion, indicating that sustained work demands affected teachers' well-being. The respondents frequently used coping mechanisms, with problem-focused coping as the most utilized strategy. Correlational results showed a significant positive relationship between occupational stressors and burnout, while coping mechanisms had a significant negative relationship with burnout. Based on the findings, the study proposed a teacher-focused intervention plan to reduce stress, strengthen coping resources, and promote teacher well-being. The results underscore the need for institutional support, balanced workload distribution, wellness programs, and peer-based assistance for sustainable MAPEH teaching practice settings.

Keywords: Occupational Stressors, Burnout, Coping Mechanisms, MAPEH Teachers, Teacher Well-Being, Intervention Plan

1. Introduction

Teaching has become an increasingly demanding profession as educators are expected to perform instructional, assessment, classroom management, administrative, and psychosocial support roles within complex school environments. In secondary schools, these demands are especially evident among Music, Arts, Physical Education, and Health (MAPEH) teachers because their work involves both cognitive and performance-based instruction. Unlike subjects that are largely classroom-textual in delivery, MAPEH requires teachers to manage physically active learning spaces, guide students in artistic and movement-based outputs, maintain safety during activities, assess performances, and prepare instructional materials suited to diverse learning tasks. These responsibilities may expose teachers to multiple occupational stressors that can affect their professional functioning and overall well-being.

Occupational stress among teachers is commonly associated with workload, student behavior, administrative requirements, time pressure, and lack of institutional support. Recent literature has shown that teacher stress is not an isolated emotional condition but a work-related

experience shaped by organizational demands, classroom realities, and available coping resources. Herman, Hickmon-Rosa, and Reinke (2020) emphasized that teacher stress and coping patterns are linked to burnout, self-efficacy, and student-related outcomes, suggesting that teacher well-being has implications not only for educators but also for classroom engagement quality. Similarly, Herman and colleagues (2020) argued through the Coping-Competence-Context framework that teacher stress must be understood through interconnected pathways involving personal coping capacity, professional competence, and contextual demands. These perspectives highlight the importance of examining stress within a wider school system rather than as an individual weakness.

Burnout is one of the most serious outcomes of prolonged occupational stress. It is commonly reflected in emotional exhaustion, physical fatigue, mental strain, detachment, and reduced professional motivation. In teaching, burnout may diminish instructional effectiveness, weaken teacher-student relationships, reduce enthusiasm, and contribute to absenteeism or intent to leave the profession. The World Health Organization (2022) underscores the importance of mental health at work and recommends organizational, managerial, and individual interventions to protect workers from psychosocial risks and support their participation and productivity. For teachers, these recommendations are highly relevant because education systems depend on emotionally resilient and professionally supported educators. When teachers experience sustained stress without adequate coping mechanisms or institutional support, burnout can become a persistent barrier to instructional quality and teacher retention.

The post-pandemic period further intensified the relevance of teacher well-being. UNESCO, UNICEF, and Education International (2021) noted that teachers were central to education recovery but also faced difficult working conditions, rapid adaptation to remote and hybrid modalities, learning loss recovery, and health and safety concerns. Although schools have returned to more regular operations, many of the demands placed on teachers have continued, including expanded documentation, remediation, student support, and administrative compliance. In the Philippine context, the Department of Education has recognized workload concerns through policies aimed at maximizing teachers' time for classroom teaching and removing administrative tasks from public school teachers. DepEd Order No. 005, s. 2024 rationalized teachers' workload by defining actual classroom teaching hours and teaching-related ancillary tasks, while emphasizing the delegation of non-teaching administrative duties to appropriate personnel. These policy developments demonstrate that teacher workload and well-being are not merely personal concerns but institutional and system-level priorities.

MAPEH teachers may be particularly vulnerable to stress because of the distinct nature of their subject area. Music and Arts teachers may face performance preparation, limited materials, student output evaluation, and program-related expectations. Physical Education teachers must manage safety, discipline, space, equipment, and physical activity participation. Health teachers are expected to address wellness-related content that may require sensitivity, accuracy, and learner engagement. When these subject demands are combined with paperwork, school programs, extracurricular assignments, and student discipline concerns, the resulting work environment may increase the risk of burnout. However, teachers are not passive recipients of stress. They employ coping mechanisms that may either reduce or intensify burnout depending on their effectiveness and appropriateness.

Coping mechanisms generally include problem-focused coping, emotion-focused coping, and social support. Problem-focused coping involves direct actions to manage the source of stress, such as planning, prioritizing, time management, and problem-solving. Emotion-focused coping involves regulating emotional responses through acceptance, relaxation, reframing, or personal reflection. Social support refers to seeking assistance, encouragement, advice, or emotional connection from colleagues, administrators, family members, or friends. Research on teacher stress profiles indicates that teachers with high stress but low coping tend to exhibit

greater burnout and less favorable professional outcomes than those with stronger coping resources (Herman et al., 2020). Thus, understanding the coping practices of MAPEH teachers is necessary in designing interventions that are responsive to their actual working conditions.

Despite increasing scholarly attention to teacher stress and burnout, there remains a need for localized studies focusing on subject-specific teacher groups such as MAPEH teachers. Many studies examine teachers in general, but fewer address the combined influence of workload, student discipline, administrative demands, burnout, and coping mechanisms within performance-based teaching areas. This gap is important because intervention plans are more effective when they are grounded in the lived occupational realities of the specific teacher group they intend to support. Accordingly, the present study examined the occupational stressors, level of burnout, and coping mechanisms of MAPEH teachers at Mangaldan National High School during the academic year 2025–2026. Specifically, it assessed stressors in terms of workload, student discipline, and administrative demands; determined burnout in terms of emotional, physical, and mental exhaustion; identified coping mechanisms in terms of problem-focused coping, emotion-focused coping, and social support; and tested the relationships among these variables. The findings served as the basis for proposing a teacher-focused intervention plan to promote well-being and reduce burnout among MAPEH teachers.

2. Method

2.1 Research Design

The study employed a quantitative, descriptive-correlational research design to examine occupational stressors, burnout levels, and coping mechanisms among MAPEH teachers in secondary schools. The descriptive component was used to determine the extent of occupational stressors experienced by the respondents in terms of workload, student discipline, and administrative demands; the level of burnout in terms of emotional, physical, and mental exhaustion; and the coping mechanisms utilized in terms of problem-focused coping, emotion-focused coping, and social support. The correlational component was used to determine the degree and direction of associations between occupational stressors and burnout, and between coping mechanisms and burnout, without manipulating variables or introducing an intervention. A cross-sectional approach was used because data were collected from respondents at a single point in time during the academic year 2025–2026, allowing the study to capture the prevailing conditions and relationships among the variables within the selected school context. This design was appropriate because the study aimed to generate empirical evidence that could serve as the basis for a teacher-focused intervention plan to promote well-being and reduce burnout among MAPEH teachers.

2.2 Participants

The study was conducted with the MAPEH teacher, 30, from High School during the academic year 2025–2026. Total enumeration sampling was employed because the population of MAPEH teachers in the selected locale was manageable and all eligible teachers could be included as respondents. The participants were teachers actively handling Music, Arts, Physical Education, and Health subjects at the time of data collection, thereby ensuring that the information obtained reflected direct experiences with the occupational demands of MAPEH instruction. Teachers who were on extended leave, assigned exclusively to administrative functions, or not teaching MAPEH classes during the data-gathering period were excluded from the study. This participant selection was appropriate because the study required respondents who were directly exposed to workload demands, student discipline concerns, administrative responsibilities, burnout experiences, and coping practices within the MAPEH teaching context. By including all eligible MAPEH teachers in the school, the study generated a comprehensive, context-specific

profile of occupational stressors, burnout levels, and coping mechanisms as a basis for developing a teacher-focused intervention plan.

2.3 Instrumentation

The primary instrument used in the study was a structured survey questionnaire designed to gather quantitative data on occupational stressors, burnout levels, and coping mechanisms among MAPEH teachers. The questionnaire was developed based on the Statement of the Problem and relevant literature on teacher stress, burnout, and coping strategies to ensure alignment with the study variables. It was organized into four parts: the first part measured perceived occupational stressors in terms of workload, student discipline, and administrative demands; the second part assessed burnout in terms of emotional, physical, and mental exhaustion; the third part determined coping mechanisms categorized as problem-focused coping, emotion-focused coping, and social support; and the fourth part gathered demographic information such as age, sex, educational attainment, teaching experience, teaching load, and area of specialization. The items were constructed using a Likert-type scale, allowing respondents to indicate the extent of their agreement or the frequency of their experience with each statement. Prior to administration, the questionnaire was reviewed by the research adviser and subject experts to assess content validity, clarity, appropriateness, and consistency with the study's objectives. The use of this structured instrument enabled systematic measurement and statistical analysis of the variables necessary for developing a teacher-focused intervention plan.

2.4 Data Analysis

The data gathered from the structured survey questionnaire were organized, coded, and analyzed using descriptive and inferential statistical procedures aligned with the study's objectives. Descriptive statistics, particularly frequency, percentage, weighted mean, and overall mean, were used to determine the extent of occupational stressors experienced by MAPEH teachers in terms of workload, student discipline, and administrative demands; the level of burnout in terms of emotional, physical, and mental exhaustion; and the coping mechanisms utilized in terms of problem-focused coping, emotion-focused coping, and social support. The computed means were interpreted using the prescribed Likert-scale descriptors to describe the level or extent of each variable. To examine the relationships among the major variables, Pearson's correlation coefficient was used to determine whether significant associations existed between occupational stressors and burnout, and between coping mechanisms and burnout. The hypotheses were tested at the 0.05 level of significance. This analytical procedure enabled the study to describe the prevailing conditions among MAPEH teachers and to establish a statistical basis for developing a teacher-focused intervention plan to reduce burnout and strengthen coping resources.

3 Results

The results revealed that MAPEH teachers experienced occupational stress to a high extent, with an overall mean of 3.65. Among the identified occupational stressors, workload had the highest mean of 3.78, followed by student discipline (3.62) and administrative demands (3.55). These findings indicate that the respondents perceived their teaching and non-teaching responsibilities as major sources of stress. The result further suggests that MAPEH teachers are affected not only by classroom instruction but also by the preparation of learning materials, assessment of performance-based outputs, management of active learners, participation in school activities, and compliance with administrative requirements.

The study also found that respondents experienced high levels of burnout, with an overall mean of 3.59. Emotional exhaustion had the highest mean of 3.70, followed by mental exhaustion (3.60) and physical exhaustion (3.48). This result indicates that the continuous exposure of

MAPEH teachers to work-related demands contributed to feelings of emotional strain, mental fatigue, and physical tiredness. The finding implies that burnout among MAPEH teachers is not limited to physical fatigue but also involves psychological and emotional depletion, which may affect motivation, instructional performance, and overall professional well-being.

The relationship between occupational stressors and burnout showed a significant positive correlation ($r = 0.69$). This result indicates that as occupational stressors increased, burnout among MAPEH teachers also increased. The finding supports the assumption that workload, student discipline concerns, and administrative demands are closely associated with emotional, physical, and mental exhaustion. It further implies that when stressors are inadequately managed or reduced, teachers may become more vulnerable to burnout, which can negatively affect their teaching effectiveness, professional satisfaction, and capacity to sustain quality instruction.

Regarding coping mechanisms, the respondents reported high utilization, with an overall mean of 3.75. Problem-focused coping had the highest mean of 3.85, followed by social support (3.72) and emotion-focused coping (3.68). These results suggest that MAPEH teachers commonly address stress by planning tasks, managing time, solving work-related problems, seeking support from colleagues or family, and regulating their emotional responses. The dominance of problem-focused coping indicates that the respondents tended to manage stress by directly addressing its sources rather than relying solely on emotional adjustment.

The relationship between coping mechanisms and burnout showed a significant negative correlation ($r = -0.63$). This means that as the use of coping mechanisms increased, the level of burnout decreased. The finding highlights the protective role of effective coping strategies in reducing the negative impact of occupational stress. It also suggests that teachers who actively use problem-focused coping, emotion-focused coping, and social support may be better able to manage professional demands and maintain psychological well-being. Taken together, the findings provide a strong basis for developing a teacher-focused intervention plan that addresses workload concerns, strengthens coping resources, promotes peer support, and reduces burnout among MAPEH teachers.

4. Discussion

The finding that MAPEH teachers experienced a high level of occupational stress corroborates the existing literature, which shows that teachers are increasingly exposed to work-related demands that extend beyond classroom instruction. In the present study, workload emerged as the most prominent stressor, followed by student discipline and administrative demands. This result is consistent with Herman, Hickmon-Rosa, and Reinke (2020), who emphasized that teacher stress is shaped by classroom demands, professional responsibilities, coping resources, and school context. For MAPEH teachers, stress may be intensified because their subject area requires performance-based instruction, movement-oriented activities, preparation of varied learning materials, assessment of practical outputs, and maintenance of safety during active classes. The high stress level reported in the study therefore reflects the complex nature of MAPEH teaching, in which instructional responsibilities are combined with behavioral management and administrative compliance.

The high level of burnout among the respondents, particularly in emotional and mental exhaustion, further supports the assumption that prolonged exposure to occupational stress can weaken teacher well-being. Burnout is commonly associated with sustained emotional strain, mental fatigue, reduced motivation, and diminished professional functioning. The World Health Organization (2022) emphasizes that workplaces should address psychosocial risks through organizational, managerial, and individual interventions to protect mental health and promote productivity. In the context of the present study, the high burnout level suggests that MAPEH teachers may be vulnerable to emotional depletion when workload, student discipline issues, and

administrative demands remain continuous and insufficiently managed. This finding highlights the need for school-level systems that recognize burnout not as an individual weakness but as an occupational concern that requires an institutional response.

The significant positive relationship between occupational stressors and burnout confirms that higher exposure to work-related stress is associated with higher levels of teacher burnout. This result aligns with the teacher well-being literature, which consistently identifies excessive workload, classroom management problems, and organizational pressure as predictors of burnout. The finding also supports the Department of Education's policy direction, which issued workload rationalization measures to allow teachers to devote more time to classroom teaching and to clarify teaching-related and non-teaching tasks (Department of Education, 2024). In this regard, the study provides local empirical support for workload-management initiatives, particularly for MAPEH teachers whose duties often include teaching, coaching, event preparation, performance assessment, and participation in school programs. Reducing unnecessary administrative burdens may therefore help lessen burnout risk and improve teachers' capacity to deliver quality instruction.

The finding that MAPEH teachers frequently used coping mechanisms, with problem-focused coping as the most utilized strategy, indicates that the respondents actively attempted to manage the sources of their stress. Problem-focused coping, such as planning, prioritizing tasks, managing time, and solving work-related problems, is generally considered adaptive because it directly addresses stressors. Emotion-focused coping and social support remain important because they help teachers regulate their emotions and draw strength from colleagues, family members, and school leaders. UNESCO, UNICEF, and Education International (2021) stressed that teachers are central to education recovery and must be supported through policies and systems that protect their professional and personal well-being. The present result suggests that while teachers possess coping capacity, such capacity should be strengthened through structured wellness programs, peer-support systems, mentoring, and accessible psychosocial assistance.

Finally, the significant negative relationship between coping mechanisms and burnout demonstrates the protective role of effective coping strategies in sustaining teacher well-being. As the use of coping mechanisms increased, burnout decreased, suggesting that teachers who manage stress through problem-solving, emotional regulation, and social support are more likely to withstand occupational demands. This finding supports the development of a teacher-focused intervention plan that addresses both reducing stressors and strengthening coping resources. Such an intervention may include workload review, stress management training, peer support groups, counseling referral systems, time management workshops, and administrator-led support mechanisms. Overall, the findings confirm that reducing burnout among MAPEH teachers requires a balanced approach: schools must lessen avoidable stressors while also empowering teachers with practical, emotional, and social coping strategies.

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IMPACT OF RECREATIONAL PHYSICAL ACTIVITIES ON THE WELLNESS AND ACADEMIC PERFORMANCE OF SENIOR HIGH SCHOOL LEARNERS

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Abstract

Senior High School learners increasingly experience academic demands, sedentary habits, and wellness concerns that may affect their physical, psychological, social, and academic development. This study investigated the influence of recreational physical activities on the wellness and academic performance of Senior High School learners. Specifically, it compared the self-reported wellness and academic achievement scores of learners who regularly engaged in recreational physical activities with those who did not, determined significant differences between the two groups, and examined the relationship between recreational activity participation and academic performance. A quantitative comparative-correlational research design was employed. Data were gathered through a researcher-developed recreational physical activity checklist, a standardized wellness questionnaire covering physical, psychological, and social wellness, and official academic achievement records. Descriptive statistics, an independent-samples t-test, and a Pearson product-moment correlation were used to analyze the data. Findings showed that active learners obtained higher wellness scores in physical, psychological, and social domains than non-active learners. Results also revealed a significant difference in the two groups' wellness scores. In terms of academic achievement, learners who regularly participated in recreational physical activities recorded higher scores than their inactive counterparts, with the difference statistically significant. Moreover, participation in recreational physical activities showed a positive and significant correlation with academic performance. These findings suggest that recreational physical activities contribute to learners' holistic wellness and academic success. Based on the results, school-based programs such as wellness breaks, after-school recreational clubs, peer-led group activities, and active lifestyle campaigns are recommended to promote learner well-being and academic performance.

Keywords: Recreational Physical Activities, Wellness, Academic Performance, Senior High School Learners, Active Lifestyle, Holistic Development

1. Introduction

Senior High School learners are increasingly negotiating academic pressure, sedentary digital habits, and psychosocial concerns during a developmental period when wellness and school performance are closely interdependent. Adolescence is marked by rapid biological, emotional, social, and cognitive transitions; thus, habits formed during this stage may shape both present functioning and long-term health behavior. Within the school context, wellness is not only a health concern but also an educational one, as learners who experience fatigue, stress, weak social connections, and low self-regulation may struggle to sustain attention, complete academic tasks, and participate meaningfully in class. The World Health Organization (WHO, 2020) recommends that children and adolescents accumulate at least 60 minutes of moderate-to-vigorous physical activity daily, yet recent global estimates indicate that about 4 in 5 adolescents do not meet these recommendations (WHO, 2024). This situation suggests that schools should examine practical, enjoyable, and inclusive forms of movement that may support learner development without limiting participation to competitive athletics.

Recreational physical activities provide one such pathway. Unlike varsity sports or performance-oriented training, recreational physical activities are voluntary, enjoyable, and usually non-competitive movements performed during free time, including walking, jogging, biking, dance fitness, outdoor games, aerobics, and informal team play. Their educational value lies in their accessibility: learners with different abilities, interests, body types, and skill levels may participate without the pressure of elite performance. The WHO global action framework recognizes active recreation, play, sport, and school-based movement opportunities as important strategies for reducing physical inactivity and improving population health (WHO, 2018). In the Philippine Senior High School context, Physical Education and Health also emphasizes health-optimizing physical activity, fitness, and lifelong wellness, indicating that movement-based learning is part of holistic learner formation rather than a peripheral school activity (Department of Education, 2018). These policy directions support the view that schools should not only teach academic content but also provide environments where learners can develop active, balanced, and socially connected lifestyles.

A growing body of empirical literature links physical activity with adolescent wellness. Systematic reviews indicate that physical activity is associated with better mental health outcomes among children and adolescents, including lower depressive symptoms and improved psychological functioning (Biddle et al., 2019; Rodriguez-Ayllon et al., 2019). These effects may operate through several mechanisms: movement can reduce physiological stress responses, improve sleep quality and perceived energy, increase self-efficacy, and provide opportunities for peer interaction and a sense of belonging. For adolescents who often face academic workload, identity development, and social adjustment, recreational activities may function as an adaptive coping resource. This is particularly relevant for Senior High School learners, who are expected to manage specialized subjects, career preparation, family expectations, and transition-related decisions. When recreational physical activity is embedded in school culture, it may strengthen physical wellness while also supporting psychological and social wellness—domains that are essential to holistic education.

Physical activity is also relevant to academic performance because cognition and learning are influenced by physical and emotional conditions. Evidence from systematic reviews shows that physical activity can support cognitive outcomes such as attention, executive function, processing speed, and academic-related performance, although the strength of effects may vary by activity type, duration, intensity, and research design (Singh et al., 2019). Likewise, the WHO guidelines identify cognitive outcomes, including academic performance and executive function, as health-related benefits of physical activity for children and adolescents (WHO, 2020). Recreational activities may therefore contribute indirectly to academic achievement by improving concentration, mood regulation, motivation, classroom readiness, and persistence. However, the relationship should not be interpreted simplistically. Academic outcomes are also shaped by teaching quality, socioeconomic conditions, parental support, study habits, nutrition, sleep, and school resources. For this reason, localized empirical investigation remains necessary to determine whether physically active learners differ meaningfully from less active learners within a specific school context.

Despite the recognized benefits of physical activity, many school systems continue to prioritize academic achievement and assessment outcomes, sometimes at the expense of daily opportunities for movement. The challenge is not merely to encourage physical activity in general, but to identify whether recreational participation is associated with measurable differences in wellness and academic achievement among learners. This distinction is important because recreational activities are more inclusive than formal competitive sports and may be easier for schools to sustain through wellness breaks, after-school clubs, peer-led activities, and activity-integrated classroom routines. In addition, national concern for student well-being is reinforced by the Philippine Mental Health Act, which establishes the promotion and protection of mental

health as a public policy priority (Republic Act No. 11036, 2018). Within this policy climate, schools have a strong basis for adopting preventive, developmentally appropriate, and evidence-informed wellness interventions.

Accordingly, this study investigates the impact of recreational physical activities on the wellness and academic performance of Senior High School learners. It specifically examines the mean self-reported wellness scores of learners who regularly engage in recreational physical activities and those who do not, across physical, psychological, and social wellness domains. It further determines whether significant differences exist between the two groups in wellness and academic achievement, and whether participation in recreational physical activities is significantly correlated with performance scores. By generating school-level evidence, the study aims to clarify the educational significance of recreational physical activities and provide a basis for proposed programs that promote active lifestyles, learner wellness, and improved academic performance.

2. Method

2.1 Research Design

The study employed a quantitative comparative-correlational research design to determine the influence of recreational physical activities on the wellness and academic performance of Senior High School learners. The comparative component examined whether statistically significant differences existed in the self-reported wellness and academic achievement scores of learners who regularly engaged in recreational physical activities and those who did not. This design was appropriate because the study sought to compare two distinct learner groups based on measurable outcomes, particularly physical, psychological, and social wellness, as well as academic achievement. Meanwhile, the correlational component was utilized to determine the degree and direction of association between learners' participation in recreational physical activities and their academic performance. Since the variables were expressed numerically and subjected to statistical analysis, the quantitative approach enabled objective measurement, systematic comparison, and empirical interpretation of the findings. Overall, the design provided a rigorous methodological basis for determining group differences, identifying meaningful relationships among the study variables, and generating evidence-based inputs for proposed school programs to promote recreational physical activities, learner wellness, and academic performance.

2.2 Participants

The study was conducted with Senior High School learners enrolled at Dagupan City National High School during the period covered by the investigation. A total of 150 learners served as respondents and constituted the primary data source for the study. They were selected using an appropriate sampling procedure to ensure fair representation of learners who regularly engaged in recreational physical activities and those who did not. The participants provided data on their demographic profiles, the frequency and duration of recreational physical activity, and self-reported wellness across physical, psychological, and social dimensions. Their academic achievement scores were obtained from official school records with proper authorization and were matched with the survey responses using coded identifiers to maintain confidentiality. The inclusion of Senior High School learners was appropriate because this group experiences increasing academic demands and developmental transitions that may influence both wellness and school performance. Thus, the selected participants provided sufficient empirical data for comparing wellness and academic achievement between active and inactive learners and for determining the relationship between recreational physical activity participation and academic performance.

2.3 Instrumentation

The study employed three primary instruments to gather the quantitative data required for the investigation. First, a researcher-developed Recreational Physical Activity Checklist was used to assess learners' participation in recreational physical activities, including frequency, duration, and type of activity. This instrument enabled the classification of respondents into active and non-active learner groups. Second, a standardized wellness questionnaire was used to measure learners' self-reported wellness across three domains: physical, psychological/emotional, and social. The questionnaire used a Likert-scale format, allowing respondents to indicate the extent to which each statement described their wellness condition. Third, official academic achievement scores were obtained from school records to provide an objective measure of the learners' academic performance. These records were matched with survey responses through coded identifiers to ensure confidentiality and accuracy. Taken together, these instruments provided complementary data sources: self-reported measures for activity participation and wellness, and verified school-based records for academic achievement. Their combined use strengthened the study's validity by allowing the researcher to compare wellness and academic performance between active and inactive learners and to examine the relationship between recreational physical activity participation and academic outcomes.

2.4 Data Analysis

The data gathered in the study were analyzed using appropriate descriptive and inferential statistical procedures aligned with the comparative-correlational nature of the research. Descriptive statistics, including frequency distributions, means, and standard deviations, were used to summarize learners' participation in recreational physical activities, their self-reported wellness scores in the physical, psychological, and social domains, and their academic achievement scores. To determine whether significant differences existed between learners who regularly engaged in recreational physical activities and those who did not, the independent-samples t-test was employed for both wellness and academic performance measures, with Levene's Test for Equality of Variances used to assess the assumption of homogeneity of variances where necessary. To examine the relationship between participation in recreational physical activities and academic performance, the Pearson product-moment correlation coefficient was used to assess the strength and direction of the association. The hypotheses were tested at the .05 level of significance, thereby allowing the researcher to establish whether the observed differences and relationships were statistically meaningful. The results of these analyses provided an empirical basis for interpreting the impact of recreational physical activities on learner wellness and academic performance and for formulating school-based programs responsive to the findings.

3 Results

The study found that Senior High School learners who regularly engaged in recreational physical activities reported higher self-reported wellness scores than those who did not. Across the three wellness domains, active learners consistently showed better outcomes, with mean scores of 4.21 in physical wellness, 4.09 in psychological wellness, and 4.15 in social wellness. In contrast, non-active learners obtained lower mean scores of 3.58, 3.47, and 3.62, respectively. The overall mean wellness score of active learners was 4.15, while non-active learners obtained an overall mean of 3.56. These findings suggest that regular participation in recreational physical activities may be associated with improved physical vitality, emotional stability, and social functioning among learners.

The independent-samples t-test further confirmed that the difference in wellness scores between active and inactive learners was statistically significant. Active learners had a mean wellness score of 4.15 (SD = 0.38), while non-active learners had a mean score of 3.56 (SD =

0.41). The computed t-value of 4.72 and p-value of 0.000 indicated a significant difference between the two groups. This result implies that learners who regularly participated in recreational physical activities demonstrated significantly better wellness than their non-active counterparts. The finding supports the assumption that recreational physical activities contribute not only to physical health but also to psychological and social well-being.

In terms of academic achievement, the study found that learners who regularly engaged in recreational physical activities also obtained higher academic performance scores. Active learners recorded a mean academic achievement score of 87.35, while non-active learners obtained a lower mean score of 83.27. This difference suggests that learners who participated in recreational activities may have benefited from improved focus, motivation, emotional regulation, and readiness for learning. Since academic performance is influenced by multiple factors, the result should be interpreted as an observed association rather than direct proof of causation; nevertheless, it provides meaningful evidence that active learners performed better academically than those who were less physically engaged.

The statistical test on academic achievement scores showed that the difference between the two groups was significant. Active learners obtained a mean score of 87.35 with a standard deviation of 3.95, while non-active learners obtained a mean score of 83.27 with a standard deviation of 4.22. The computed t-value of 3.89 and p-value of 0.000 confirmed that the academic performance of active learners was significantly higher than that of non-active learners. Furthermore, the Pearson correlation analysis showed a positive and significant relationship between recreational physical activity participation and academic performance ($r = 0.42$, $p = 0.001$). This indicates that as participation in recreational physical activities increased, academic performance also tended to improve.

Based on these findings, the study identified the need to strengthen school-based programs that promote recreational physical activity among Senior High School learners. The proposed programs included weekly wellness breaks, academic-recreational integration strategies, after-school recreational activity clubs, peer-led group fitness and activity sessions, and a schoolwide active lifestyle campaign. These programs directly address the observed differences in wellness and academic performance, as well as the positive relationship between activity participation and achievement. Overall, the results suggest that recreational physical activities are valuable components of holistic learner development and should be incorporated into school wellness and academic support initiatives.

4. Discussion

The study found that Senior High School learners who regularly engaged in recreational physical activities achieved higher levels of physical, psychological, and social wellness than those who did not. This result is consistent with the broader literature, which emphasizes that physical activity contributes to adolescent well-being by supporting physical fitness, emotional regulation, stress reduction, and social connectedness. The World Health Organization (2020, 2024) affirms that regular physical activity among children and adolescents promotes physical fitness, cognitive development, and mental health. Similarly, Rodriguez-Ayllon et al. (2019) reported that physical activity is positively associated with mental health outcomes among children and adolescents, while Biddle et al. (2019) emphasized that movement-based participation may contribute to better psychological functioning. In this context, the higher wellness scores of active learners suggest that recreational activities may serve as accessible wellness-promoting experiences that help learners manage academic pressure and developmental challenges.

The significant difference in wellness scores between active and non-active learners further strengthens the interpretation that recreational physical activity is meaningfully associated with holistic learner wellness. This finding indicates that the benefits of activity participation extend

beyond bodily fitness and may include psychological and interpersonal gains. Recreational activities such as walking, jogging, biking, dance workouts, and non-competitive games provide learners with opportunities for enjoyment, emotional release, peer interaction, and the development of self-confidence. These outcomes align with the view that school-based physical activity should not be limited to competitive sports but should include inclusive and enjoyable forms of movement that encourage broader participation. Masini et al. (2022) found that school-based active-break interventions among pre-adolescent and adolescent students may improve physical activity levels, classroom behavior, cognitive functions, and well-being. Thus, the present findings corroborate the importance of integrating recreational movement into school wellness initiatives.

In terms of academic achievement, the study found that active learners achieved higher mean scores than non-active learners. This finding is supported by evidence suggesting that physical activity may enhance academic functioning through improved attention, executive function, motivation, and classroom readiness. Singh et al. (2019) concluded that physical activity interventions can support cognitive and academic performance among children and adolescents, particularly when activities are developmentally appropriate and properly integrated into school contexts. The positive academic performance of active learners in the present study may therefore be partly linked to the cognitive and emotional benefits of regular movement. However, the result should be interpreted with caution, as academic performance is also shaped by multiple factors, including teaching quality, study habits, family support, socioeconomic conditions, sleep, nutrition, and learner motivation.

The significant difference in academic achievement scores between active and inactive learners provides additional evidence that recreational physical activity may be associated with better academic outcomes. This does not necessarily establish direct causation, but it supports the idea that learners who maintain active lifestyles may possess conditions that favor academic success. Physical activity may help reduce stress, improve alertness, support emotional stability, and enhance self-regulation, all of which are relevant to learning. The positive and significant correlation between recreational activity participation and academic performance further indicates that as learners' involvement in recreational physical activities increases, their academic performance also tends to improve. This relationship supports the study's conceptual assumption that wellness and academic functioning are interconnected dimensions of learner development.

Taken together, the findings support the development of school-based programs that promote recreational physical activity as part of a broader strategy to improve learner wellness and academic performance. The proposed programs, such as weekly wellness breaks, after-school recreational clubs, peer-led fitness sessions, academic-recreational integration strategies, and schoolwide active lifestyle campaigns, are aligned with international recommendations encouraging schools to create supportive environments for physical activity (WHO, 2020). Given that WHO (2024) reported that a large proportion of adolescents globally do not meet recommended physical activity levels, schools have an important role in addressing sedentary behavior through structured, inclusive, and enjoyable movement opportunities. Therefore, the study's results provide empirical support for strengthening recreational physical activity programs as a practical approach to promoting holistic development among Senior High School learners.

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PROJECT REBOUND: A REMEDIAL SUPPORT PROGRAM FOR LOW PERFORMING LEARNERS IN MAPEH

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Abstract

Academic underperformance in MAPEH remains a persistent concern, with learners earning failing or near-failing grades and requiring structured remedial support to recover lost competencies. This study developed and evaluated Project Rebound, a remedial support program for low-performing learners in Music, Arts, Physical Education, and Health at the Junior High School Department of Alejandro F. Oligan National High School during School Year 2025–2026. Specifically, it determined learners' academic performance before the intervention in terms of written assessments, performance-based tasks, and quarterly grades; identified the key components of the program; established its content validity and acceptability; examined the significant difference between pretest and posttest academic performance; assessed learner engagement and motivation after participation; and described the final form of the developed program. The study employed a quantitative developmental-evaluative design using a single-group pretest-posttest approach. Sixty learners with failing or near-failing MAPEH grades were selected through purposive sampling, while five MAPEH experts validated the program. Data were gathered through written achievement tests, performance-based assessment rubrics, an expert validation checklist, and a learner engagement and motivation questionnaire. Findings showed that learners initially performed below the proficiency level, while Project Rebound was found to be highly valid and acceptable. After the six-week intervention, written assessment scores, performance-based task ratings, and quarterly grades significantly improved. Learners also reported high to very high engagement and motivation. The study concluded that Project Rebound effectively improved academic performance and may serve as a structured remedial model for MAPEH learners in similar public secondary school settings.

Keywords: Project Rebound, Remedial Support Program, Low-Performing Learners, MAPEH, Academic Performance, Learner Engagement

1. Introduction

Academic underperformance remains a continuing concern in basic education, particularly among learners who obtain failing or near-failing grades and are at risk of developing persistent competency gaps. In performance-oriented subjects such as Music, Arts, Physical Education, and Health (MAPEH), low achievement may reflect not only limited content knowledge but also insufficient mastery of psychomotor, creative, and applied health-related competencies. Unlike purely written subjects, MAPEH requires learners to demonstrate understanding through written assessments, practical tasks, physical performance, artistic production, and behavioral application. Consequently, learners who struggle in MAPEH may require a more structured, multidimensional remediation that addresses cognitive, affective, and performance-based learning needs.

Remedial instruction has become a necessary academic support mechanism for learners who do not meet expected competency standards. In the Philippine basic education system, classroom assessment policies emphasize using assessment results to support learner progress and to provide opportunities for learners to catch up on competencies they have not mastered. DepEd Order No. 29, s. 2015, which clarified classroom assessment guidelines under the K to 12

Basic Education Program, recognized the need to provide learning opportunities for learners who had failed so they could make progress on specific competencies (Department of Education, 2015). More recently, Republic Act No. 12028, also known as the Academic Recovery and Accessible Learning (ARAL) Program Act, established a national learning intervention program intended to help struggling learners attain the competencies set by the Department of Education (Republic Act No. 12028, 2024). These policy directions affirm that academic recovery is not a peripheral activity but a formal responsibility of schools.

The need for remedial support became even more pronounced as schools faced learning gaps intensified by disruptions in instruction and uneven learner readiness. The ARAL Program Act was designed as a national response to learning losses and seeks to provide free and effective learning interventions for struggling learners (Republic Act No. 12028, 2024). Although the national program prioritizes essential learning areas such as reading, mathematics, and science, the principle behind ARAL is equally relevant to MAPEH: learners who fail to meet expected competencies need timely, structured, and accessible support. MAPEH is an important component of holistic education because it develops physical literacy, artistic expression, health awareness, creativity, discipline, collaboration, and performance confidence. Thus, remedial programs in MAPEH should be designed not only to improve grades but also to rebuild learners' confidence and engagement.

Research on classroom interventions supports the use of systematic assessment, feedback, and repeated practice to improve learner outcomes. Formative assessment has been shown to promote student learning by providing timely information about learners' progress and by guiding instructional adjustments. In a meta-analysis of formative assessment practices, Karaman (2021) reported that formative assessment had a positive overall effect on student learning, with different forms of feedback contributing to measurable improvement. Similarly, Yang et al. (2021) found that testing or quizzing can enhance classroom learning and long-term retention when it is used as an instructional strategy, especially when combined with corrective feedback and repeated opportunities for retrieval. These findings support the idea that remedial programs should not merely repeat regular lessons but should include diagnosis, targeted instruction, feedback, practice, and reassessment.

Project Rebound responds to this need by offering a structured remedial support program for low-performing learners in MAPEH. The program is designed around key instructional components, including instructional design, remedial strategies, learning materials and activities, and monitoring and feedback mechanisms. This structure reflects the principle that academic recovery should be planned, competency-based, and measurable. Through diagnostic assessment, differentiated instruction, guided practice, performance-based tasks, and continuous feedback, the program seeks to address specific learning gaps among learners who obtained failing or near-failing grades. The inclusion of both written assessments and performance-based evaluations is particularly important in MAPEH because achievement in the subject cannot be captured solely through paper-and-pencil tests.

Despite the recognized importance of remediation, many intervention studies and school-based programs focus primarily on core academic subjects, leaving performance-based disciplines such as MAPEH less examined. This creates a research-practice gap. MAPEH requires a remedial model that can address multiple learning domains simultaneously: cognitive understanding in Music, Arts, Physical Education, and Health; psychomotor performance in movement and skills; creative expression in arts-based outputs; and motivation to participate in learning activities. Moreover, remedial programs are often implemented informally, without systematic validation, structured monitoring, or empirical evaluation. Such limitations make it difficult to determine whether a program is instructionally sound, acceptable to experts, feasible for school use, and effective in improving learner outcomes.

The present study was therefore conducted to develop and evaluate Project Rebound as a remedial support program for low-performing learners in MAPEH. Specifically, the study determined learners' academic performance before the intervention in terms of written assessments, performance-based tasks, and quarterly grades; identified the key components of the program; established its content validity and acceptability through expert evaluation; examined whether significant differences existed between pretest and posttest academic performance; assessed learner engagement and motivation after participation; and described the final form of the developed program. Using a quantitative developmental-evaluative design with a single-group pretest-posttest design, the study aimed to generate empirical evidence on the effectiveness of Project Rebound. The findings are expected to support MAPEH teachers, school administrators, curriculum planners, and future researchers in designing structured, validated, and learner-responsive remediation programs that promote academic recovery, skill development, and sustained learner engagement.

2. Method

2.1 Research Design

The study employed a quantitative developmental-evaluative research design to develop, validate, and determine the effectiveness of Project Rebound as a remedial support program for low-performing learners in MAPEH. The developmental phase focused on the systematic construction of the program, including its instructional design, remedial strategies, learning materials and activities, and monitoring and feedback mechanisms. This phase also involved expert validation to establish the program's content validity, acceptability, and feasibility prior to implementation. The evaluative phase used a single-group pretest-posttest design to assess changes in learners' academic performance before and after participation in the six-week remedial intervention. Academic performance was assessed through written assessments, performance-based tasks, and quarterly grades, while learner engagement and motivation were measured after the intervention using a structured survey questionnaire. This design was appropriate because the study aimed to determine whether exposure to a structured remedial program produced measurable improvements among learners with failing or near-failing grades. Although no control group was used, the design allowed the researcher to compare baseline and post-intervention performance and to generate empirical evidence regarding the effectiveness of Project Rebound as a school-based academic recovery program in MAPEH.

2.2 Participants

The study was 60 low-performing Junior High School learners enrolled at Alejandro F. Oligan National High School, Asan Sur, Sison, Pangasinan, during School Year 2025–2026. The learners were selected through purposive sampling based on official academic records showing that they obtained failing grades below 75% or near-failing grades between 75% and 77% in MAPEH during the third quarter. This selection criterion ensured that the respondents were academically at risk and well-suited to the objectives of Project Rebound, a remedial support program. Learners were included if they were officially enrolled during the study, met the academic eligibility criteria, expressed willingness to participate, and secured parental or guardian consent, along with learner assent. Those who obtained grades above 77%, were not officially enrolled during the intervention period, had medical or documented conditions that prevented participation in performance-based tasks without clearance, or declined to participate were excluded from the study. In addition, five qualified MAPEH educators served as expert validators of the program, evaluating its objectives, content relevance, instructional strategies, assessment procedures, and implementation feasibility. Through this participant structure, the study obtained both learner-

based intervention data and expert-based validation evidence necessary for evaluating the effectiveness and acceptability of Project Rebound.

2.3 Instrumentation

The study used structured, validated quantitative instruments to collect data on the development, acceptability, and effectiveness of Project Rebound. A written achievement test was used to measure learners' cognitive mastery of MAPEH competencies before and after the intervention, with parallel pretest and posttest forms prepared to ensure comparability of results. Performance-based assessment rubrics were employed to evaluate learners' psychomotor and creative competencies in Music, Arts, Physical Education, and Health through practical demonstrations, skill execution, and performance tasks. To determine the affective outcomes of the program, a learner engagement and motivation survey questionnaire was administered after the six-week intervention, using a Likert-scale format to measure participation, interest, effort, confidence improvement, and overall motivation. During the developmental phase, five qualified MAPEH educators used an expert validation checklist to assess the program's objectives, content relevance, instructional strategies, assessment procedures, and implementation feasibility. The instruments were aligned with the study objectives and MAPEH competencies, and they underwent content validation to ensure clarity, relevance, appropriateness, and consistency. Through these instruments, the study generated measurable data necessary to determine the validity of Project Rebound and its effectiveness in improving the academic performance, engagement, and motivation of low-performing learners in MAPEH.

2.4 Data Analysis

The quantitative data were analyzed using descriptive and inferential statistical procedures aligned with the study's developmental and evaluative objectives. Descriptive statistics, including mean, standard deviation, weighted mean, and descriptive interpretation, were used to summarize learners' pretest and posttest academic performance in written assessments, performance-based tasks, and quarterly grades, as well as the expert validators' ratings on the content validity and acceptability of Project Rebound. Weighted means were also used to determine the level of learner engagement and motivation after participation in the program, including participation, interest, effort, confidence improvement, and overall motivation. To determine the intervention's effectiveness, a paired-samples t-test was used to examine whether there was a statistically significant difference in learners' academic performance before and after the six-week implementation of Project Rebound. The null hypothesis was tested at the 0.05 significance level. In addition, the effect size was considered to determine the practical magnitude of the intervention's impact beyond statistical significance. Through this analytical procedure, the study established whether Project Rebound produced measurable academic improvement and whether the developed remedial support program was valid, acceptable, and pedagogically useful for low-performing learners in MAPEH.

3 Results

The results showed that prior to the implementation of Project Rebound, the low-performing learners demonstrated below-proficiency levels in MAPEH. The pretest mean for the written assessment was 72.45, and the mean for performance-based tasks was 73.10, both indicating proficiency below. The quarterly grade mean of 74.20 further indicated that the learners were academically at risk and near the failing level. These findings confirmed the presence of measurable competency gaps in both cognitive and performance-based areas of MAPEH. The baseline results, therefore, justified the need for a structured remedial support program that could address learners' deficiencies through targeted instruction, guided practice, and continuous feedback.

In terms of program development, Project Rebound was designed around key components that addressed the identified learning needs of low-performing learners. These components included instructional design, remedial strategies, learning materials and activities, and monitoring and feedback mechanisms. The instructional design ensured that the remedial objectives were aligned with MAPEH competencies, while the remedial strategies emphasized scaffolded instruction, differentiated activities, and guided practice. Learning materials and activities were developed to support both written and performance-based learning tasks, and monitoring mechanisms were incorporated to track learner progress. This structured organization strengthened the program's instructional coherence and provided a clear framework for implementation.

The content validity and acceptability results indicated that Project Rebound was highly valid as evaluated by five expert validators. Content relevance received the highest mean rating of 4.70, followed by objectives (4.65), assessment procedures (4.60), instructional strategies (4.58), and implementation feasibility (4.55). These ratings showed that the program was considered appropriate, relevant, feasible, and aligned with the intended competencies and learning needs of the respondents. The high validation results further established that Project Rebound had sufficient pedagogical soundness before its field implementation.

After the six-week implementation of Project Rebound, the learners demonstrated significant improvement in academic performance. Written assessment scores increased from 72.45 to 82.30, yielding a mean gain of 9.85. Performance-based task scores improved from 73.10 to 84.15, with the highest mean gain of 11.05. Quarterly grades also increased from 74.20 to 83.40, producing a mean gain of 9.20. The p-values for all three measures were below the 0.05 level of significance, indicating a statistically significant improvement after the intervention. These findings led to the rejection of the null hypothesis and confirmed that Project Rebound effectively enhanced learners' academic performance in MAPEH.

The study also found that learners reported high to very high levels of engagement and motivation after participating in Project Rebound. Confidence improvement obtained the highest mean of 4.50, interpreted as very high, followed by overall motivation with a mean of 4.45, also interpreted as very high. Interest, participation, and effort were likewise rated high, indicating that the intervention positively influenced learners' involvement in remedial activities. These findings suggest that Project Rebound not only improved academic performance but also strengthened learners' confidence, willingness to participate, and motivation to continue improving in MAPEH. Overall, the results support the usefulness of Project Rebound as a structured academic recovery program for low-performing learners.

4. Discussion

The finding that low-performing learners demonstrated below-proficiency levels before the implementation of Project Rebound confirms the need for structured remedial support in MAPEH. The baseline results showed that learners had difficulty not only in written assessments but also in performance-based tasks, indicating that their academic gaps covered both cognitive and applied skill domains. This pattern is expected in MAPEH because the subject requires learners to understand concepts, perform skills, produce outputs, and apply health-related knowledge. The result is consistent with the principle of classroom assessment under DepEd Order No. 8, s. 2015, which states that assessment allows teachers to track and measure learners' progress and adjust instruction accordingly (Department of Education, 2015a). It is also aligned with DepEd Order No. 29, s. 2015, which emphasizes that learners who incurred failures should be provided with learning opportunities to catch up or make progress on specific competencies (Department of Education, 2015b). Thus, the pre-intervention findings justify implementing Project Rebound as a targeted response to documented learning deficiencies.

The high content validity and acceptability ratings from expert validators suggest that Project Rebound was instructionally sound, relevant, and feasible prior to implementation. The program components—comprising instructional design, remedial strategies, learning materials and activities, and monitoring and feedback mechanisms—were aligned with the needs of low-performing learners and with the competency-based nature of MAPEH. This supports the view that remedial instruction must be systematically planned rather than implemented as an informal repetition of previous lessons. A validated remedial program increases the likelihood that intervention activities are coherent, measurable, and responsive to learner needs. The expert validation results therefore strengthened the intervention's credibility by confirming that the program was acceptable in terms of objectives, content relevance, instructional strategies, assessment procedures, and implementation feasibility.

The significant improvement in learners' written assessment scores, performance-based task ratings, and quarterly grades after the six-week implementation of Project Rebound indicates that the intervention was effective in improving academic performance. The increase from below-proficiency and near-failing baseline scores to higher post-intervention performance supports the value of structured remediation, guided practice, and continuous feedback. This finding is corroborated by Karaman's (2021) meta-analysis, which found that formative assessment practices positively affect student learning. It is also supported by Yang et al. (2021), who conducted a systematic and meta-analytic review and found that classroom testing or quizzing can enhance learning and retention, especially when paired with corrective feedback and repeated learning opportunities. In the present study, the use of pretest-posttest assessment, performance rubrics, remedial drills, and feedback mechanisms likely contributed to the observed learning gains.

The high to very high level of learner engagement and motivation after participation in Project Rebound further suggests that academic remediation can influence not only achievement but also affective readiness for learning. Confidence improvement obtained the highest rating, indicating that learners felt more capable of performing MAPEH tasks and improving their grades after experiencing structured academic support. This finding is important because learners with failing or near-failing grades may experience discouragement, avoidance, or low participation. When remedial programs are designed to provide achievable tasks, feedback, and visible progress, they can help rebuild learners' confidence and willingness to participate. In this sense, Project Rebound functioned not only as an academic recovery program but also as a motivational support mechanism that encouraged learners to re-engage with MAPEH learning activities.

Finally, the challenges encountered during implementation, including time limitations, occasional absenteeism, and limited supplementary materials, show that remedial programs require institutional support to become sustainable. These challenges do not weaken Project Rebound's effectiveness; rather, they point to areas for program refinement. The enactment of Republic Act No. 12028, or the Academic Recovery and Accessible Learning Program Act, affirms the State's policy to establish free and effective learning intervention programs so struggling learners can attain competencies set by the Department of Education (Republic Act No. 12028, 2024). Although the law prioritizes reading, mathematics, and science, its academic recovery framework supports the broader principle that schools should provide systematic learning interventions for learners at risk. Therefore, Project Rebound may be strengthened by using modular materials, extending remedial schedules, implementing structured attendance monitoring, and providing administrative support to ensure continuity and scalability in MAPEH.

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BEAT-MATCHED HIGH-INTENSITY INTERVAL TRAINING PROGRAM AND ITS EFFECTS ON CARDIOVASCULAR ENDURANCE AND PERCEIVED MOTIVATION AMONG GRADE 10 LEARNERS

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Abstract

Declining physical activity and low engagement in school-based exercise have become pressing concerns among adolescents, particularly in physical education settings where traditional routines often fail to sustain motivation and cardiovascular development. This study examined the effects of a beat-matched high-intensity interval training (HIIT) program on cardiovascular endurance, perceived motivation, and enjoyment of physical activity among Grade 10 students at Dagupan City National High School. Using a quasi-experimental pretest-posttest non-equivalent groups design, 150 students were assigned to an experimental group exposed to beat-matched HIIT and a control group that participated in traditional physical education activities. Data were collected through the 20-Meter Progressive Aerobic Cardiovascular Endurance Run (PACER), a perceived motivation questionnaire, and the Physical Activity Enjoyment Scale. Findings revealed that the experimental group's mean PACER score improved from 28.45 laps in the pretest to 38.72 laps in the posttest, indicating a substantial gain in cardiovascular endurance. Motivation scores likewise increased from 3.12 to 4.21, reflecting a shift from moderate to high motivation. Moreover, motivation and cardiovascular endurance showed a strong positive relationship ($r = .72$), suggesting that greater motivation was associated with better endurance performance. The experimental group also reported significantly higher enjoyment ($M = 4.32$, $SD = 0.41$) than the control group ($M = 3.71$, $SD = 0.48$), with $t = 6.85$ and $p = .000$. The study concludes that beat-matched HIIT is an effective and engaging intervention for improving fitness, motivation, and enjoyment in secondary school physical education. Its integration may strengthen active lifestyles and student participation in school.

Keywords: Beat-Matched HIIT, Cardiovascular Endurance, Perceived Motivation, Physical Activity Enjoyment, Grade 10 Students

1. Introduction

Adolescent physical inactivity remains a major public health concern worldwide and continues to challenge schools that are expected to cultivate lifelong health habits. The World Health Organization (2024) states that children and adolescents should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily, yet about 80% of adolescents globally do not meet recommended activity levels. This pattern matters because regular physical activity supports physical fitness, cardiometabolic health, bone health, motor development, and mental well-being during the school-age years. In this context, Physical Education (PE) is not merely a curricular requirement; it is one of the most consistent institutional spaces where schools can address inactivity and promote health-enhancing movement behaviors among young people.

Despite this mandate, PE classes often struggle to generate sufficient intensity and sustained engagement to produce meaningful fitness gains. Recent school-based exercise literature notes that PE settings face practical constraints, including limited class time, competing instructional demands, and uneven student motivation, all of which can reduce opportunities for sustained moderate- to vigorous-intensity movement. For this reason, researchers have increasingly argued that school interventions must be both time-efficient and engaging if they are

to improve adolescents' health-related fitness within real instructional schedules. The problem is not only how to get students to move more, but also how to get them to participate with sufficient effort and consistency for measurable physiological adaptation to occur.

Within this discussion, high-intensity interval training (HIIT) has emerged as a promising strategy. HIIT typically alternates short bouts of vigorous activity with brief recovery periods, providing substantial physiological stimulus in a relatively short time. In an umbrella review of 18 systematic reviews covering 223 original studies and 13,900 unique participants, Poon et al. (2024) found that HIIT was effective for improving cardiorespiratory fitness in children and adolescents and was also associated with favorable changes in several cardiometabolic indicators. Likewise, Duncombe et al. (2022), in a systematic review and meta-analysis of school-based HIIT programs, concluded that HIIT is effective for improving several health outcomes in school-aged populations. These findings position HIIT as a practical response to the time limitations of school PE while preserving the intensity needed to improve health-related fitness.

More recent school-based evidence strengthens this argument. Jovanović et al. (2024) reported that a 12-week HIIT intervention implemented during PE classes produced significantly greater improvements in shuttle run performance and estimated VO₂max in adolescents than a comparison condition, concluding that HIIT embedded in PE can significantly improve selected health-related fitness components. Such findings are particularly relevant for cardiovascular endurance, a central marker of aerobic fitness and a key health outcome during adolescence. Because beat-matched HIIT retains the intensity logic of HIIT while adding rhythmic structure, it offers a plausible extension of this evidence base for school-based cardiovascular conditioning.

However, physical improvement alone does not guarantee continued participation. In PE, students' motivation, enjoyment, and perceived competence strongly shape whether they engage fully in activities and whether they develop favorable attitudes toward physical activity beyond the classroom. White et al. (2021), in a systematic review of qualitative studies on self-determination theory in PE, found that need satisfaction was associated with positive affect and increased participation. In contrast, low competence and relatedness were linked to negative affect and reduced participation. This is important because adolescents are unlikely to sustain effort in demanding exercise formats if the activity feels aversive, socially threatening, or monotonous. Thus, interventions in PE are more likely to succeed when they promote not only physiological challenge but also positive affective experience and motivational support.

Music may help address this motivational challenge. Park et al. (2023) argued that music can act as an affective stimulant for physical activity by increasing positive affect, reducing ratings of perceived exertion, and improving performance and oxygen-use efficiency. Their review further proposed three mechanisms through which music may influence exercise behavior: musical pleasure and reward, rhythmic entrainment, and sensory distraction from exertion. In school PE specifically, Cools et al. (2023) found that playing music during PE significantly improved students' intrinsic motivation, enjoyment, and sense of competence, with students reporting greater enthusiasm, energy, and fun during music-supported lessons. These findings suggest that music is not merely decorative in exercise settings; it can alter how learners experience, interpret, and sustain activity.

For Philippine schools, this discussion has practical relevance. The Department of Education's Galaw Pilipinas guidelines institutionalized a national calisthenics exercise program and explicitly linked school-based activity to the daily physical activity needs of children and adolescents. This policy context indicates that the Philippine basic education already recognizes the importance of regular, structured opportunities for movement. However, policy support alone does not determine which PE strategies are most effective for improving both fitness and student engagement. Compared with the stronger literature on HIIT in general and on music use in PE more broadly, there remains a practical need to examine how a beat-matched HIIT format performs when used with secondary school learners in an actual school setting.

In this context, the present study was undertaken. Based on the uploaded thesis, the investigation focused on Grade 10 students of Dagupan City National High School. It examined the effects of an 8- to 12-week beat-matched HIIT program on cardiovascular endurance, perceived motivation, and enjoyment of physical activity, while also considering the relationship between motivation and endurance and comparing enjoyment outcomes with those of students exposed to traditional PE activities. By integrating a physiologically efficient exercise model with a potentially motivating rhythmic structure, the study addresses a school-based question of clear instructional value: whether beat-matched HIIT can serve as an effective, enjoyable, and implementable PE strategy for adolescent learners. In doing so, it provides evidence that may support more engaging, fitness-oriented PE programming and inform a context-responsive action plan for school implementation.

2. Method

2.1 Research Design

The study employed a quasi-experimental research design, specifically the pretest–posttest non-equivalent groups design, to determine the effects of a beat-matched high-intensity interval training (HIIT) program on the cardiovascular endurance, perceived motivation, and enjoyment of Grade 10 students at Dagupan City National High School. This design was appropriate because it enabled the researcher to compare two naturally existing groups under authentic school conditions: an experimental group exposed to the beat-matched HIIT intervention and a control group that continued with traditional physical education activities. Prior to the intervention, both groups were administered baseline assessments using a standardized cardiovascular endurance test and self-report questionnaires on motivation and enjoyment to establish initial comparability. The intervention was then implemented over an 8–12-week period during regular physical education classes, with the experimental group participating in structured music-synchronized HIIT sessions designed to regulate exercise pace and enhance engagement. After the intervention, the same instruments were administered to both groups to determine changes in physical and affective outcomes. By integrating pretest and posttest measurements with group comparisons, the design enabled the study to examine treatment effects in a systematic, statistically defensible manner while preserving the natural educational setting in which the intervention was applied.

2.2 Participants

The participants in the study were 150 Grade 10 students officially enrolled at Dagupan City National High School, selected as respondents because they were in the developmental stage most actively engaged in structured school-based physical education and were physically capable of participating in moderate- to vigorous-intensity exercise interventions. The sample was divided into two groups: an experimental group that underwent the beat-matched high-intensity interval training (HIIT) program for 8–12 weeks and a control group that continued with traditional physical education activities, thereby allowing a direct comparison of outcomes under authentic classroom conditions. A purposive sampling technique was employed to ensure that only students who met the inclusion criteria were admitted to the study, specifically those who were regularly attending Grade 10 physical education classes, medically fit to participate, and free from physical limitations or health conditions that could compromise safety or performance during the intervention. Students with medical concerns that might restrict physical exertion were excluded to protect participant welfare and to preserve the internal consistency of the dataset. This participant structure was appropriate for the study because it provided a manageable yet sufficiently robust sample for examining the effects of the beat-matched HIIT program on

cardiovascular endurance, perceived motivation, and enjoyment within a real secondary school context.

2.3 Instrumentation

The study employed a set of carefully selected and functionally aligned instruments to capture both the physiological and psychological outcomes of the beat-matched high-intensity interval training (HIIT) intervention among Grade 10 students. Cardiovascular endurance was measured using the 20-Meter Progressive Aerobic Cardiovascular Endurance Run (PACER) test, which served as the primary standardized fitness instrument for determining pretest and posttest changes in aerobic capacity. To assess the psychological dimension of the intervention, the researcher administered a motivation questionnaire to determine students' perceived motivation toward physical activity before and after exposure to beat-matched HIIT sessions. In addition, students' affective responses to participation were measured using the Physical Activity Enjoyment Scale (PACES), which provided a structured means of evaluating the degree of pleasure and positive engagement experienced during the exercise program. These instruments were appropriate for the study because they captured the central variables identified in the statement of the problem—namely, cardiovascular endurance, perceived motivation, and enjoyment—while also allowing the researcher to compare changes across time and between groups using quantifiable data. Taken together, the PACER test and the self-report scales constituted a coherent, methodologically sound instrument for evaluating the effectiveness of the beat-matched HIIT program in a secondary school physical education setting.

2.4 Data Analysis

The data gathered in the study were systematically organized, encoded, and analyzed using quantitative statistical procedures appropriate to the research objectives and the quasi-experimental nature of the investigation. Descriptive statistics, particularly the mean and corresponding interpretive descriptors, were first employed to summarize the cardiovascular endurance scores and perceived motivation levels of the Grade 10 students before and after participation in the beat-matched high-intensity interval training (HIIT) program. To determine the relationship between students' psychological and physiological responses, a correlational analysis, specifically Pearson's product-moment correlation, was used to examine whether cardiovascular endurance and perceived motivation were significantly associated, particularly in relation to students' adherence to the intervention. For the comparative component of the study, independent-samples t-tests were used to determine whether a statistically significant difference in perceived enjoyment of physical activity existed between the experimental group exposed to beat-matched HIIT and the control group participating in traditional physical education activities. As indicated in the methodology, comparative procedures such as ANCOVA were also considered where appropriate for group comparison. Using this analytical framework, the study generated statistically grounded interpretations of change, association, and group differences, thereby providing a coherent empirical basis for evaluating the effectiveness of beat-matched HIIT as a school-based physical education intervention.

3 Results

The study found that the beat-matched high-intensity interval training (HIIT) program was associated with a marked improvement in cardiovascular endurance among Grade 10 learners in the experimental group. Based on the PACER results, the experimental group's mean pretest score was 28.45 laps, indicating a below-average performance. In contrast, the mean posttest score increased to 38.72 laps, interpreted as average to above average, yielding a mean gain of 10.27 laps. This pattern indicates that after 8–12 weeks of participation in beat-matched HIIT sessions, learners were able to sustain a longer, more demanding aerobic effort than before the

intervention. The results suggest that the structured interval format, together with the rhythmic support of synchronized music, created a physically stimulating environment that helped students maintain pace, tolerate exertion, and improve aerobic capacity over time.

The study likewise found a substantial improvement in the learners' perceived motivation toward physical activity after exposure to the beat-matched HIIT program. Prior to the intervention, the experimental group obtained a mean motivation score of 3.12, which was interpreted as moderate motivation. After the intervention, this increased to 4.21, corresponding to high motivation, for a mean gain of 1.09 points. This result indicates that the program did not merely improve physical endurance; it also enhanced the learners' willingness to participate, their enthusiasm toward exercise, and their positive disposition toward physical education activities. The findings imply that the combination of structured high-intensity movement and beat-matched music made the sessions feel more energizing, engaging, and rewarding than conventional routines, thereby strengthening students' internal drive to participate.

A further important result of the study was the strong positive relationship between perceived motivation and cardiovascular endurance. The correlational analysis yielded an r -value of 0.72, interpreted in the thesis as a strong positive relationship, indicating that learners who reported higher motivation also tended to obtain better PACER performance. This finding suggests that the affective and physiological dimensions of the intervention were closely linked. Students who were more interested, more engaged, and more willing to exert effort during the beat-matched HIIT sessions also appeared to derive greater cardiovascular benefit from the program. In this sense, the results underscore that endurance development in school-based exercise is not solely a matter of physical exposure to training, but is also shaped by the learner's motivational state and psychological readiness to participate fully.

The study also revealed that perceived enjoyment of physical activity was higher among students who participated in beat-matched HIIT than among those who engaged in traditional physical education activities. In the descriptive comparison, the experimental group reported higher enjoyment, while the control group reported only moderate enjoyment. More importantly, the independent-samples t -test confirmed a statistically significant difference between groups: the experimental group obtained a mean enjoyment score of 4.32 ($SD = 0.41$), while the control group obtained 3.71 ($SD = 0.48$), with $t = 6.85$ and $p = 0.000$. These findings indicate that the beat-matched HIIT format produced a more pleasurable, emotionally positive exercise experience than regular PE activities. The results support the view that rhythm, novelty, and structured intensity can reduce monotony and heighten students' enjoyment, making physical activity more attractive and more likely to be sustained.

Taken together, the results show that the beat-matched HIIT program produced favorable outcomes across the study's major variables: cardiovascular endurance improved, motivation increased, and motivation was strongly associated with endurance performance, with enjoyment significantly higher in the experimental group than in the control group. These converging findings suggest that beat-matched HIIT functioned as both an effective fitness intervention and a motivating pedagogical strategy within the secondary school PE setting. The overall pattern of results provided the empirical basis for the study's proposed action plan, which recommended integrating beat-matched HIIT into the Grade 10 physical education curriculum, supporting teacher training, using student-preferred music, and monitoring endurance and motivation regularly to sustain participation and fitness improvement. One caution, however, is that the thesis presents two slightly different descriptive enjoyment summaries in separate tables; the inferential comparison table with the reported t -value and p -value provides the clearest basis for the conclusion that enjoyment differed significantly between groups.

4. Discussion

The present study found that the beat-matched high-intensity interval training (HIIT) program improved cardiovascular endurance, with the experimental group's PACER mean increasing from 28.45 laps at pretest to 38.72 laps at posttest after the 8–12-week intervention. This pattern is strongly corroborated by contemporary school-based HIIT literature. An umbrella review by Poon et al. (2024), which synthesized 18 systematic reviews, 223 original studies, and 13,900 participants, concluded that HIIT is effective for improving cardiorespiratory fitness and other cardiometabolic indicators in children and adolescents. Likewise, Duncombe et al. (2022) reported in a systematic review and meta-analysis that school-based HIIT is effective for improving several health outcomes, while Jovanović et al. (2024) found that HIIT implemented during physical education classes significantly improved selected health-related fitness components in adolescents. Taken together, these studies support the interpretation that the rise in PACER performance in the present study was not incidental; rather, it reflects the well-documented capacity of HIIT to generate meaningful aerobic adaptations within school schedules.

The study also showed that students' perceived motivation increased from 3.12 (moderate) to 4.21 (high) after participation in the beat-matched HIIT sessions. This finding is consistent with the literature, which shows that motivation in physical education improves when exercise is both intense enough to feel purposeful and enjoyable enough to remain engaging. White et al. (2021), in a systematic review of qualitative studies, found that competence and relatedness satisfaction in physical education are closely associated with positive affect and participation. In a more directly relevant PE context, Cools et al. (2023) reported that students experienced significantly greater motivation, more joy, and more fun during PE lessons with music than without. Park et al. (2023) further explained that music can enhance physical activity by promoting positive affect, reducing perceived exertion, and increasing hedonic motivation to continue moving. These converging findings help explain why the students in the present investigation responded favorably to beat-matched HIIT: the intervention likely combined physiological challenge with rhythmic stimulation, thereby supporting both effort and willingness to participate.

A similarly important result of the study was the strong positive relationship between motivation and cardiovascular endurance ($r = .72$), together with the significantly higher enjoyment reported by the experimental group compared with the control group ($M = 4.32$ vs. 3.71 ; $t = 6.85$, $p = .000$). These findings are corroborated by broader evidence on music and affective responses during exercise. Terry et al. (2020), in a meta-analytic review, concluded that music has positive effects on exercise performance, affect, and perceived exertion across a wide range of physical activity settings. More specifically, in HIIT, Karageorghis et al. (2021) found that respite-active music improved enjoyment and remembered pleasure during high-intensity interval training. In PE settings, Cools et al. (2023) similarly observed that music enhanced joy, enthusiasm, and competence. Thus, the present study's higher enjoyment scores and the strong association between motivation and endurance are theoretically and empirically plausible: when students experience exercise as enjoyable and energizing, they are more likely to sustain effort, tolerate discomfort, and achieve better endurance outcomes.

Overall, the present study aligns well with the contemporary consensus that school-based HIIT can be an effective and time-efficient strategy for improving adolescent fitness, and that the addition of music may strengthen the motivational and affective factors that support participation. The findings, therefore, contribute to a growing body of evidence suggesting that physical education interventions are most effective when they address both the physiological and psychological dimensions of exercise. At the same time, the results should be interpreted within the study's context: they were derived from a single school over a relatively short intervention period. They relied partly on self-report measures for motivation and enjoyment. Even so, the consistency between the present findings and the wider evidence base supports the conclusion

that beat-matched HIIT is a promising, school-feasible approach for improving cardiovascular endurance, enhancing motivation, and making physical activity more enjoyable among Grade 10 learners.

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PARTICIPATION ON EXTRACURRICULAR ACTIVITIES IN MAPEH ITS EFFECT ON STUDENT SOCIAL SKILLS AND ACADEMIC SUCCESS

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Abstract

Extracurricular activities in MAPEH provide meaningful opportunities for students to develop social skills, strengthen academic habits, and experience holistic growth beyond regular classroom instruction. This study determined the effects of participation in Music, Arts, Physical Education, and Health extracurricular activities on students' social skills and academic success. Specifically, it identified the extracurricular activities in MAPEH, determined the level of student participation, examined the effects of participation on social skills and academic success, tested significant differences in the effects across activity categories, identified challenges encountered by students, and proposed intervention measures to improve participation and performance. The study employed a quantitative, descriptive-correlational research design involving 400 students who were actively participating in MAPEH extracurricular activities. Data were gathered through a structured survey questionnaire measuring participation level, the impact of social skills and academic success, challenges, and recommended improvements. Findings revealed that sports teams had the highest participation frequency and the highest mean participation score, followed by music clubs, art clubs, and health advocacy groups. Participation in sports teams also showed the strongest perceived effect on both social skills and academic success, while music and art clubs likewise contributed positively to communication, teamwork, confidence, creativity, motivation, and academic development. Significant differences were observed in the effects of participation across activity categories, with sports teams demonstrating the strongest impact. The main challenges encountered were time constraints, lack of resources, and limited awareness of some activities. The study concluded that MAPEH extracurricular participation positively influences students' social and academic development and recommended resource support, flexible scheduling, stronger promotion, and inclusive program planning.

Keywords: MAPEH Extracurricular Activities, Student Participation, Social Skills, Academic Success, Sports Teams, Holistic Development

1. Introduction

Extracurricular activities have become an important component of holistic education because they provide students with structured learning experiences beyond the formal classroom curriculum. In secondary schools, these activities allow learners to explore talents, develop interpersonal abilities, build discipline, and strengthen school connectedness. Music, Arts, Physical Education, and Health (MAPEH) extracurricular activities are especially valuable because they combine creative expression, physical engagement, teamwork, leadership, and health awareness. Participation in music clubs, art clubs, sports teams, and health advocacy groups provides students with opportunities to apply what they learn in MAPEH while developing competencies essential to personal, social, and academic growth.

Social skills are among the most important developmental outcomes linked to extracurricular participation. Communication, teamwork, empathy, cooperation, leadership, and conflict management are not developed solely through lecture-based instruction; they are strengthened through repeated interaction with peers in meaningful and goal-oriented activities.

In MAPEH extracurricular settings, students work with others in rehearsals, performances, competitions, exhibitions, fitness events, advocacy campaigns, and group projects. These contexts require learners to listen, coordinate, share responsibility, respect differences, and contribute to group success. The OECD explains that social and emotional skills such as cooperation, sociability, curiosity, self-control, and persistence support important life outcomes, including academic achievement, well-being, healthier behaviors, and career aspirations.

The link between extracurricular participation and student development is also supported by recent empirical evidence. Wang, Li, and Yao (2024) found that participation in extracurricular arts and sports activities was significantly and positively associated with adolescents' social and emotional skills. Their study further reported that students who participated in both arts and sports activities had higher scores across social and emotional skill dimensions than those who did not participate in such activities. This finding is relevant to MAPEH because the subject area encompasses both arts-based and sports-related activities, suggesting that a balanced extracurricular program may offer broader developmental benefits than participation in a single activity type alone.

Academic success may also be influenced by extracurricular involvement. Participation in structured activities can strengthen time management, persistence, motivation, responsibility, focus, and goal orientation. These qualities are important for students who must balance academic work with club meetings, practices, performances, training sessions, and competitions. A meta-analysis by Lewis (2005) reported that student outcomes were significantly related to participation in general extracurricular activities and prosocial activities, with both showing notable effects on academic achievement. However, the relationship between extracurricular activities and academic outcomes must be interpreted carefully because achievement is also shaped by prior performance, family support, socioeconomic background, teacher quality, learning resources, and school climate.

Extracurricular activities can also support the formation of friendships and a sense of belonging among peers. Schaefer, Simpkins, Vest, and Price (2011) explained that extracurricular activities are settings where adolescents may maintain existing friendships and develop new ones. This social function is particularly important in secondary education, where peer relationships influence identity, motivation, confidence, and participation in school life. In MAPEH activities, social belonging may be formed through shared goals such as preparing a musical performance, completing an artwork, winning a sports event, or implementing a health advocacy campaign. These shared experiences may improve students' confidence and willingness to engage with others.

Despite these benefits, participation in extracurricular activities is not without challenges. Students may encounter time constraints, academic workload, limited resources, insufficient facilities, transportation issues, lack of awareness, low motivation, or limited school support. These barriers can reduce participation, especially in less visible or less popular activities. In the uploaded thesis, sports teams showed the highest participation and the strongest perceived effects, while health advocacy groups recorded lower participation and impact ratings. This pattern suggests that not all MAPEH extracurricular activities receive equal student engagement, and schools may need targeted interventions to promote balanced participation across music, arts, sports, and health-related programs.

Although many studies have examined extracurricular participation in general, there remains a need for school-based evidence focusing specifically on MAPEH extracurricular activities. MAPEH is distinct because it integrates artistic, physical, cultural, social, and health-related dimensions of learning. Music and arts activities may enhance creativity, expression, and confidence; sports activities may strengthen teamwork, discipline, and resilience; and health advocacy groups may develop responsibility, awareness, and civic engagement. Because these activities contribute differently to student development, it is important to examine which activities

students join, how actively they participate, how such participation affects social skills and academic success, and what challenges limit fuller engagement.

Accordingly, the present study determined the effects of participation in extracurricular activities in MAPEH on students' social skills and academic success. Specifically, it identified the extracurricular activities in MAPEH, determined the level of student participation, assessed the perceived effects of participation on social skills and academic success, examined significant differences in effects across activity categories, identified challenges encountered by students, and proposed intervention measures to improve participation and performance. Using a quantitative, descriptive-correlational design with 400 student respondents, the study aimed to generate empirical evidence to guide administrators, teachers, coaches, policymakers, parents, and learners in strengthening MAPEH extracurricular programs as instruments for holistic student development.

2. Method

2.1 Research Design

The study employed a quantitative descriptive-correlational research design to examine the effects of participation in MAPEH extracurricular activities on students' social skills and academic success. The descriptive component was used to identify the types of extracurricular activities in MAPEH, determine the level of student participation, describe the perceived effects of participation on social skills and academic success, and identify the challenges students encounter when joining these activities. The correlational component was used to determine the relationship between students' level of participation in MAPEH extracurricular activities and their perceived social and academic development. This design was appropriate because the study sought to gather numerical data from student respondents, analyze patterns of participation, and determine whether participation was associated with positive outcomes in communication, teamwork, leadership, motivation, time management, and academic performance. Since the study did not manipulate variables or introduce an intervention, the design allowed the researcher to examine naturally occurring relationships among extracurricular participation, social skills, and academic success. Through this approach, the study generated empirical evidence that served as the basis for proposing intervention measures to strengthen MAPEH extracurricular programs and address barriers to participation.

2.2 Participants

The study was of 400 students actively involved in extracurricular activities at selected schools in Music, Arts, Physical Education, and Health. The respondents were selected through stratified random sampling to ensure representation across relevant student characteristics, including gender, age, grade level, and level of participation in MAPEH activities. They served as the primary source of data because their experiences directly reflected the relationship between extracurricular participation, social skills development, and academic success. The participants were engaged in different MAPEH-related activities, including music clubs, art clubs, sports teams, and health advocacy groups. Through their responses, the study gathered information on their level of participation, perceived effects on communication, teamwork, leadership, motivation, time management, academic performance, and challenges encountered in sustaining involvement. This participant profile was appropriate because the study required data from learners with direct experience in MAPEH extracurricular activities and the ability to meaningfully evaluate how such participation influenced their social and academic development.

2.3 Instrumentation

The study used a structured survey questionnaire as the primary instrument to collect quantitative data on participation in MAPEH extracurricular activities and their effects on students' social skills and academic success. The questionnaire was organized into several sections aligned with the study's objectives. The first section gathered demographic information, such as gender and grade level, while the second section identified the MAPEH extracurricular activities students participated in, including music club, art club, sports team, health advocacy group, and other related activities. The third section measured participation using frequency indicators and Likert-scale ratings. The succeeding sections assessed the perceived impact of participation on social skills, including teamwork, communication, leadership, and collaboration, as well as academic success in terms of motivation, time management, problem-solving, critical thinking, and performance in other subjects. Another section identified challenges students face, including time constraints, limited resources or facilities, limited awareness, and insufficient support. The final section gathered recommendations for improving participation and program benefits. The questionnaire underwent content validation by experts in education, MAPEH, and research methodology, and pilot testing was conducted to establish clarity, relevance, and reliability. Through this instrument, the study obtained measurable data necessary for analyzing the relationship between MAPEH extracurricular participation, social skills, academic success, and participation challenges.

2.4 Data Analysis

The data collected from the survey questionnaires were analyzed using both descriptive and inferential statistical techniques appropriate for a quantitative descriptive-correlational study. Descriptive statistics, including frequency counts, percentages, weighted means, and ranking, were used to identify the extracurricular activities in MAPEH, determine the level of student participation, assess the perceived effects of participation on social skills and academic success, and identify the challenges encountered by respondents. The weighted mean was used to assess the extent of participation and the impact of MAPEH extracurricular activities on students' development. Inferential statistical procedures, including t-test and Analysis of Variance (ANOVA), were employed to determine whether significant differences existed in the effects of participation across different activity categories and respondent groups. Correlation analysis was likewise utilized to examine the relationship between participation in MAPEH extracurricular activities and students' social skills and academic success. All hypotheses were tested at the 0.05 level of significance. The results of these statistical analyses provided objective evidence regarding the contribution of MAPEH extracurricular activities to students' social and academic development and served as the basis for recommending intervention measures to enhance participation and program effectiveness.

3 Results

The results showed that students participated in different extracurricular activities under MAPEH, namely Music Club, Art Club, Sports Team, and Health Advocacy Group. Among these activities, the Sports Team recorded the highest frequency, with 140 participants, followed by the Music Club with 120, the Art Club with 90, and the Health Advocacy Group with 50. This finding indicates that physical education-related extracurricular activities were the most preferred among the respondents, while health advocacy activities had the lowest participation. The result suggests that students were more inclined to join activities that involved active physical engagement, teamwork, competition, and visible school participation.

In terms of participation level, the Sports Team had the highest mean score of 4.5, indicating very high participation. This was followed by Music Club (4.2), Art Club (3.8), and Health Advocacy Group (3.6). These results show that students were generally active in MAPEH

extracurricular activities, although participation varied across activity categories. Higher participation in sports and music may be attributed to their popularity, availability, and alignment with students' interests, whereas lower participation in health advocacy groups may suggest the need for stronger promotion, better program design, and more engaging activities.

The effects of participation on social skills were also positive across all MAPEH extracurricular activities. The sports team had the highest social skills impact mean of 4.7, followed by Music Club (4.3), Art Club (4.0), and Health Advocacy Group (3.9). These findings indicate that participation in MAPEH extracurricular activities helped students improve teamwork, communication, leadership, confidence, collaboration, and peer interaction. The strong effect of sports teams suggests that structured physical activities provide frequent opportunities for cooperation, shared goals, discipline, and interpersonal development.

In terms of academic success, the Sports Team again recorded the highest impact mean of 4.4, followed by Music Club with 4.0, Art Club with 3.9, and Health Advocacy Group with 3.7. These results suggest that participation in MAPEH extracurricular activities contributed positively to students' academic development by improving motivation, discipline, time management, problem-solving, and commitment to schoolwork. Although the academic impact scores were slightly lower than the social skills scores, the findings still indicate that extracurricular participation supported both social and academic growth among learners.

The study further revealed significant differences in the effects of participation across activity categories, with sports teams demonstrating the strongest impact on both social skills and academic success. However, the respondents also identified challenges that limited their participation, including time constraints, lack of resources, and limited awareness of some activities. These findings suggest that while MAPEH extracurricular activities provide clear developmental benefits, schools must address participation barriers to maximize their impact. The results support intervention measures such as increased resource allocation, flexible scheduling, stronger promotion of less popular activities, improved facilities, and more inclusive program planning to strengthen student participation and performance.

4. Discussion

The finding that sports teams recorded the highest frequency and participation level among MAPEH extracurricular activities suggests that students were more strongly attracted to activities involving physical engagement, teamwork, competition, and visible school representation. This result is consistent with the study of Wang, Li, and Yao (2024), which found that participation in extracurricular arts and sports activities was positively associated with adolescents' social and emotional skills. In the present study, high participation in sports teams suggests that physical education-related activities may provide students with structured opportunities to interact, collaborate, practice discipline, and develop confidence. However, the lower participation in health advocacy groups suggests that some MAPEH-related activities may require stronger promotion, improved program design, and more meaningful student engagement strategies.

The strong positive effect of MAPEH extracurricular participation on students' social skills supports the idea that structured after-school and school-based programs can strengthen interpersonal development. Sports teams had the greatest impact on social skills, followed by music clubs, art clubs, and health advocacy groups. These results indicate that participation helped students develop teamwork, communication, leadership, collaboration, and peer interaction. Durlak, Weissberg, and Pachan (2010) found in their meta-analysis that after-school programs designed to promote personal and social skills produced significant improvements in students' feelings, attitudes, behavior, and school performance. This corroborates the present finding that MAPEH extracurricular activities can serve as practical settings for developing learners' social competence.

The positive effect of participation on academic success further suggests that extracurricular involvement may support academic development when students can balance participation in activities with school responsibilities. In the study, sports teams had the greatest impact on academic success, while music and art clubs also contributed positively. This implies that MAPEH extracurricular activities may help strengthen motivation, discipline, time management, responsibility, problem-solving, and commitment to schoolwork. The OECD (2024) reported that social and emotional skills are linked to better life outcomes, including academic success, healthier behaviors, reduced anxiety, and stronger aspirations. Thus, the academic benefits observed in this study may be partly explained by the social-emotional and behavioral habits that students develop through consistent participation in structured extracurricular activities.

The significant differences in effects across activity categories indicate that not all MAPEH extracurricular activities influence student outcomes equally. Sports teams demonstrated the strongest impact on both social skills and academic success, while health advocacy groups showed positive but comparatively lower effects. This result suggests that activity structure, visibility, practice frequency, peer involvement, and student interest may influence the level of developmental benefit derived from participation. The finding aligns with Mahoney, Cairns, and Farmer's (2003) work, which linked extracurricular participation with interpersonal competence and educational success, emphasizing that structured activities can contribute to positive youth outcomes. In the present study, the stronger effects of sports teams may be due to their regular practice schedules, team-based goals, performance expectations, and opportunities for leadership and cooperation.

Finally, the challenges identified by the respondents—time constraints, limited resources, and limited awareness—indicate that the benefits of MAPEH extracurricular activities may not be fully realized unless participation barriers are addressed. Time constraints may prevent learners from consistently joining activities, while limited resources and facilities may reduce the quality of program implementation. Limited awareness may also explain why some activities, such as health advocacy groups, had lower participation. Therefore, the proposed intervention measures are justified: schools should allocate resources more equitably, promote less popular activities, provide flexible schedules, support teachers and coaches, and design inclusive programs that allow students with different interests and abilities to participate. Overall, the findings support the value of MAPEH extracurricular activities as instruments for social development and academic support, provided that schools strengthen accessibility, visibility, and program quality.

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CULTURALLY RESPONSIVE PHYSICAL EDUCATION: INTEGRATING INDIGENOUS GAMES TO FOSTER CULTURAL IDENTITY AND ENGAGEMENT

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Abstract

As schools seek culturally responsive approaches to make physical education more meaningful, the integration of indigenous games has become increasingly relevant as a strategy to strengthen both student engagement and cultural identity. This study examined the effects of integrating indigenous games into culturally responsive physical education classes on students' cultural identity engagement, observed classroom engagement, and knowledge and appreciation of local indigenous games. The study employed a quantitative quasi-experimental one-group pretest–posttest design involving 200 students enrolled in physical education classes at a public secondary school in Pangasinan. Data were gathered through a researcher-made survey questionnaire, structured observation checklists, and pre-test and post-test instruments. Descriptive statistics, including weighted means and standard deviations, were used to describe respondents' levels of cultural identity engagement and classroom engagement.

In contrast, a paired-samples t-test was used to determine the significance of differences in knowledge and appreciation before and after the intervention. Findings revealed that students demonstrated a high level of perceived cultural identity engagement (mean = 4.49) and a very high level of observed student engagement (mean = 4.54). Results further showed a substantial improvement in knowledge and appreciation scores, from a pre-test mean of 18.20 to a post-test mean of 26.85, yielding a mean gain of 8.65. The paired-sample t-test confirmed that this increase was statistically significant ($t = 15.72$, $p < .05$). The study concluded that integrating indigenous games into culturally responsive physical education effectively enhances cultural identity, promotes active engagement, and improves students' knowledge and appreciation of local cultural heritage, thereby supporting the development of a teacher training program for sustainable implementation.

Keywords: Culturally Responsive Physical Education, Indigenous Games, Cultural Identity Engagement, Student Engagement, Knowledge And Appreciation, Quasi-Experimental Study

1. Introduction

Physical education (PE) is no longer viewed solely as a school subject for exercise and recreation; it is increasingly understood as a curriculum space in which health, movement competence, values formation, and social learning are cultivated together. In the Philippine basic education system, this broader view is explicitly supported by policy. Republic Act No. 10533 requires a learner-centered, culture-sensitive, and contextualized curriculum. At the same time, DepEd's implementation frameworks emphasize localization and indigenization, making learning more meaningful through the use of local knowledge, community experiences, and culturally grounded materials. The K to 12 PE curriculum likewise frames physical education as a domain for developing values, knowledge, skills, and experiences related to movement, play, and social interaction, rather than as a purely technical training field. Taken together, these policy directions suggest that PE should not be detached from learners' cultural worlds; rather, it should be designed to recognize identity, context, and community as legitimate dimensions of learning.

This policy orientation aligns closely with the international discourse on safeguarding intangible cultural heritage through education. The 2003 UNESCO Convention identifies education, awareness-raising, and community participation as key means of preserving living heritage, including traditional practices transmitted across generations. UNESCO's current education resources further emphasize that intangible cultural heritage can be integrated into teaching and learning across relevant disciplines, thereby supporting more inclusive, culturally meaningful, and sustainable education. Notably, UNESCO's Asia-Pacific guidance for educators includes adaptable lesson models that use traditional games within school instruction, including physical education. These positions are important for the present study because they frame indigenous games not as nostalgic extras, but as legitimate cultural resources that can function pedagogically in formal schooling. In this sense, integrating indigenous games into PE responds simultaneously to educational goals and to the broader responsibility of cultural preservation.

Within the Philippine context, this argument is particularly compelling because traditional games remain deeply associated with local memory, community interaction, and childhood socialization. DepEd learning materials explicitly identify *Laro ng Lahi* as traditional Filipino games played across generations, often using native or improvised materials, thereby locating them within the nation's cultural inheritance. Contemporary Philippine evidence also suggests that these games possess educational value beyond mere amusement. A recent study on indigenous games reported strong perceived contributions to physical, cognitive, socio-emotional, and socio-cultural development, including their role in supporting Filipino social identity. At the same time, the same body of work warns that indigenous games are increasingly threatened by cyber-technology, modernization, and changing leisure patterns, all of which reduce their everyday visibility among younger learners. This dual reality creates a curricular urgency: if schools do not intentionally create spaces for indigenous games, an important form of embodied cultural knowledge risks becoming progressively marginalized.

The educational significance of this issue becomes even clearer when viewed through the lens of culturally relevant and culturally sustaining pedagogy. Ladson-Billings' recent reflection on three decades of culturally relevant, responsive, and sustaining pedagogy underscores that meaningful teaching must engage students' cultural worlds rather than treat them as peripheral to academic work. In physical education and sport pedagogy, this principle has generated a growing literature showing that culturally relevant approaches can reformulate practice so that instruction better reflects students' lives, histories, and communities. Research on culturally relevant PE and community-based sport pedagogy has shown that when pedagogy is grounded in learners' cultural experiences, participation becomes more meaningful and the learning environment more responsive. These arguments are especially important in PE because the subject is inherently social, participatory, and embodied: learners do not merely hear about knowledge, they enact it. When that enactment includes culturally familiar forms such as indigenous games, PE can become a site for both movement learning and identity affirmation.

Even so, the literature shows that integrating indigenous games into health and physical education remains uneven and underexamined. A recent systematic review on Indigenous games in physical education teacher education identified both enabling factors and significant constraints in bringing such games meaningfully into curriculum practice. Related scholarship has argued that Indigenous knowledges and games have often been marginalized or omitted in mainstream health and physical education, despite their clear pedagogical and cultural value. This gap matters because much of the existing discourse still emphasizes broad principles of inclusion and cultural responsiveness without generating enough localized, measurable evidence on actual student outcomes. For Philippine schools, the issue is even more pronounced: while indigenous games are culturally recognizable and policy-aligned, there is limited quantitative evidence on whether their integration into PE strengthens outcomes such as cultural identity engagement, classroom engagement, and knowledge and appreciation of heritage-based practices. Thus, the need is not

simply for advocacy, but for empirical work capable of demonstrating educational impact under actual school conditions.

It is within this curricular, cultural, and research context that the present study becomes timely and significant. More specifically, the study examined students' perceived cultural identity engagement, observed engagement during class, and their knowledge and appreciation of indigenous games before and after exposure to the intervention, with the results intended to inform a teacher training program for sustainable implementation. This focus is important because it translates the broad ideals of culturally responsive and heritage-sensitive education into measurable school-based evidence. Rather than assuming that indigenous games are beneficial simply because they are traditional, the study asks a more rigorous educational question: whether deliberate integration of such games in PE can produce observable gains in identity, engagement, and learning. In doing so, the research contributes to the growing effort to position culturally responsive physical education not only as a value-oriented practice, but also as an evidence-based instructional approach.

2. Method

2.1 Research Design

The study employed a quantitative quasi-experimental research design, specifically a one-group pre-test–post-test design, to determine the effects of integrating indigenous games into culturally responsive physical education on students' cultural identity engagement, overall classroom engagement, and knowledge and appreciation of local games. This design was appropriate because it enabled the researcher to generate numerical evidence on change over time by observing the same group of learners before and after the intervention, thereby allowing a focused examination of the instructional effect of indigenous-game integration within an authentic school setting. The design began with a pre-test to establish students' baseline knowledge and appreciation of indigenous games, followed by a structured intervention comprising several culturally responsive PE sessions in which selected indigenous games were introduced, contextualized, and implemented in alignment with curricular objectives. After the intervention, the same participants completed a post-test to determine measurable gains. At the same time, additional data on cultural identity engagement and observed student engagement were collected through a standardized survey instrument and structured observation checklists completed by teachers and peer observers. By combining repeated measurement with multiple quantitative indicators, the design provided a systematic and empirically defensible framework for assessing whether culturally grounded PE instruction could significantly influence students' cognitive, affective, and participatory outcomes.

2.2 Participants

The study included 200 student respondents enrolled in Physical Education classes at a public secondary school in Pangasinan, specifically drawn from Grades 7 to 10, thereby providing a developmentally diverse yet contextually coherent sample for examining the educational effects of integrating indigenous games into culturally responsive PE instruction. The participants were selected through purposive sampling, a procedure that enabled the researcher to include learners who were directly exposed to the intervention and therefore capable of providing meaningful data on cultural identity engagement, classroom engagement, and knowledge and appreciation of indigenous games. This participant structure was methodologically appropriate because the study sought to evaluate change within an actual school-based instructional setting rather than to compare randomized groups across multiple institutions. By focusing on officially enrolled PE learners within a single school context, the study ensured curricular consistency, shared exposure to the intervention, and sufficient statistical power for pre-test–post-test analysis. At the same

time, the inclusion of students across several grade levels strengthened the practical relevance of the findings, as it enabled the study to reflect on how culturally responsive physical education may function across a broader range of junior secondary learners while remaining grounded in a single institutional environment.

2.3 Instrumentation

The study employed a multi-instrument quantitative data-gathering system carefully developed to capture the cognitive, affective, and behavioral outcomes of integrating indigenous games into culturally responsive physical education. The principal instruments consisted of a pre-test and post-test, a standardized survey questionnaire on cultural identity engagement, and a structured observation checklist. The pre-test and post-test served as the primary measures of students' knowledge and appreciation of indigenous games, containing multiple-choice, identification, and short-response items designed to assess both factual knowledge—such as rules, equipment, and origins of the games—and conceptual understanding of their cultural significance. These test instruments underwent content validation by a panel composed of a licensed Physical Education teacher, a curriculum development specialist, and a local historian, followed by pilot testing, item analysis, and reliability screening through Cronbach's alpha to ensure acceptable internal consistency. To examine the affective dimension of the intervention, the researcher used a five-point Likert-scale survey questionnaire to measure students' perceived cultural pride, belongingness, and heritage connection after exposure to culturally grounded PE lessons. In addition, a structured observation checklist was utilized to record real-time indicators of behavioral, emotional, and cognitive engagement, with teachers and peer observers undergoing prior calibration to improve inter-rater consistency. Collectively, these instruments provided a robust, validated, and methodologically coherent means of measuring the impact of indigenous-game integration on students' learning, engagement, and cultural identity outcomes.

2.4 Data Analysis

The study employed a quantitative data analysis framework designed to generate both descriptive and inferential evidence on the effects of integrating indigenous games into culturally responsive physical education. After all responses and test results were collated, encoded, tabulated, and double-checked for accuracy, the researcher used descriptive statistics—particularly frequency, percentage, mean, weighted mean, and standard deviation—to summarize the students' pre-test and post-test scores, their perceived level of cultural identity engagement, and the observed classroom engagement ratings gathered through the survey questionnaires and structured observation checklists. To determine whether the intervention produced a statistically significant change in students' knowledge and appreciation of indigenous games, the study employed the paired-samples t-test, an inferential procedure appropriate for comparing the scores of the same group of participants before and after the intervention. This procedure enabled the researcher to determine whether the observed gains were merely chance variations or could be attributed to the culturally responsive PE lessons that integrated indigenous games. Through this combination of descriptive and inferential treatment, the analysis provided an objective, systematic, and methodologically sound basis for interpreting the extent to which the intervention influenced students' cognitive, affective, and participatory outcomes.

3 Results

The study found that integrating indigenous games into culturally responsive physical education led to a high level of cultural identity engagement among the 200 student participants. The findings indicated that students did not merely participate in the activities as routine physical tasks; rather, they developed a stronger sense of pride, belongingness, and connection to their Filipino cultural heritage. The highest-rated aspect of this outcome was the students' appreciation

for the value and significance of traditional games, suggesting that the intervention succeeded in transforming physical education into a culturally meaningful learning experience. This result implies that indigenous games functioned not only as movement activities but also as cultural texts through which learners could reconnect with community traditions and local identity.

A second major result concerned the students' overall engagement during culturally responsive PE classes, which was described as very high. The observation data showed that behavioral engagement received the highest rating ($M = 4.60$), indicating active participation, cooperation, and collaborative involvement during the games. This was followed by emotional engagement ($M = 4.55$), reflecting enjoyment, enthusiasm, and positive affect during the lessons. Cognitive engagement was likewise rated high ($M = 4.48$), suggesting that students remained attentive, strategic, and mentally involved in the learning tasks. The overall mean engagement score of 4.54 confirmed that the integration of indigenous games stimulated participation across behavioral, emotional, and cognitive dimensions, thereby making PE classes more interactive, meaningful, and learner-centered.

The third set of findings focused on students' knowledge and appreciation of indigenous games before and after the intervention. Results showed a substantial increase in scores, with the pre-test mean of 18.20 ($SD = 3.15$) rising to a post-test mean of 26.85 ($SD = 2.80$). The mean gain of 8.65 indicated a significant improvement in the learners' understanding of the rules, mechanics, and cultural relevance of indigenous games. This result suggests that the culturally responsive PE lessons were effective not only in increasing student participation but also in enhancing both cognitive learning and affective appreciation. In practical terms, students did not simply play the games; they also came to understand their heritage value more deeply through structured instructional exposure.

This gain was further validated by the paired-sample t-test, which revealed a highly significant difference between the pre-test and post-test scores ($t = 15.72$, $p = 0.000$). Since the computed p-value was below the 0.05 level of significance, the null hypothesis was rejected, confirming that the increase in students' knowledge and appreciation was not due to chance. This statistical outcome provides strong empirical evidence that integrating indigenous games into culturally responsive physical education was an effective intervention. The result established that the instructional strategy had a measurable positive effect on students' learning outcomes and justified the continued inclusion of indigenous games in PE as a culturally grounded educational practice.

Taken together, the results present a coherent pattern: the intervention strengthened cultural identity engagement, generated very high classroom engagement, and produced a statistically significant improvement in knowledge and appreciation of indigenous games. Because these outcomes were consistently positive across affective, behavioral, cognitive, and achievement-related measures, the study justified the development of a proposed teacher training program centered on game familiarization, culturally responsive pedagogy, and appropriate assessment strategies. Thus, the results demonstrate that indigenous games can serve as effective pedagogical tools for making physical education more culturally affirming, engaging, and educationally meaningful in the school setting.

4. Discussion

The present study found that integrating indigenous games into culturally responsive physical education was associated with high cultural identity engagement among the 200 student-participants, with an overall mean of 4.49, and the highest indicator centered on appreciation of the value of local indigenous games. This pattern aligns well with the broader literature on culturally relevant pedagogy, which argues that learning becomes more powerful when students' cultural resources are treated as legitimate foundations for classroom meaning-making. Ladson-Billings' reflection on culturally relevant, responsive, and sustaining pedagogy emphasizes that

schooling should engage, not sideline, learners' cultural worlds, while UNESCO's heritage-in-education framework explicitly states that intangible cultural heritage can provide context-specific content and pedagogy that increase the relevance and quality of education and improve learning outcomes. In the Philippine context, Dizer et al. (2022) likewise describe *Laro ng Lahi* as reflecting cultural heritage and social identity, with empirical value for holistic development and for the revival of traditional play in schools. Read together, these sources support the interpretation that the study's gains in cultural identity were not incidental; they are consistent with what would be expected when PE is redesigned to affirm learners' heritage through embodied, familiar, and socially meaningful practices.

A second major finding of the study was the very high overall student engagement score ($M = 4.54$), with behavioral engagement rated highest ($M = 4.60$). This result is also strongly corroborated by current scholarship. Bonato et al.'s systematic review of Indigenous games in physical education teacher education identifies culturally relevant pedagogy as a major enabler of the effective implementation of Indigenous perspectives in curriculum and notes that it emerged repeatedly across the literature as a key factor in classroom-level success. In parallel, self-determination research in PE shows that students' adaptive outcomes are positively associated with supportive learning environments that strengthen autonomy, competence, and relatedness; those motivational pathways are especially relevant to indigenous games, which are usually cooperative, participatory, and socially interactive. The present study's very high behavioral and emotional engagement is therefore consistent with the view that indigenous games do more than "add activity"; they can satisfy students' need to belong and participate in a culturally resonant learning space, thereby enhancing the quality of engagement during PE lessons.

The study also demonstrated a substantial increase in knowledge and appreciation of indigenous games, with the mean score rising from 18.20 in the pre-test to 26.85 in the post-test, and with the paired-sample t-test confirming a highly significant difference ($t = 15.72$, $p = 0.000$). This result is consistent with research suggesting that traditional games can generate cognitive as well as affective learning gains. A recent school-based intervention on traditional games reported statistically significant improvements in children's movement competence and motivation. In contrast, a recent review of traditional games in PE concluded that such games can positively influence cognitive, affective, and psychomotor outcomes. UNESCO's education program on intangible cultural heritage likewise states that learning and teaching with and about heritage can be integrated across relevant disciplines, as heritage-based pedagogies enhance educational relevance and support learning. Against that backdrop, the present study's pre-post improvement can be interpreted not merely as increased familiarity with game rules but as evidence that culturally grounded PE can deepen both conceptual understanding and appreciation of heritage when students learn through structured, repeated, and socially mediated participation.

Finally, the study's proposal for a teacher training program focused on game familiarization, culturally responsive pedagogy, and assessment strategies is strongly justified by the literature. Bonato et al. identify professional development as one of the important enablers in implementing Indigenous perspectives, while UNESCO's education initiative stresses that safeguarding intangible cultural heritage through schooling depends on active transmission, formal and non-formal education, and pedagogical support for teachers. UNESCO also notes that traditional and indigenous games express a rich cultural heritage and should be protected and promoted. From this perspective, the training component recommended by the study is not an optional add-on but a practical requirement for sustainability. The discussion, therefore, suggests that the study's contribution lies not only in showing positive student outcomes but also in pointing toward the institutional conditions needed to sustain them: teachers must know the games accurately, understand their cultural significance, and assess both participation and heritage-related learning in ways that preserve educational rigor and cultural respect.

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THE EFFECT OF TRAINING HOURS ON THE ACADEMIC PERFORMANCE OF STUDENT-ATHLETES

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Abstract

Student-athletes continually face the challenge of balancing intensive training schedules with academic demands. This study investigated the effect of training hours on the academic performance of student-athletes at Dagupan City National High School during the Academic Year 2025–2026. Specifically, it examined differences in academic performance between student-athletes with high and low training hours, determined the relationship between weekly training hours and academic performance, compared academic class attendance rates between student-athletes and non-athletes, and proposed an action plan based on the quantitative findings. The study employed a quantitative, non-experimental design using correlational and comparative approaches. A total of 300 respondents participated in the study. Data were gathered from official institutional records on grade point average and attendance, and from a standardized self-report questionnaire on training hours and time management skills. The data were analyzed using the mean, standard deviation, independent-samples t-test, and Pearson product-moment correlation coefficient. Findings revealed that student-athletes with fewer training hours achieved a higher mean academic performance score ($M = 3.12$, $SD = 0.35$) than those with more training hours ($M = 2.85$, $SD = 0.42$), with the difference statistically significant. A significant moderate negative correlation was likewise established between training hours and academic performance ($r = -0.385$, $p < .001$). In addition, student-athletes recorded lower attendance rates than non-athletes, although those with high training hours reported better time management skills. The study concluded that excessive training hours adversely affect academic outcomes and class attendance, thereby necessitating institutional interventions that promote a healthier balance between athletic commitments and academic responsibilities.

Keywords: Training Hours, Academic Performance, Student-Athletes, Attendance Rate, Time Management, Quantitative Study

1. Introduction

School sports are widely recognized as a valuable component of learner development because they promote physical fitness, discipline, teamwork, leadership, and psychosocial well-being. In the Philippine setting, this educational value is explicitly reflected in current policy. DepEd's 2025 policy on School Sports Clubs frames organized sport as an extension of formal learning that supports holistic development and academic pursuits, while Republic Act No. 11470, or the National Academy of Sports Act, mandates a quality secondary education program integrated with a special curriculum on sports for student-athletes. Earlier DepEd guidance on the Special Program in Sports likewise emphasized the goal of achieving school-sport balance, signaling that athletic participation should not be separated from academic formation but harmonized with it. These policy directions show that the Philippine education system does not view sport as peripheral; rather, it treats sport as a legitimate developmental and educational domain that must be aligned with the broader goals of schooling.

However, the educational promise of sport is accompanied by a recurring structural challenge: student-athletes must simultaneously satisfy the demands of academic work and organized training. In the international literature, this is commonly described as the dual-

career condition. A 2025 scoping review covering 25 studies from 23 countries and more than 3,000 student-athletes concluded that dual-career athletes consistently face difficulties balancing academic and athletic commitments, with recurring barriers including inflexible educational arrangements, limited financial support, and insufficient access to coordinated institutional services. Importantly, the same review found that 88.5% of the studies came from European contexts, suggesting that the evidence base is geographically uneven and that more work is needed in non-European and developing-country settings. This concern is echoed by Gjaka et al. (2024), whose study of university student-athletes in Kosovo found that limited leisure time, academic overload, and frequent class absences were among the most commonly reported difficulties. Collectively, these findings suggest that the core issue is not whether sport matters in education, but how schools can prevent athletic commitments from eroding learning opportunities and academic continuity.

One of the clearest mechanisms through which heavy athletic involvement can affect schooling is time pressure. Training hours are not merely numerical indicators of participation; they represent a cumulative demand on time, energy, recovery, and attention. Astridge et al. (2021), working with high-performance dual-career student swimmers, showed that training and academic demands were associated with sleep quality, highlighting how the overlap of sport and study can compromise recovery. Similarly, Wang et al. (2024) found that study time and training time were the strongest predictors of sleep quality among dual-career collegiate badminton athletes, with lower study and training hours predicting better sleep quality. This evidence matters because inadequate sleep and impaired recovery can undermine concentration, memory, learning efficiency, and emotional regulation, all of which are central to academic functioning. In other words, the problem is not only that student-athletes are busy; the deeper issue is that high training load can disrupt the recovery systems needed for sustained classroom performance and scholastic success.

A related strand of evidence points to psychological spillover from the athletic domain into the academic domain. Xu et al. (2025) found that athlete burnout significantly predicted academic burnout among college athletes, with emotion regulation and sleep quality partially mediating that relationship. Their findings are important because they clarify that the burden of sport is not confined to physical fatigue alone. When training stress accumulates without adequate recovery, it can reduce motivation, weaken self-regulation, and impair academic engagement. This interpretation is highly relevant to school-based student-athletes, for whom training, travel, competition, and study requirements frequently converge within the same weekly schedule. If the training load becomes excessive, the resulting depletion may not simply reduce performance on the field; it may also diminish the learner's capacity to attend class consistently, complete academic tasks, and sustain cognitive effort over time. Such evidence supports the view that academic outcomes among student-athletes should be examined not only through grades but also through the interacting pathways of fatigue, attendance, stress, and self-management.

Attendance is another crucial dimension of this issue. In general education research, absenteeism has been shown to affect achievement negatively. Keppens (2023) reported that school absenteeism is detrimental to learning and academic achievement, with both sickness-related and unexcused absenteeism associated with poorer examination outcomes. Ha et al. (2024) likewise found a significantly positive effect of class attendance on academic performance, even in contexts where attendance was not mandatory for course grading. For student-athletes, this literature is especially significant because organized sport often requires training extensions, off-campus competition, and travel time, all of which may reduce direct exposure to instruction. At the same time, the relationship between sport and academic performance is not uniformly negative. In a Philippine high school study, Agustin (2022) found that student-athletes' academic performance improved after the implementation of a structured school sports support program, suggesting that the educational effects of sport depend greatly on how athletic participation is

supported, scheduled, and integrated into the school environment. Thus, the issue is best understood not as a simple opposition between sports and academics, but as a question of whether training demands are moderated by effective institutional support.

It is within this conceptual and policy context that the present study becomes necessary. The uploaded thesis shows that the study focuses on Dagupan City National High School during Academic Year 2025–2026 and investigates the effect of training hours on the academic performance of student-athletes. More specifically, it examines differences in academic performance between student-athletes with high and low training hours, determines the relationship between weekly training hours and academic performance, compares attendance rates between student-athletes and non-athletes, and uses the findings to develop an action plan. This focus is timely because it converts a broad dual-career concern into measurable school-level evidence. Rather than assuming that sports participation is either beneficial or harmful in itself, the study asks a more precise and educationally useful question: at what point do training demands begin to interfere with academic functioning? By addressing training load, attendance, and academic performance together, the study contributes evidence that can help schools, coaches, and administrators design more balanced support systems for student-athletes and protect both athletic development and scholastic achievement.

2. Method

2.1 Research Design

The study employed a quantitative, non-experimental research design using both correlational and comparative approaches to examine how training hours influenced the academic outcomes of student-athletes at Dagupan City National High School during Academic Year 2025–2026. This design was appropriate because the investigation sought to determine the strength, direction, and statistical significance of naturally occurring relationships and group differences without manipulating the independent variable, namely weekly training hours. Within this framework, the correlational component was used to measure the association between training load and academic performance. In contrast, the comparative component enabled the researcher to test significant differences in academic performance between student-athletes with high and low training hours, as well as differences in class attendance rates between student-athletes and non-athletes. The design relied on the systematic collection of numerical data from institutional records and standardized self-report measures, thereby allowing the use of inferential statistics to generate objective, testable, and data-driven conclusions. Overall, the selected research design provided a rigorous methodological framework for assessing the academic implications of athletic time demands and for generating empirical evidence to guide school-based interventions and policy decisions regarding student-athlete support systems.

2.2 Participants

The study comprised 300 respondents from Dagupan City National High School during Academic Year 2025–2026, including officially recognized student-athletes from various teams and competitive levels, as well as a corresponding comparison group of non-athlete students drawn from comparable academic programs. Their inclusion was methodologically necessary because the study examined not only differences in academic performance between student-athletes with high and low training hours, but also differences in class attendance rates between student-athletes and non-athletes. Student-athlete participants were selected through purposive sampling to ensure adequate representation of those exposed to varying levels of weekly training load, particularly the high- and low-training-hour categories identified through preliminary data from coaches or the athletic director. In contrast, the non-athlete comparison group was selected through convenience sampling from non-athletic, co-educational academic

programs to provide a baseline for academic engagement and attendance. The sample size was determined to provide sufficient statistical power for the comparative and correlational analyses. At the same time, all participants were included only after informed consent was obtained and ethical safeguards for anonymity and confidentiality were strictly observed.

2.3 Instrumentation

The study employed two complementary research instruments to generate both objective institutional data and self-reported behavioral data relevant to the investigation of training load and academic functioning among student-athletes. First, the researcher used official institutional data retrieval forms, duly approved by the Registrar's Office and the Athletic Department, to extract the participants' Academic Performance Scores (CGPA/TGPA) and Academic Class Attendance Rates, thereby ensuring that the core dependent variables were measured through verified school records rather than respondent recall. Second, the study utilized a standardized, validated self-report questionnaire to obtain data not ordinarily available in institutional databases, particularly the respondents' weekly training hours and time management skills. The questionnaire included a section that captured the total time devoted to practice, conditioning, and competition. It also incorporated a recognized time-management measure, identified in the thesis as the Time Management Behavior Scale (TMBS) or a similar validated subscale, to quantify the participants' perceived ability to organize and regulate competing academic and athletic demands. The combined use of documentary records and a structured survey instrument strengthened the study's methodological rigor by integrating objective performance indicators with psychometrically grounded self-report data, thereby providing a more comprehensive basis for analyzing the academic implications of athletic training demands.

2.4 Data Analysis

The study employed a quantitative data analysis framework using the Statistical Package for the Social Sciences (SPSS) Version 28, which enabled the systematic analysis of numerical data gathered from institutional records and standardized self-report instruments. Descriptive statistics, specifically mean, standard deviation, and frequency, were first computed to summarize the respondents' profiles and characterize the central variables of the investigation, including academic performance, attendance rate, training hours, and time management skills. To test differences between groups, the study used the Independent Samples t-test, particularly in comparing the academic performance of student-athletes with high versus low training hours and the attendance rates of student-athletes versus non-athletes. To determine the magnitude and direction of association between weekly training hours and academic performance, the study employed the Pearson Product-Moment Correlation Coefficient (Pearson's r). All hypotheses were tested at the 0.05 level of significance, allowing the researcher to establish whether the observed differences and relationships were statistically meaningful. Overall, the adopted statistical procedures provided a rigorous and objective basis for interpreting the effect of training load on student-athletes' academic outcomes and for generating evidence-based conclusions relevant to school policy and intervention planning.

3 Results

The results of the study clearly showed that training load was associated with differences in academic performance among student-athletes. Those classified under low training hours obtained a higher mean academic performance score ($M = 3.12$, $SD = 0.35$) than those under high training hours ($M = 2.85$, $SD = 0.42$). This descriptive pattern indicates that as athletic demands intensified, academic output tended to decline. The finding suggests that the heavier commitment required by extensive weekly training may reduce the time, energy, and cognitive

focus available for academic tasks, thereby placing high-load student-athletes at greater scholastic risk.

The inferential analysis further strengthened this difference. The Independent Samples t-test revealed a highly significant difference in academic performance between the two training-load groups ($t = -5.89$, $p < 0.001$), leading to the rejection of the null hypothesis. In substantive terms, this result confirms that the gap in academic performance was not due solely to chance. Rather, the quantity of weekly training hours emerged as a statistically meaningful factor in shaping academic outcomes. The results, therefore, support the study's central proposition that excessive athletic time commitment can adversely affect school performance when the competing demands of training and academics become difficult to reconcile.

The correlational findings likewise reinforced this conclusion. The study found a moderate negative correlation between training hours per week and academic performance score ($r = -0.385$, $p < 0.001$), indicating that as training hours per week increased, academic performance tended to decrease. This is an important result because it moves beyond group comparison and demonstrates a measurable inverse relationship between the two variables across the sample. The strength and direction of the correlation suggest that training load is not merely associated with isolated academic difficulty but functions as a broader academic risk factor among student-athletes in the study setting.

Another important result concerned time management skills. Interestingly, student-athletes with high training hours reported a higher mean Time Management Skills Score ($M = 78.55$, $SD = 6.12$) than those with low training hours ($M = 75.10$, $SD = 7.98$), and this difference was also statistically significant ($t = 3.15$, $p = 0.002$). This indicates that greater athletic involvement may foster stronger self-reported organizational skills; however, these skills were insufficient to offset the negative academic consequences of excessive training demands. Thus, the findings suggest that while high-load athletes may become better at time management, the cumulative burden of fatigue, pressure, and reduced study opportunities still outweighs the potential benefit of improved scheduling behavior.

Finally, the study showed that academic class attendance was significantly lower among student-athletes than among non-athletes. The mean attendance rate of student-athletes was 4.5% lower, and the difference proved highly significant ($t = -4.20$, $p < 0.001$). This finding points to attendance as a likely mechanism through which training demands weaken academic performance. Missed classes due to training schedules, competition, and travel reduce direct engagement with lessons, classroom discussions, and instructional guidance. Taken together, the results portray a consistent pattern: higher training hours were linked with lower academic performance, a significant decline in attendance, and only partial compensation through stronger time management skills, thereby justifying the need for structured school-based interventions to help student-athletes maintain balance between academic and athletic responsibilities.

4. Discussion

The present study found that student-athletes with high training hours obtained lower academic performance scores than those with low training hours, and that training hours were moderately and negatively correlated with academic performance. This pattern is consistent with current dual-career literature, which shows that success in academics and sport is strongly shaped by training schedules, competitions, travel demands, and the institutional conditions surrounding them. It is further supported by Wang et al. (2024), who reported that lower study and training hours predicted better sleep quality among dual-career collegiate badminton athletes, and by Xu et al. (2025), who found that athlete burnout significantly predicted academic burnout, with sleep quality acting as part of the explanatory pathway. Taken together, these studies corroborate the present results by suggesting that excessive training load does not simply reduce

available study time; it also depletes recovery, heightens fatigue, and increases the likelihood that athletic strain will spill over into academic functioning.

A second important finding of the study was that student-athletes posted significantly lower class attendance rates than non-athletes, with a 4.5% attendance gap. This result is especially important because attendance is one of the concrete mechanisms through which training load affects scholastic outcomes. Ha et al. (2024) found that class attendance had a significantly positive effect on academic performance, with a one-standard-deviation increase in attendance associated with a 0.08-standard-deviation increase in performance. De Maio et al. (2025) likewise identified the absence of flexible programmes and exams, along with logistical barriers such as distance between sport and education spaces, as recurring obstacles in student-athletes' dual-career experience. In this light, the attendance deficit observed in the present study should not be treated as a secondary issue. It is better understood as a direct academic risk pathway: when training and competition reduce classroom presence, they also reduce access to instruction, peer interaction, clarification, and feedback, all of which support achievement.

The study also produced a more nuanced result: student-athletes with high training hours reported significantly better time management skills, yet they still achieved lower academic performance than the low-training group. This partially aligns with Fu et al. (2025), who found that time management positively predicted study engagement and also operated indirectly through self-control and reduced mobile phone dependence. It also aligns with Howard et al. (2025), whose scoping review of high school-aged aspiring athletes emphasized that personal skills matter, but that support systems from educational and sport organizations are equally important. The present study, therefore, contributes an important refinement to the discussion: time management remains beneficial, but it becomes insufficient when training load becomes too heavy. In other words, self-regulation can moderate strain, but it may not fully overcome the academic costs of sustained fatigue, reduced attendance, and limited recovery.

The practical implications of the findings are therefore well justified. The study's proposed actions—training-load thresholds, time-management translation programs, academic flexibility, and stronger coach-faculty communication—are strongly supported by recent literature and policy. De Maio et al. (2025) note that structured tutorship and peer-to-peer support can form a valid network for dual-career athletes, while DepEd Order No. 022, s. 2025 explicitly frames school sports as an extension of formal learning that should support learners' academic pursuits and holistic development. From this, it is reasonable to infer that schools cannot assume sports participation will remain educationally beneficial on its own; they must actively regulate load, protect recovery, and compensate for missed instruction. Thus, the present study does not argue against school sports. Rather, it demonstrates that sport becomes educationally sustainable only when deliberate academic protections and institutional support balance training demands.

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THE MISMATCH: EXPLORING THE CHALLENGES OF NON-SPECIALIST TEACHING

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Abstract

Teacher specialization remains a critical foundation of effective instruction. However, many schools continue to assign educators to subjects outside their formal preparation, creating challenges that affect teaching quality, teacher confidence, and institutional responsiveness. This study explored the lived experiences of non-specialist teachers in Lingayen, Pangasinan, with emphasis on the challenges they encountered, the effects of specialization mismatch on their pedagogical approaches, the institutional support available to them, and the intervention measures that may address their needs. Using a qualitative phenomenological design, the study gathered data from ten purposively selected non-specialist teachers through in-depth semi-structured interviews. The data were analyzed through thematic analysis to identify recurring patterns and meanings embedded in the participants' narratives. Findings revealed that non-specialist teachers experienced substantial difficulties rooted in limited content mastery, increased preparation time, instructional insecurity, and emotional strain. These challenges influenced their classroom practices, leading to survival-based pedagogical strategies such as heavy reliance on textbooks, simplification of lessons, avoidance of complex concepts, and improvised instructional methods. The study further found that institutional support was often inconsistent, generic, and insufficient, while collegial assistance from subject-specialist peers emerged as the most practical form of support. Participants emphasized the need for subject-specific professional development, structured mentoring, co-teaching arrangements, and stricter specialization-based deployment policies. The study concluded that non-specialist teaching is not merely a staffing concern but a systemic instructional issue requiring coordinated interventions at the school, policy, and professional development levels to enhance teacher competence, well-being, and instructional effectiveness.

Keywords: Non-Specialist Teaching, Teacher Specialization Mismatch, Pedagogical Challenges, Institutional Support, Qualitative Phenomenology, Professional Development

1. Introduction

Teacher shortages, uneven deployment, and curriculum pressures have made out-of-field or non-specialist teaching a persistent feature of school systems across countries. UNESCO reported that the world will need 44 million additional primary and secondary teachers by 2030, a shortage that often compels schools to assign available teachers to vacancies rather than to where their specialization best aligns. In the literature, teaching out of field refers to situations in which teachers are assigned subjects for which they have inadequate preparation, qualifications, or specialization. Ingersoll's work remains foundational in showing that this practice is not merely a staffing inconvenience but a form of underqualification because a licensed teacher may still be insufficiently prepared for the specific disciplinary and pedagogical demands of a subject outside his or her training. For this reason, the issue should be understood not only as a workforce problem but also as a challenge to instructional quality, teacher effectiveness, and educational equity (Hobbs & Porsch, 2021; Ingersoll, 2002; UNESCO, 2024).

The instructional significance of non-specialist teaching is best understood through the lens of teacher knowledge. Shulman (1986, 1987) argued that effective teaching depends not simply on generic pedagogical skill but on the integration of subject matter knowledge and pedagogical content knowledge, or the teacher's capacity to transform disciplinary knowledge into forms that learners can meaningfully understand. When teachers are deployed outside their specialization, this integration becomes fragile. They may know how to manage a class, sequence activities, or assess learning in general terms, yet still struggle to explain concepts with precision, anticipate misconceptions, or design tasks that preserve conceptual rigor. Hobbs and Porsch (2021) likewise noted that out-of-field teaching often places teachers in professional situations for which they are inadequately prepared, especially during early career stages, when identity formation and competence-building are still underway. Thus, specialization mismatch does not merely reduce teacher comfort; it can weaken the intellectual coherence of instruction itself (Hobbs & Porsch, 2021; Shulman, 1986, 1987).

Empirical research further shows that the consequences of teaching outside one's field extend beyond content coverage to teacher confidence, identity, and professional growth. Du Plessis, Gillies, and Carroll (2014) described out-of-field teaching as an international concern with major implications for professional development because teachers assigned to unfamiliar subjects develop needs that generic, one-size-fits-all programs cannot address. Their analysis emphasized issues of confidence, self-esteem, belongingness, and access to relevant support. More recent work has echoed these concerns. Biebricher (2023), for example, found that out-of-field assignments can shape teacher identity over time, while a Philippine study by Recede et al. (2023) showed that teachers assigned beyond their preservice preparation often reported only moderate confidence in helping struggling learners and promoting higher-order thinking. Together, these studies suggest that non-specialist teaching influences not only what teachers know, but also how they see themselves, how cautiously they teach, and how effectively they respond to learner needs (Biebricher, 2023; du Plessis et al., 2014; Recede et al., 2023).

The Philippine context makes the issue especially urgent. EDCOM 2 reported in 2024 that 62% of high school teachers in the Philippines were teaching subjects they did not major in during college, indicating a large-scale misalignment between preservice preparation and actual teaching assignments. A PIDS policy note published in 2025 similarly characterized teacher-subject mismatch as widespread, while another PIDS publication emphasized that such mismatch affects pedagogical effectiveness and student learning outcomes. At the same time, Philippine evidence also points to weaknesses in teacher content mastery and the uneven accessibility of in-service support. World Bank analyses cited in Philippine policy discussions have noted that many teachers lack mastery of the content. At the same time, recent PIDS work has examined whether teachers assigned outside their specialization had attended the appropriate training programs, suggesting that workforce mismatch and professional development gaps are closely linked. This convergence of staffing, knowledge, and training concerns makes non-specialist teaching a systemic issue rather than an isolated school-level anomaly (EDCOM 2, 2024; Mejia et al., 2025; Philippine Institute for Development Studies, 2025; World Bank, 2020).

Philippine policy and legal frameworks also underscore the expectation that teaching quality must rest on professional competence and adequate support. Republic Act No. 10533, or the Enhanced Basic Education Act of 2013, affirms a complete and quality basic education system and explicitly includes teacher education and training within reform implementation. Republic Act No. 7836, the Philippine Teachers Professionalization Act of 1994, frames teaching as a regulated profession and anchors quality education in licensure and professional standards. Republic Act No. 4670, the Magna Carta for Public School Teachers, was enacted to promote and improve the status, conditions, and career opportunities of public school teachers. In parallel, DepEd Order No. 7, s. 2015 stresses the need for highly competent teachers and links hiring policy to the broader goal of improving the quality of basic education. Taken together, these policies imply that

teacher assignment should not be indifferent to specialization, because instructional quality depends on both qualification and institutional support (Department of Education, 2015; Republic of the Philippines, 1966, 1994, 2013).

Against this backdrop, the present study, “The Mismatch: Exploring the Challenges of Non-Specialist Teaching,” is timely and necessary because it moves the discussion from broad policy concern to lived instructional reality in Lingayen, Pangasinan. The uploaded thesis shows that the study is specifically concerned with the challenges faced by non-specialist teachers, the effects of specialization mismatch on pedagogical approaches and instructional strategies, the institutional support and professional development available to them, and the intervention measures that may be proposed from their experiences. By adopting a qualitative phenomenological approach, the study is positioned to capture nuances that large-scale policy discussions often miss: how teachers make sense of unfamiliar content, how they adapt classroom practice under pressure, how support is actually experienced, and what forms of intervention are most meaningful within a local school context. In doing so, the study contributes not only to the literature on teacher specialization mismatch but also to ongoing efforts to strengthen instructional quality, teacher well-being, and institutional responsiveness in Philippine basic education.

2. Method

2.1 Research Design

The study employed a qualitative phenomenological research design, specifically Interpretative Phenomenological Analysis (IPA), to examine the lived experiences of non-specialist teachers assigned to teach subjects outside their area of specialization. This design was appropriate because the inquiry sought to capture the depth, complexity, and subjective meanings embedded in teachers’ instructional struggles, professional adjustments, and personal reflections within authentic school contexts. Rather than measuring variables quantitatively, the study pursued a naturalistic and interpretive understanding of how participants experienced specialization mismatch, how such mismatch shaped their pedagogical identity and instructional decision-making, and how they navigated the institutional conditions surrounding their assignments. Data were generated primarily through in-depth semi-structured interviews, which allowed participants to articulate their experiences openly while enabling the researcher to probe for nuance, clarification, and reflective detail. Interview data were audio-recorded with consent, transcribed verbatim, and examined through an inductive thematic analysis to identify significant statements, recurring meanings, emergent themes, and subthemes grounded in the participants’ narratives. The design likewise incorporated reflexivity and trustworthiness measures—credibility, dependability, confirmability, and transferability—to ensure methodological rigor and interpretive integrity. Overall, the chosen research design provided a rich and systematic framework for uncovering the instructional, emotional, and institutional realities of non-specialist teaching and for generating findings that can inform educational policy, school support systems, and teacher development initiatives.

2.2 Participants

The study consisted of ten purposively selected non-specialist teachers from various schools in Lingayen, Pangasinan, who had direct experience teaching subjects outside their academic preparation, field of specialization, or professional training. Their inclusion was deliberate and criterion-based, as the study sought information-rich cases that could illuminate the lived realities of specialization mismatch in actual school settings. As central informants, these teachers were considered most qualified to articulate the instructional, emotional, and institutional dimensions of non-specialist teaching because they had personally navigated unfamiliar subject

content, adapted their pedagogical practices, and interacted with school support systems while carrying mismatched teaching assignments. The study emphasized depth rather than numerical breadth; hence, the relatively small participant group was methodologically appropriate for phenomenological inquiry, which aims to generate nuanced, context-sensitive, and experientially grounded insights rather than statistical generalizations. Their narratives provided rich, descriptive accounts of how they understood their roles and how they coped with instructional demands. They interpreted the effects of teaching outside their specialization, thereby supplying the empirical foundation for the study's thematic analysis and subsequent intervention proposals.

2.3 Instrumentation

The study employed a researcher-developed semi-structured interview guide as its primary research instrument, a choice well aligned with the phenomenological orientation of the inquiry because it enabled the systematic elicitation of rich, experience-based narratives from non-specialist teachers while preserving the flexibility needed to probe unexpected yet analytically relevant insights. The instrument consisted of open-ended questions anchored in the study's problem statement. It was designed to elicit in-depth accounts of teachers' instructional challenges, pedagogical adjustments, experiences with institutional support, and recommended intervention measures. Its semi-structured format ensured both consistency across participants and responsiveness to each participant's unique lived experience, thereby enhancing the depth and authenticity of the data. To strengthen content validity, the interview guide underwent expert validation, after which revisions were made to improve clarity, relevance, sequencing, and scope. In addition to the interview guide, the researcher used audio recordings to preserve the accuracy of participants' responses, field notes to capture contextual cues and nonverbal expressions, and supplementary observations and informal conversations to enrich interpretation. Collectively, these instruments supported the generation of comprehensive, credible, and contextually grounded qualitative data necessary for examining the multifaceted realities of non-specialist teaching.

2.4 Data Analysis

The study employed thematic analysis as its principal method of qualitative data analysis, following the systematic framework of Braun and Clarke (2006) to ensure an orderly, rigorous, and interpretive examination of the narratives generated from the semi-structured interviews. After each interview, the audio-recorded responses were transcribed verbatim to preserve the authenticity, nuance, and semantic depth of the participants' accounts. The analysis began with repeated reading of the transcripts to achieve data familiarization, after which the researcher identified significant statements, recurrent expressions, and meaningful segments relevant to the study's objectives. These data units were then inductively coded and clustered into broader categories, allowing preliminary patterns to emerge from participants' lived experiences rather than preconceived assumptions. Through iterative review and refinement, these categories evolved into coherent themes and subthemes that captured the instructional, emotional, pedagogical, and institutional dimensions of non-specialist teaching. The finalized themes were subsequently synthesized into an analytically integrated narrative that directly addressed the problem statement. To strengthen interpretive credibility, the researcher also practiced reflexivity throughout the analytic process and employed member checking by allowing participants to review their transcribed responses for accuracy and clarification. Overall, the adopted data analysis procedure enabled the study to derive rich, trustworthy, and contextually grounded thematic insights into the complexities of teaching outside one's specialization.

3 Results

The study found that the experiences of non-specialist teachers in Lingayen, Pangasinan were shaped primarily by limited content expertise, which emerged as the most pervasive source of instructional difficulty. Participants described struggling with inadequate mastery of the subject matter they were assigned to teach, making lesson delivery more demanding and emotionally taxing. This lack of specialization translated into hesitation when explaining concepts, uncertainty in answering learners' questions, and difficulty in constructing assessments that accurately reflected curricular expectations. More importantly, the mismatch generated an intensified workload, as teachers had to devote substantial time to self-study, repeated textbook review, and independent preparation to meet the minimum requirements of classroom instruction. As a result, the findings established that non-specialist teaching was not an occasional inconvenience but a continuing professional burden that shaped teachers' daily practice and sense of competence.

A second major result showed that specialization mismatch significantly affected teachers' pedagogical approaches and instructional strategies. Rather than exercising fully developed subject-specific pedagogy, the participants tended to adopt what the study identified as survival-based teaching strategies. These included heavy reliance on textbooks, modules, and teacher's guides; simplification of lessons; avoidance of cognitively demanding tasks; and reduced use of inquiry-based activities or higher-order questioning. Such strategies were not merely matters of personal preference but practical responses to insecurity about content knowledge. At the same time, the findings also demonstrated teacher resilience, as participants attempted to compensate through improvised instructional materials, multimedia integration, contextual examples, and other adaptive classroom techniques. Nevertheless, the study found that these coping strategies, while helpful in sustaining classroom instruction, did not fully compensate for the absence of strong pedagogical content knowledge associated with formal specialization.

The third area of results focused on institutional support and professional development, where the findings indicated inconsistencies, insufficiencies, and weak alignment with teachers' actual needs. Although some forms of assistance were available, they were often generic and failed to address the specific subject-content gaps faced by non-specialist teachers. Training opportunities were often broad and procedural rather than discipline-specific, limiting their usefulness for teachers assigned outside their areas of expertise. Administrators were generally aware of the mismatch problem. However, their responses were often constrained by staffing shortages, budget limitations, and structural hiring issues, leading to short-term accommodations rather than long-term solutions. In practice, the most meaningful support came from informal collegial networks, particularly from subject-specialist peers who shared lesson plans, explained difficult content, and provided emotional encouragement. This result underscored that peer mentoring had become the *de facto* support system, even though it lacked formal institutional structure and sustainability.

Finally, the study generated a set of proposed intervention measures grounded in the participants' lived experiences. Teachers consistently recommended subject-specific professional development, more deliberate and specialization-based deployment policies, and the institutionalization of mentoring and co-teaching arrangements. These recommendations reflected a practical understanding that the issue of non-specialist teaching required both immediate support and systemic reform. At the school level, the results pointed to the need for structured coaching, accessible specialist guidance, and targeted capacity-building. At the policy level, the findings emphasized the importance of improving teacher assignment practices to align specialization and instructional responsibility better. Taken together, the study's results portrayed non-specialist teaching as both an instructional and an organizational issue—one that affects teacher confidence, pedagogical quality, and the broader effectiveness of the educational system.

4. Discussion

The present study found that the most persistent burden of non-specialist teaching was limited content mastery, which in turn led to instructional insecurity, excessive preparation demands, and emotional strain among participants. This finding is strongly corroborated by Shulman's (1986) argument that effective teaching depends not only on general classroom technique but also on teachers' grasp of subject matter and their ability to transform it into teachable representations. In the same vein, Hobbs and Porsch (2021) characterize teaching out-of-field as a condition in which teachers are assigned to subjects for which they lack adequate preparation. This mismatch places pressure on both competence and identity. du Plessis et al. (2014) likewise show that out-of-field teaching is associated with confidence problems, fragile professional belonging, and highly specific developmental needs. Taken together, these sources support the present study's conclusion that specialization mismatch is not merely an assignment issue; it is a layered instructional and psychosocial condition that reshapes how teachers prepare, perform, and perceive themselves in the classroom.

The study also revealed that non-specialist teachers frequently adopted survival-based pedagogy, including heavy reliance on textbooks and modules, simplification of lessons, avoidance of complex content, and cautious restriction of higher-order questioning. This pattern is consistent with Shulman's (1986) "missing paradigm" critique, which explains that when content knowledge is weak, instruction risks becoming generic, procedural, and disconnected from deep conceptual understanding. The present findings are further supported by recent Philippine evidence from Mejia et al. (2025), who reported that subject-teaching alignment is positively associated with students' examination scores and that out-of-field teachers commonly experience lower confidence, increased preparation time, and greater difficulty addressing student misconceptions. These convergences suggest that the participants' conservative instructional choices were less a failure of commitment than a rational adaptation to inadequate subject-specific preparation. At the same time, the present study's account of improvised multimedia use and contextualized examples underscores teacher resilience; however, the evidence indicates that such compensatory practices cannot fully replace strong pedagogical content knowledge when curricular rigor is required.

A third point of corroboration concerns institutional support and professional development. Participants in the present study described support as inconsistent, generic, and often dependent on informal collegial help rather than formal systems. This closely mirrors du Plessis et al. (2014), who argue that one-size-fits-all professional development is poorly suited to the needs of out-of-field teachers, as their learning needs are content- and context-specific. The OECD similarly warns that one-off seminars have generally failed to produce meaningful professional growth and emphasizes that sustained collaboration and school-based professional learning are more effective for improving teaching quality. In the Philippine setting, this discussion is especially relevant because DepEd's NEAP Professional Development Framework explicitly distinguishes regular programs, which are non-subject-specific, from subject content programs, which are intended to improve teachers' content knowledge and pedagogical content knowledge in relevant learning areas. Read against that framework, the present study suggests that the issue is not the absence of policy language on targeted support, but the insufficient translation of that intent into accessible, sustained, and subject-specific assistance for non-specialist teachers at the school level.

Finally, the intervention measures proposed by participants—subject-specific professional development, stricter specialization-based deployment, and formal mentoring or co-teaching arrangements—are strongly reinforced by current Philippine policy discourse and research. Mejia et al. (2025) recommend recruitment and assignment procedures that prioritize teacher-subject matching, alongside targeted professional development and strategic workforce planning. EDCOM 2 has also reported that 62% of high school teachers are teaching subjects they did not

major in during college, underscoring that the mismatch identified in the present study reflects a broader structural problem rather than an isolated local anomaly. In addition, DepEd has publicly committed to professional development focused on learning area specialization and to graduate certificate programs for nonmajors. These converging lines of evidence strengthen the study's practical significance: its recommendations are grounded in participant experience and aligned with national reform directions.

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**INTEGRATIVE APPROACHES IN TEACHING MUSIC, ARTS, PHYSICAL EDUCATION,
AND HEALTH ON STUDENT ENGAGEMENT AND HOLISTIC
DEVELOPMENT IN JUNIOR HIGH SCHOOL**

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Abstract

In contemporary junior high school contexts, the demand for holistic, engaging, and developmentally responsive instruction has intensified the need to examine integrative approaches in Music, Arts, Physical Education, and Health (MAPEH). This study investigated the effects of integrative MAPEH teaching on student engagement, holistic development, and academic performance among junior high school learners in Pangasinan I Schools Division during 2025–2026. Employing a quantitative descriptive-comparative and correlational design, the study involved 150 Grades 7–10 students and 10 MAPEH teachers selected from public schools. Data were gathered through validated survey questionnaires measuring perceived effectiveness, implementation extent, engagement, and holistic development, while academic performance was obtained from school records. Descriptive statistics, an independent-samples t-test, and Pearson's correlation were used to analyze the data. Findings revealed that teachers ($M = 4.32$, $SD = 0.41$) and students ($M = 4.18$, $SD = 0.52$) perceived integrative approaches as highly effective. Students exposed to integrative MAPEH instruction recorded higher holistic development scores ($M = 4.27$, $SD = 0.39$) than those who experienced non-integrative instruction ($M = 3.81$, $SD = 0.44$), with a significant difference between groups, $t(148) = 6.21$, $p < .001$. The extent of implementation was moderately high ($M = 3.94$, $SD = 0.47$), and academic performance was higher among the integrative group ($M = 87.45$) than the comparison group ($M = 83.12$). A moderate positive correlation emerged between the extent of implementation and academic performance ($r = .41$, $p < .001$). The study concludes that integrative MAPEH instruction enhances learner engagement, holistic development, and academic achievement.

Keywords: Integrative Approaches; MAPEH Instruction; Student Engagement; Holistic Development; Academic Performance; Junior High School

1. Introduction

Education systems are increasingly expected to produce learners who are not only academically competent but also healthy, expressive, socially connected, and able to apply knowledge in real-life situations. This expectation is particularly relevant in junior high school, where learners experience rapid physical, emotional, social, and cognitive changes that require instruction to move beyond fragmented subject delivery. Music, Arts, Physical Education, and Health (MAPEH) is uniquely positioned to support this broader developmental agenda because it combines creative expression, movement, wellness, cultural understanding, and performance-based learning within a single curricular space. When taught integratively, MAPEH can become more than a set of separate components; it can function as a meaningful learning environment where students sing, create, move, reflect, collaborate, and make health-related decisions in ways that connect school learning with everyday life.

Recent literature supports the growing relevance of interdisciplinary instruction. A systematic review of secondary school interdisciplinarity found that interdisciplinary practices can promote student learning, interest, interpersonal skills, and teacher professional development, although authentic integration remains limited without strong conceptual links and favorable school conditions (Tonnetti & Lentillon-Kaestner, 2023). Similarly, White and Delaney (2021)

reported that interdisciplinary STEAM learning in high school settings is promising, particularly when implemented through real-world, project- or problem-based tasks, yet they also noted that empirical evidence remains insufficient for wide-scale adoption. These findings suggest that integration is not simply the act of combining subjects; rather, it requires deliberate lesson design, teacher readiness, appropriate resources, and assessment practices that capture multidimensional learning.

The value of integration is especially visible when the arts, movement, and health are considered as complementary dimensions of development. Arts education has been associated with improved school engagement, emotional empathy, writing achievement, and student discipline, indicating that creative learning experiences can influence both academic and socio-emotional outcomes (Bowen & Kisida, 2023). In physical education, evidence also shows that school-based physical activity may contribute to selected academic outcomes and cognitive functions when meaningfully embedded in school routines (Loturco et al., 2022). Health education likewise benefits from whole-school and systems-based approaches. The World Health Organization and UNESCO (2021) emphasized that schools are important settings for both education and well-being and that health-promoting schools should strengthen physical, social-emotional, and psychological conditions for learning. Taken together, these studies affirm that music, arts, physical activity, and health concepts can jointly support learners who are intellectually active, physically capable, emotionally aware, socially responsive, and health-conscious.

Student engagement provides an important pathway through which integrative MAPEH instruction may influence learning outcomes. Engagement is not a single behavior but a multidimensional construct involving participation, effort, attention, interest, emotional investment, and agency. Reeve et al. (2025), in a meta-analysis of student engagement, found that different engagement types serve distinct purposes: behavioral engagement is most strongly linked to achievement, and emotional engagement is strongly associated with motivation and well-being. This is important for MAPEH because integrative lessons often require students to perform, collaborate, solve problems, create outputs, reflect on health choices, and participate physically. These activities naturally activate behavioral, emotional, and cognitive engagement, making MAPEH a fertile context for studying how instructional integration relates to student development and academic performance.

Holistic development is also central to the present inquiry. Contemporary education discourse increasingly recognizes that academic rigor and holistic growth should not be treated as competing priorities. Datnow et al. (2022) argued that education systems seeking holistic student development attend to intellectual, physical, emotional, social, cultural, and moral dimensions while still sustaining academic quality. This view aligns closely with the nature of MAPEH, where learning outcomes cannot be fully understood through grades alone. A student who participates confidently in a group performance, observes proper movement and safety practices, appreciates cultural expression, and applies health knowledge is demonstrating development that extends beyond conventional academic achievement. Thus, examining holistic development in MAPEH allows the study to capture outcomes that are often visible in classroom life but underrepresented in formal research measures.

Despite the theoretical and empirical support for integrative instruction, important gaps remain. Existing interdisciplinary research often focuses on STEM/STEAM or general secondary instruction, while MAPEH-specific studies remain limited. Local evidence also suggests that MAPEH teachers need continued support in strengthening technological, pedagogical, and content knowledge for effective instruction (Didulo, 2023). Moreover, much of the available literature discusses engagement, arts learning, physical activity, or health promotion separately, leaving limited evidence on how the combined use of Music, Arts, Physical Education, and Health affects junior high school learners. In particular, there is a need to examine whether students

exposed to integrative MAPEH demonstrate stronger holistic development than those who experience traditional, discipline-separated instruction, and whether the extent of integrative implementation is associated with academic performance in core subjects.

Responding to these gaps, the present study investigates the effects of integrative approaches in teaching MAPEH on student engagement, holistic development, and academic performance among junior high school learners. It examines perceived effectiveness as rated by teachers and students, compares the holistic development scores of learners exposed and not exposed to integrative instruction, determines the extent of implementation, and analyzes its relationship with academic performance. By situating the inquiry within the Pangasinan I Schools Division, the study provides localized empirical evidence on how an integrative MAPEH pedagogy may support more engaging, developmentally responsive, and academically meaningful learning experiences. Ultimately, the study aims to provide a basis for pedagogical guidelines that can help teachers design MAPEH lessons that are not only connected across disciplines but also responsive to the whole learner.

2. Method

2.1 Research Design

The study employed a quantitative research design integrating descriptive, comparative, and correlational approaches to examine the effects of integrative approaches in teaching Music, Arts, Physical Education, and Health (MAPEH) on junior high school students' engagement, holistic development, and academic performance. This design was appropriate because the study sought to generate objective, measurable, and statistically interpretable evidence regarding the instructional value of integrative MAPEH practices. The descriptive component was used to determine the perceived effectiveness and extent of implementation of integrative approaches among teachers and students, thereby providing a clear profile of how interdisciplinary MAPEH instruction was practiced in the classroom. The comparative component enabled the study to determine whether significant differences existed in the holistic development of students who received integrative MAPEH instruction compared with those exposed to non-integrative or conventional approaches. Meanwhile, the correlational component was employed to examine the relationship between the extent of integrative MAPEH implementation and students' academic performance in core subjects. Through this combined design, the study captured both the current state of instructional practice and the measurable associations among key learning outcomes. The use of quantitative procedures also strengthened the objectivity of the inquiry, as data were obtained through structured survey instruments and official academic records, and then analyzed using appropriate statistical tools, including means, standard deviations, independent-samples t-tests, and Pearson correlations. Overall, the research design provided a systematic and rigorous framework for determining whether integrative MAPEH instruction contributes meaningfully to student engagement, holistic development, and academic achievement.

2.2 Participants

The study consisted of junior high school students and MAPEH teachers from selected public secondary schools in the Pangasinan I Schools Division. A total of 150 students from Grades 7 to 10 and 10 full-time MAPEH teachers were involved, representing learning environments situated in rural, semi-urban, and coastal communities. The inclusion of both learners and teachers provided a balanced source of data, as students supplied information on engagement, holistic development, exposure to integrative MAPEH instruction, and academic performance, while teachers contributed data on the perceived effectiveness and extent of implementation of integrative approaches. Student participants were included if they were officially enrolled in Grades 7 to 10, had completed at least one full grading period of MAPEH

instruction, and had provided assent with parental or guardian consent. Teacher participants were included if they were full-time MAPEH teachers in Pangasinan I, had at least 1 year of teaching experience, and had implemented either an integrative or a traditional MAPEH approach. Participants who lacked sufficient instructional exposure, submitted incomplete responses, transferred during data collection, or did not meet the established criteria were excluded to preserve data validity. This participant composition enabled the study to capture both learner outcomes and instructional practices within diverse classroom contexts.

2.3 Instrumentation

The study employed structured survey questionnaires and documentary records as the principal instruments for data collection. For student respondents, the questionnaire comprised sections measuring student engagement, holistic development, exposure to integrative MAPEH instruction, and relevant demographic information. Student engagement was assessed in terms of behavioral, emotional, and cognitive involvement, while holistic development covered physical literacy, artistic competence, health awareness, emotional wellness, and social interaction skills. Exposure to integrative MAPEH teaching was also measured to classify students based on whether they had experienced lessons integrating Music, Arts, Physical Education, and Health concepts. For teacher respondents, a separate questionnaire was used to determine the extent to which integrative approaches were implemented in classroom instruction and how effective these approaches were perceived to be in improving student learning outcomes. Both student and teacher instruments used a five-point Likert scale, allowing responses to be converted into quantitative data suitable for statistical analysis. To strengthen validity, the instruments were reviewed by MAPEH and research experts, while pilot testing was conducted among respondents outside the study sample to establish reliability. In addition to survey data, students' official grades in core subjects were obtained from school records and served as objective indicators of academic performance. Class lists, attendance records, and teaching schedules were also consulted to verify participant eligibility and ensure the completeness and accuracy of the dataset.

2.4 Data Analysis

The data gathered in the study were encoded, organized, and analyzed using quantitative statistical procedures appropriate to the descriptive-comparative and correlational nature of the research. Descriptive statistics, particularly frequency counts, means, and standard deviations, were used to summarize the perceived effectiveness of integrative approaches, the extent of their implementation in MAPEH classes, students' engagement, holistic development scores, and academic performance. To determine whether students exposed to integrative MAPEH instruction differed significantly from those who experienced non-integrative or conventional instruction, an independent-samples t-test was employed, allowing the study to compare group means in holistic development. Meanwhile, Pearson product-moment correlation was used to examine the degree and direction of association between the extent of integrative MAPEH implementation and students' academic performance in core subjects. The use of these statistical tools enabled the researcher to move beyond simple description by identifying measurable differences and relationships among the major study variables. Results were interpreted using statistical values, levels of significance, and corresponding qualitative descriptions to ensure the findings were presented with clarity, objectivity, and empirical grounding. Overall, the data analysis procedure provided a systematic basis for determining whether integrative approaches in MAPEH were associated with improved learner engagement, holistic development, and academic achievement.

3 Results

The findings revealed that integrative approaches in teaching Music, Arts, Physical Education, and Health (MAPEH) were perceived as highly effective by both teachers and

students. Teacher-respondents obtained a mean rating of 4.32 with a standard deviation of 0.41, while student-respondents recorded a mean rating of 4.18 with a standard deviation of 0.52. These results suggest a strong shared recognition of the instructional value of integrative MAPEH practices. From the perspective of teachers, integration allowed the four components of MAPEH to be delivered in a more connected and purposeful manner. From the perspective of students, such approaches appeared to make learning more meaningful, engaging, and easier to relate to real-life situations. This indicates that integrative instruction was not merely viewed as an alternative teaching strategy but as a relevant pedagogical approach that enhanced classroom experience and learner participation.

The comparison of holistic development scores showed that students who experienced integrative MAPEH instruction achieved higher developmental outcomes than those taught through non-integrative or conventional approaches. The integrative group had a mean score of 4.27 with a standard deviation of 0.39, indicating high development, while the non-integrative group had a mean score of 3.81 with a standard deviation of 0.44, indicating moderate development. This difference implies that exposure to integrative MAPEH lessons may have strengthened students' growth across physical, emotional, social, artistic, and health-related domains. Since MAPEH naturally involves performance, movement, creativity, collaboration, and wellness awareness, its integrated delivery may have provided learners with richer opportunities to develop as whole persons rather than as recipients of isolated subject content.

The independent samples t-test further confirmed that the difference in holistic development between the two groups was statistically significant, with $t = 6.21$, $df = 148$, and $p < .001$. This result provides empirical support for the claim that integrative MAPEH instruction produces measurable developmental advantages among junior high school learners. The significant difference suggests that students exposed to interdisciplinary learning experiences were more likely to demonstrate balanced growth than those who experienced separated or traditional delivery of MAPEH components. In practical terms, this finding emphasizes the importance of designing lessons that connect music, arts, physical education, and health into unified learning tasks, as such integration appears to deepen not only student participation but also personal and social development.

The study also found that the extent of using integrative approaches in MAPEH was moderately high, with a mean of 3.94 and a standard deviation of 0.47. This indicates that teachers were already implementing integrative strategies in their classes, although the level of implementation had not yet reached full consistency. The result suggests that while teachers recognized the value of integration and applied it in instruction, there may still be areas requiring improvement, such as interdisciplinary lesson planning, availability of instructional resources, teacher collaboration, and professional development. This finding is important because the success of integrative MAPEH instruction depends not only on teacher willingness but also on sustained institutional support, capacity-building, and curriculum alignment.

In terms of academic performance, students exposed to integrative MAPEH instruction achieved a higher mean grade of 87.45 compared with 83.12 for those who received non-integrative instruction. Moreover, the Pearson correlation showed a moderate positive relationship between the extent of integrative MAPEH implementation and academic performance ($r = .41$, $p < .001$). This means that higher levels of integrative teaching were associated with better academic outcomes in core subjects. Although the correlation does not imply direct causation, the result suggests that integrative MAPEH instruction may contribute to broader academic success by improving engagement, motivation, confidence, creativity, and cognitive involvement. Overall, the findings indicate that integrative MAPEH approaches have meaningful instructional value, particularly in enhancing student engagement, promoting holistic development, and supporting academic achievement.

4. Discussion

The study's findings affirm that integrative approaches in teaching MAPEH were perceived as highly effective by both teachers and students, indicating that interdisciplinary instruction is pedagogically meaningful when learners are given opportunities to connect Music, Arts, Physical Education, and Health within unified learning experiences. This result is consistent with Tonnetti and Lentillon-Kaestner (2023), who emphasized that interdisciplinary teaching in secondary schools can strengthen students' learning, interest, and interpersonal development when integration is intentionally designed rather than superficially combined. In the present study, the high ratings from teachers and students suggest that integrative MAPEH instruction enabled learners to experience lessons as more connected, relevant, and participatory. This finding also supports White and Delaney's (2021) view that interdisciplinary learning becomes more powerful when it is organized around authentic, activity-based, and problem-centered tasks. In this sense, integrative MAPEH may have increased the instructional value of the subject by transforming separate content areas into a coherent learning experience that encourages creativity, movement, reflection, collaboration, and real-life application.

The higher holistic development scores among students exposed to integrative MAPEH instruction corroborate the growing literature on whole-child education. Datnow et al. (2022) argued that education systems should intentionally support learners' intellectual, physical, emotional, social, cultural, and moral development rather than focusing solely on academic measures. The results of the present study support this principle, as students who experienced integrative instruction demonstrated greater development across physical, emotional, social, artistic, and health-related domains. This is further supported by the World Health Organization and UNESCO (2021), which emphasized that schools should promote life skills, socio-emotional competencies, and healthy lifestyles as part of quality education. Since MAPEH naturally involves movement, creative expression, teamwork, wellness practices, and self-awareness, its integrative delivery provides a strong instructional pathway for holistic development. Thus, the significant difference in holistic development between the integrative and non-integrative groups suggests that learners benefit more when MAPEH is taught as an interconnected developmental experience rather than as isolated subject components.

The significant difference between students exposed to integrative MAPEH and those taught through conventional approaches also aligns with evidence on arts education and physical activity. Bowen and Kisida (2023) found that increased arts educational experiences improved students' writing achievement, emotional empathy, school engagement, and discipline-related outcomes, showing that creative learning contributes to broader academic and socio-emotional development. Similarly, Loturco et al. (2022) reported that school-based physical activity interventions may support academic achievement in areas such as mathematics, language, reading, and composite performance. These studies help explain why integrative MAPEH instruction may have produced stronger developmental outcomes in the present study. By combining artistic, physical, and health-oriented experiences, learners were not only acquiring subject knowledge but also practicing self-expression, bodily coordination, cooperation, attention, discipline, and decision-making. These competencies are essential to holistic development and may explain why the integrative group performed better than the non-integrative group.

The moderately high extent of integrative implementation indicates that teachers were already applying interdisciplinary strategies, but that full implementation still requires institutional and professional support. This finding is consistent with Didulo (2023), who reported that MAPEH teachers' technological, pedagogical, and content knowledge remains an important basis for instructional improvement and intervention planning. It also supports Tonnetti and Lentillon-Kaestner's (2023) observation that while interdisciplinarity is widely valued, authentic integration in secondary schools remains limited and requires favorable teaching conditions. Therefore, the present study implies that teacher capacity-building, collaborative planning, access to learning

resources, and curriculum-aligned performance tasks are necessary to strengthen integrative MAPEH instruction. Without these supports, integration may remain dependent on individual teacher initiative rather than becoming a sustained instructional practice across schools.

Finally, the higher academic performance of students exposed to integrative MAPEH and the moderate positive correlation between implementation extent and academic performance suggest that integrative instruction may contribute to broader academic outcomes. Reeve et al. (2025) explained that student engagement has different dimensions, with behavioral, emotional, cognitive, and agentic engagement serving important functions in achievement, motivation, social support, and well-being. In the present study, integrative MAPEH likely increased learners' participation, interest, effort, and cognitive investment, which may have supported academic performance beyond the MAPEH classroom. However, the correlation should be interpreted cautiously because it indicates association rather than direct causation. Other factors such as teacher quality, learner motivation, home support, prior achievement, and school resources may also influence performance. Even with this limitation, the results provide meaningful evidence that integrative MAPEH instruction is associated with improved engagement, holistic development, and academic achievement. The findings therefore justify the development of pedagogical guidelines that promote interdisciplinary lesson planning, collaborative performance tasks, health-and-arts integration, reflective learning, and continuous teacher professional development.

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THE EFFECTS OF MOBILE TECHNOLOGY INTEGRATION ON LEARNING OUTCOMES AND MOTIVATION IN PHYSICAL EDUCATION

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Abstract

The increasing adoption of plant-based diets among competitive athletes has intensified interest in whether such dietary patterns can sustain high-level performance without compromising nutritional adequacy. This study compared the nutritional intake and physical performance of 300 competitive athletes in Metro Manila, divided equally into plant-powered and omnivorous groups. Using a comparative, quantitative, cross-sectional design, data were collected through 7-day food records, 24-hour dietary recalls, food frequency questionnaires, and standardized performance assessments of endurance, strength, and speed. Descriptive statistics, independent-samples t-tests, and Pearson correlation were applied at the 0.05 level of significance. Findings showed significant differences in dietary intake between groups. Plant-powered athletes consumed a higher proportion of carbohydrates, whereas omnivorous athletes consumed a higher proportion of protein and had markedly higher intakes of vitamin B12 and omega-3 fatty acids. Iron intake was slightly higher among plant-powered athletes. Despite these nutritional differences, no statistically significant differences were found in VO₂max, squat 1-repetition maximum ratio, or 100-meter sprint time, indicating comparable endurance, strength, and speed outcomes across dietary patterns. Correlation analysis further revealed that higher carbohydrate intake was positively associated with VO₂max, protein intake with strength, and omega-3 intake with time-to-exhaustion, while vitamin B12 showed a significant negative correlation with sprint time. The study concludes that a well-planned plant-based diet can support athletic performance comparable to that of an omnivorous diet, provided that key micronutrient gaps are addressed through careful dietary planning and appropriate supplementation.

Keywords: Plant-Powered Athletes, Nutritional Intake, Physical Output Performance, Endurance, Strength, Micronutrient Adequacy

1. Introduction

The rapid expansion of plant-based eating patterns has reshaped contemporary discussions in health, sustainability, and human performance. In recent years, vegetarian and vegan dietary patterns have moved beyond lifestyle preference and entered mainstream clinical and athletic discourse, prompting renewed interest in whether these diets can adequately sustain the physiological demands of competitive sport. Current professional guidance indicates that appropriately planned vegetarian dietary patterns can be nutritionally adequate for adults and may support long-term health; however, athletic populations represent a distinct nutritional context because training, recovery, and competition place unusually high demands on energy availability, protein turnover, glycogen restoration, and micronutrient sufficiency. As a result, the question is no longer whether plant-based diets are generally healthful, but whether they can consistently support high-level physical output under competitive conditions.

Athletes require a dietary pattern that does more than prevent deficiency; it must optimize adaptation to training, maintain lean tissue, and sustain repeated bouts of high-intensity effort. Protein intake is especially critical in this regard. The International Society of Sports Nutrition states that most exercising individuals need approximately 1.4 to 2.0 g of protein per kilogram of body weight per day to support training adaptations, recovery, and maintenance of fat-free mass.

Carbohydrate availability is equally central because it underpins muscle glycogen replenishment and supports prolonged or intense exercise. Thus, nutritional adequacy in athletes must be evaluated not only in terms of total intake, but also in terms of the quality, bioavailability, and performance relevance of specific nutrients across different dietary patterns.

Plant-based diets appear attractive in sport for several reasons. They are typically richer in complex carbohydrates, dietary fiber, polyphenols, and antioxidant-rich foods than conventional omnivorous diets, characteristics that may support glycogen stores, cardiometabolic health, and recovery from training stress. At the same time, the current evidence base does not support simplistic claims that vegan diets automatically enhance performance. A recent review of nutritional considerations for vegan athletes concluded that athletes can follow a vegan diet without an unavoidable detriment to performance. However, the available evidence does not show a consistent ergogenic advantage of vegan diets over omnivorous diets. This position suggests that dietary pattern alone is not the primary determinant of athletic success; rather, performance depends on whether the diet is carefully structured to meet sport-specific nutrient needs.

One of the most persistent criticisms of plant-based sports nutrition concerns protein quality. Compared with many animal-source proteins, single-source plant proteins often contain lower proportions of certain essential amino acids, particularly leucine, and may show lower digestibility. These characteristics have historically raised concern about whether plant-based athletes can support muscle protein synthesis, strength development, and recovery as effectively as omnivorous athletes. However, newer controlled evidence complicates this assumption. In a resistance-training trial comparing a high-protein plant-based diet with a protein-matched omnivorous diet, no significant between-group differences were found in strength or body composition outcomes when total protein intake was adequate. Such findings suggest that the practical issue is not whether protein comes from plants or animals per se, but whether total intake, amino acid composition, meal planning, and training context are sufficient to meet anabolic demands.

Micronutrient sufficiency remains the more delicate issue in plant-based athletic diets. Vitamin B12 is a particularly important concern because it is not naturally present in plant foods unless they are fortified, and recent reviews emphasize that oral supplementation is the safest strategy for maintaining adequate B12 status in plant-based populations. Iron is another critical nutrient because exercise increases iron demands, while the bioavailability of nonheme iron in vegetarian diets is lower than that of heme iron from mixed diets. The National Institutes of Health notes that vegetarians may need substantially more dietary iron than non-vegetarians due to these differences in iron absorption. Long-chain omega-3 fatty acids, especially DHA and EPA, also merit attention, although vegetarian-compatible algal oil supplements provide a viable source. For athletes, these micronutrients are not merely markers of general wellness; they are linked to oxygen transport, neuromuscular function, recovery, inflammation control, and overall training readiness.

Despite the growth of sports-nutrition literature, important gaps remain. Much of the available evidence has emphasized either endurance or resistance outcomes, often in small or highly controlled samples, and many studies do not simultaneously examine actual dietary intake alongside direct measures of athletic performance. This limitation matters because performance cannot be interpreted fully without understanding what athletes are actually consuming. A plant-based athlete with inadequate B12, iron, or total protein intake is nutritionally distinct from a plant-based athlete following a carefully planned, supplemented, high-protein regimen; similarly, an omnivorous athlete may consume animal products without necessarily achieving optimal sport nutrition. Comparative research that integrates macronutrient intake, key micronutrients, and objective performance metrics is, therefore, essential for generating practically useful conclusions rather than ideological ones.

The present study addresses this need by comparing the nutritional intake and physical output performance of plant-powered and omnivorous athletes in Metro Manila. Specifically, it examines dietary intake of macronutrients and selected micronutrients and relates these nutritional patterns to measurable indicators of endurance, strength, and speed. By doing so, the study extends the current debate from generalized claims about the superiority of vegans or omnivores toward a more evidence-based assessment of nutritional sufficiency and performance non-inferiority. It is particularly relevant in a setting where athletes, coaches, and sports dietitians require locally grounded evidence to guide dietary planning under real training conditions.

Ultimately, this inquiry is significant for both science and practice. Scientifically, it contributes to the growing body of literature evaluating whether dietary patterns predict performance independently of nutrient adequacy. In practice, it may help clarify whether plant-powered athletes can achieve comparable physical output to omnivorous athletes when dietary intake is appropriately managed, and identify the nutritional variables most strongly associated with performance. In this sense, the study does not frame plant-based and omnivorous diets as opposing ideologies, but rather as competing nutritional systems whose effectiveness depends on how well they meet the biological requirements for athletic performance.

2. Method

2.1 Research Design

This study employed a non-experimental, comparative quantitative research design to determine whether meaningful differences existed in nutritional intake and physical output performance between plant-powered athletes and omnivorous athletes. More specifically, the investigation adopted a cross-sectional approach because all dietary, anthropometric, and performance-related data were collected within a defined period rather than across multiple time points. This design was appropriate because the principal independent variable, namely dietary pattern, could not be manipulated or randomly assigned on ethical and practical grounds, given that participants had already been adhering to their respective diets for an extended period prior to recruitment. The comparative design enabled direct statistical examination of group differences in macronutrient and micronutrient intake, as well as in endurance, strength, and speed performance indicators. In this sense, the design was well-suited to the study's central purpose, which was not to establish causality in an experimental sense but to generate empirical evidence on whether dietary patterns were associated with measurable variation in athletic nutrition and performance outcomes under naturally occurring conditions.

2.2 Participants

The study participants were 300 competitive adult athletes from Metro Manila, composed of 150 plant-powered and 150 omnivorous athletes. They were selected through non-probability purposive sampling because the study required respondents who met highly specific inclusion criteria related to both training status and long-term dietary adherence. Eligible participants were between 18 and 40 years old, actively engaged in high-intensity training, and involved in competitive sports such as running, weightlifting, and team sports. To ensure stable dietary adaptation, participants in the plant-powered group were required to have consistently followed a strict vegan or plant-based diet for at least 1 year. In contrast, those in the omnivorous group were expected to have maintained a regular diet including animal products over the same period. Recruitment was facilitated through athletic clubs, university sports teams, and online athlete communities in Metro Manila, and each prospective participant underwent screening to verify compliance with the study criteria. The equal distribution of respondents across the two dietary groups strengthened the comparability of the dataset and improved the robustness of the inferential statistical procedures used in the investigation.

2.3 Instrumentation

The study utilized a multi-instrument quantitative protocol to capture both nutritional intake and physical output performance with sufficient rigor and comparability. Nutritional intake data were gathered through a structured 7-day food record, a 24-hour dietary recall, and a standardized food frequency questionnaire, all administered with the assistance of a registered dietitian to improve reporting accuracy and to verify long-term dietary patterns. These dietary records were subsequently encoded into a validated nutritional analysis software package to determine the mean daily intake of the major macronutrients. They selected key micronutrients, including vitamin B12, iron, and omega-3 fatty acids. For physical performance assessment, the study relied on calibrated and standardized testing equipment. Endurance was measured through VO2max and time-to-exhaustion procedures using laboratory-based metabolic testing equipment and a stationary bicycle; strength was assessed through 1-repetition maximum testing on major compound lifts using calibrated free weights; and speed was measured through standardized sprint trials using electronic timing gates on an athletic track. The use of these instruments ensured that both self-reported and performance-based variables were systematically captured and consistent with the study's comparative objectives.

2.4 Data Analysis

The collected data were processed and analyzed quantitatively using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, particularly means and standard deviations, were first employed to summarize the nutritional and performance profiles of the two dietary groups. To test whether statistically significant differences existed between plant-powered and omnivorous athletes in daily nutrient intake and physical performance scores, the study used an independent-samples t-test at the 0.05 level of significance. In portions of the methodology draft, analysis of variance was also indicated as part of the inferential framework for testing differences in means where appropriate. In addition, Pearson's Product-Moment Correlation was used to determine the magnitude and direction of the relationship between selected nutritional variables and performance outcomes, thereby allowing the study to examine whether higher or lower nutrient intake was associated with better endurance, strength, or speed metrics. Through this analytical structure, the study addressed both its comparative and relational research objectives in a statistically coherent manner.

3 Results

The analysis of nutritional intake revealed clear, statistically significant differences between plant-powered and omnivorous athletes. In terms of macronutrients, the plant-powered group derived a significantly greater proportion of energy from carbohydrates ($M = 62.1\%$, $SD = 4.5$) than the omnivorous group ($M = 54.0\%$, $SD = 5.1$), with a computed t-value of 7.15 and a p-value of $< .001$. By contrast, omnivorous athletes obtained a significantly higher percentage of energy from protein ($M = 22.3\%$, $SD = 2.8$) than plant-powered athletes ($M = 18.5\%$, $SD = 2.1$), $t = -5.89$, $p < .001$. Total caloric intake also differed significantly, with omnivorous athletes reporting higher daily energy intake ($M = 3120$ kcal, $SD = 350$) than plant-powered athletes ($M = 2950$ kcal, $SD = 310$), $t = -3.51$, $p < .001$. These findings indicate that the two dietary groups were nutritionally distinct, with the plant-powered pattern characterized by stronger carbohydrate emphasis and the omnivorous pattern by greater protein density. The thesis interprets this pattern as consistent with contemporary sports nutrition thinking, which holds that high carbohydrate availability supports endurance work, whereas protein distribution remains central to muscular adaptation.

Likewise, marked differences were observed in key micronutrients. Plant-powered athletes reported substantially lower vitamin B12 intake ($M = 1.1$ µg, $SD = 0.8$) than omnivorous athletes ($M = 3.5$ µg, $SD = 1.2$), with $t = -12.90$ and $p < .001$. A similarly pronounced gap appeared in omega-3 fatty acid intake, with plant-powered athletes consuming 45 mg ($SD = 35$) compared

with 210 mg (SD = 55) among omnivorous athletes, yielding $t = -9.44$ and $p < .001$. Interestingly, iron intake was slightly but significantly higher in the plant-powered group ($M = 17.8$ mg, $SD = 3.2$) than in the omnivorous group ($M = 15.5$ mg, $SD = 3.5$), with $t = 2.11$ and $p = .035$. The study discussed this result cautiously, noting that higher reported iron intake does not necessarily indicate better iron status, as plant-derived non-heme iron is generally less bioavailable than heme iron. Accordingly, the results suggest that plant-powered diets may successfully provide carbohydrate-rich fueling. However, they also require deliberate attention to micronutrients that are commonly limited in the absence of animal-source foods.

Despite these nutritional differences, the two groups demonstrated highly comparable physical output performance. Plant-powered athletes recorded a mean $VO_{2\max}$ of 58.1 mL/kg/min ($SD = 4.5$), while omnivorous athletes posted 57.5 mL/kg/min ($SD = 4.8$), with no significant difference between groups, $t = 0.98$, $p = .328$. Strength performance was likewise similar, as measured by squat 1-RM to body weight ratio, where the plant-powered group obtained a mean of 1.95 ($SD = 0.21$) and the omnivorous group 1.98 ($SD = 0.20$), with $t = -0.65$ and $p = .517$. Speed outcomes followed the same trend: the 100-meter sprint times of plant-powered athletes ($M = 11.85$ s, $SD = 0.40$) and omnivorous athletes ($M = 11.79$ s, $SD = 0.42$) did not differ significantly, $t(1) = -1.11$, $p = .267$. These findings led to the retention of the second null hypothesis and support the thesis's central conclusion that a well-managed plant-powered diet does not inherently compromise endurance, strength, or speed in competitive athletes.

The correlation analysis offered a more nuanced interpretation, showing that athletic performance was more strongly associated with specific nutrient variables than with the dietary label alone. Carbohydrate intake showed a significant positive correlation with $VO_{2\max}$ ($r = .285$, $p = .001$), indicating that greater carbohydrate availability was associated with greater aerobic capacity. Protein intake, in grams per kilogram of body weight, also correlated positively with the squat 1-RM ratio ($r = .352$, $p < .001$), reinforcing the importance of adequate protein provision for strength performance. In addition, omega-3 fatty acid intake was positively associated with time-to-exhaustion ($r = .211$, $p = .015$), while vitamin B12 intake showed a significant negative correlation with 100-meter sprint time ($r = -.188$, $p = .038$), suggesting that higher B12 intake was linked to faster sprint performance. The thesis interpreted these findings to mean that nutrient adequacy, rather than dietary identity, is the more decisive factor in optimizing athletic performance.

Taken together, the results demonstrate that plant-powered and omnivorous diets produce distinct nutritional profiles, yet these differences do not automatically translate into inferior or superior overall performance. Instead, the findings indicate that performance parity is achievable when athletes meet the physiological demands of training through appropriate nutrient planning. For plant-powered athletes, this implication is especially important: the diet can support competitive performance, but only when attention is given to protein sufficiency, strategic carbohydrate intake, and targeted micronutrient support, particularly for vitamin B12 and omega-3 fatty acids. Thus, the study advances an evidence-based position that athletic success is determined less by whether the diet is plant-based or omnivorous and more by whether it is nutritionally adequate, sport-specific, and consistently implemented.

4. Discussion

The present study's finding that plant-powered athletes consumed a higher proportion of carbohydrates but a lower proportion of protein than omnivorous athletes is well supported by current sports-nutrition literature. Contemporary reviews consistently describe vegetarian and vegan dietary patterns as richer in complex carbohydrates, fiber, and plant phytochemicals, while also requiring more deliberate attention to protein density, amino acid distribution, and total energy intake. Luna et al. (2024) concluded that well-planned vegetarian diets can meet athletic requirements, but only when macronutrient planning is intentional. Similarly, West et al. (2023)

emphasized that vegan athletes can perform without detriment, although spontaneous or poorly structured vegan diets may produce suboptimal intakes of protein and selected nutrients. The Academy of Nutrition and Dietetics likewise states that appropriately planned vegetarian and vegan patterns can be nutritionally adequate. However, they require individualized meal planning to reduce the risk of nutrient inadequacies (Raj et al., 2025). Thus, the nutritional profile observed in the present study is not anomalous; rather, it reflects a pattern already documented in the broader literature on plant-based sport nutrition.

The present study's significantly lower vitamin B12 and omega-3 intakes in the plant-powered group, together with slightly higher iron intake, also corroborate the current evidence base. Reviews focused on plant-based athletes identify vitamin B12, iron, calcium, vitamin D, zinc, and omega-3 fatty acids as nutrients most often requiring careful monitoring because their sources are limited in plant-based diets or their absorption is less efficient. Ayaz et al. (2024) and West et al. (2023) both stress that vitamin B12 and, in many cases, omega-3 fatty acids are difficult to obtain adequately from unsupplemented plant-based diets, while the lower bioavailability of non-heme iron complicates iron adequacy. Importantly, Nebl et al. (2019) found that recreational runners following vegetarian and vegan diets could maintain adequate vitamin B12, vitamin D, and iron status when supplementation and careful planning were used. This helps explain why the present study found higher reported iron intake in plant-powered athletes without assuming superior physiological iron status. In other words, the current study aligns with the literature, indicating that plant-based athletes may meet adequate intake targets. However, micronutrient sufficiency is more dependent on planning, fortification, and supplementation than in omnivorous diets.

The most important finding of the present study, however, is that there was no statistically significant difference between plant-powered and omnivorous athletes in endurance, strength, or speed. This result strongly agrees with existing comparative evidence. In a randomized crossover trial, Roberts et al. (2022) found no significant differences in running or strength outcomes between predominantly plant-based and omnivorous diets when protein intake remained within recommended ranges. Nebl et al. (2019) likewise reported no differences in exercise capacity among vegan, lacto-ovo-vegetarian, and omnivorous recreational runners. In resistance-focused contexts, Hevia-Larraín et al. (2021) showed that a high-protein plant-based diet supported comparable strength and muscle adaptations to a protein-matched omnivorous diet, and Monteyne et al. (2023) reached a similar conclusion for myofibrillar protein synthesis and hypertrophy during high-volume resistance training. More recently, López-Moreno et al. (2025) synthesized randomized trials and concluded that plant-based diets do not compromise upper-body, lower-body, or overall muscular strength compared with omnivorous diets. Taken together, these studies reinforce the interpretation that the absence of performance differences in the present investigation is consistent with the strongest available evidence: plant-based diets can support athletic performance when nutrient intake is sufficient.

The correlation results in the present study also align with established physiological principles, although they should be interpreted carefully. The positive association between carbohydrate intake and VO₂max is biologically plausible because carbohydrate remains the primary fuel for moderate-to-high-intensity exercise and supports glycogen availability during endurance work. The positive link between protein intake and strength likewise aligns with evidence showing that high-protein diets, especially above 1.6 g/kg/day, support resistance-training adaptation when paired with progressive overload. At the same time, the relationships between omega-3 intake and time-to-exhaustion, and between vitamin B12 intake and sprint time, should be discussed with nuance. Current reviews suggest that omega-3 fatty acids may help reduce post-exercise inflammation and muscle damage, but direct performance improvements remain inconsistent. Similarly, vitamin B12 is clearly relevant to red blood cell formation and nervous system function. However, athletic outcomes are better interpreted in relation to actual

biomarker status and supplementation practices than intake alone. Accordingly, the present study's correlations are best understood as physiologically credible associations that support careful nutrient management, rather than as proof that any single nutrient alone determines performance.

Overall, the present study is corroborated by the contemporary consensus in sports nutrition: dietary pattern matters, but nutrient adequacy matters more. The literature now consistently rejects the assumption that plant-powered athletes are inherently disadvantaged. Instead, it shows that performance comparability is achievable when energy intake, carbohydrate availability, protein quantity and quality, and high-risk micronutrients are appropriately managed. This makes the practical contribution of the present study especially valuable. It demonstrates, within a Metro Manila cohort, that plant-powered diets can support competitive endurance, strength, and speed outcomes, while also making clear that such diets require more structured nutritional planning than omnivorous diets. Therefore, the study contributes to an increasingly evidence-based view that athletic performance depends less on whether food is plant- or animal-derived and more on whether the diet is adequately designed to meet sport-specific physiological demands.

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THE IMPACT OF PARTICIPATION IN RECREATIONAL ACTIVITIES ON ACADEMIC ACHIEVEMENT AMONG SENIOR HIGH SCHOOL STUDENTS

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Abstract

In senior high school, students face increasing academic demands while also needing meaningful opportunities for recreation, social connection, creativity, well-being, and resilience. This study examined the impact of participation in recreational activities on the academic achievement of senior high school students. Using a quantitative cross-sectional, comparative, and correlational research design, the study assessed students' participation in physical, creative, social, and outdoor recreational activities and related these patterns to academic achievement indicators, particularly Grade Point Average (GPA) and standardized test scores. Data were gathered through a structured self-report questionnaire and official school records. Descriptive statistics, an independent-samples t-test, and Pearson's correlation were employed to analyze the data. Findings revealed that students demonstrated a moderate overall level of participation in recreational activities, with social activities receiving the highest engagement, followed by physical, creative, and outdoor activities. Academic achievement was generally favorable, as reflected in a good mean GPA and satisfactory standardized test scores. Results further showed that students who participated in recreational activities obtained higher GPAs and standardized test scores than non-participants. Significant differences were observed between participants and non-participants, while correlation analysis indicated a positive association between recreational activity participation and academic achievement. These findings suggest that recreation is not merely a break from academic work but a meaningful contributor to students' motivation, balance, cognitive functioning, and overall school performance. The study concludes that schools should intentionally promote accessible and varied recreational programs to support academic achievement and holistic development among senior high school learners across diverse learning contexts and communities.

Keywords: Recreational Activities; Academic Achievement; Senior High School Students; GPA; Standardized Test Scores; Holistic Development

1. Introduction

Senior high school is a demanding stage of education where students are expected to meet more rigorous academic requirements, prepare for higher education or employment, and make important decisions about their future. In this period, academic achievement is often treated as the central indicator of success, yet students' capacity to perform well in school is also shaped by their health, motivation, emotional balance, social relationships, and opportunities for meaningful recreation. Recreational activities—such as sports, exercise, music, arts, clubs, volunteer work, and outdoor activities—are not merely pastimes; they are developmental spaces where learners recover from stress, build confidence, form friendships, practice discipline, and strengthen skills that may support academic growth. This makes recreation an important area of inquiry in schools that seek not only high grades but also the holistic development of learners.

Recent studies increasingly show that well-designed physical and recreational experiences may contribute to academic and developmental outcomes. Loturco et al. (2022), in a systematic review, reported that physical activity interventions may improve overall academic

achievement among school students, although effects may vary across academic domains. Similarly, He et al. (2025) found that school-based physical activity had positive effects on academic achievement, particularly in mathematics and overall academic performance, while also emphasizing that intervention duration, intensity, and implementation quality influence outcomes. These findings suggest that recreational engagement can support learning not by replacing academic work but by improving the conditions under which students learn—such as attention, energy, self-regulation, and motivation.

Recreational participation also has social and emotional value, especially during adolescence. O'Donnell et al. (2024) found that participation in extracurricular activities predicted stronger school belonging over time, and that school belonging was associated with lower depressed mood among adolescents. This is relevant because students who feel accepted and connected within the school environment are more likely to participate, persist, and engage meaningfully in academic tasks. Reeve et al. (2025) further explained that student engagement is multidimensional, with behavioral engagement closely linked to achievement, emotional engagement associated with motivation and well-being, and agentic engagement related to social support. Recreational activities may therefore serve as pathways for strengthening the very forms of engagement that support academic success.

Creative and arts-related activities also deserve attention in discussions of recreation and achievement. Ishiguro et al. (2023) found that extracurricular music and visual arts activities were associated with improved academic performance among school-aged learners, although the effects were complex and sometimes mediated by growth in art-related skills. This indicates that creative activities may develop more than artistic talent; they may also nurture patience, concentration, self-expression, and cognitive flexibility. For senior high school students, participation in creative recreation may offer an alternative channel for learning, especially for those who thrive in expressive, performance-based, or collaborative environments.

Outdoor recreation adds another important dimension to students' well-being. Jackson et al. (2021) reported that participation in outdoor activities was associated with better subjective well-being among adolescents during the COVID-19 pandemic, highlighting the role of outdoor play and nature-based activities in strengthening resilience. Although outdoor activities are sometimes viewed as secondary to classroom learning, they may help students manage stress, restore attention, and develop a healthier relationship with their environment. In the context of senior high school, where academic pressure can be intense, outdoor recreation may provide a protective space for emotional regulation and mental recovery.

At the policy level, the connection between student health, well-being, and learning is increasingly recognized. The World Health Organization and UNESCO (2021) emphasized that schools are powerful settings for promoting both health and education outcomes, arguing that a health-promoting school strengthens the physical, social-emotional, and psychological conditions needed for learning. This perspective supports the idea that recreation should not be treated as an optional or peripheral activity. Instead, it should be understood as part of a balanced educational environment that enables students to become academically capable, socially connected, physically active, and emotionally resilient.

Despite these contributions, gaps remain in the literature. First, recreational activities are often studied separately, with physical activity, arts participation, social clubs, and outdoor recreation examined as distinct experiences. This makes it difficult to understand how overall recreational participation relates to academic achievement. Second, many studies focus on younger learners or on general extracurricular participation, leaving senior high school students underrepresented. Third, existing research often reports broad associations but gives limited attention to differences between students who participate in recreational activities and those who do not. Finally, there is still a need for school-based evidence to guide practical action plans to improve academic achievement through structured, accessible recreational opportunities.

To address these gaps, the present study examines the impact of participation in recreational activities on academic achievement among senior high school students. Specifically, it examines the level of student participation in physical, creative, social, and outdoor recreational activities; determines the level of academic achievement as reflected in Grade Point Average and standardized test scores; compares the academic achievement of students who participate in recreational activities and those who do not; and analyzes the relationship between recreational participation and academic achievement. By examining these relationships, the study aims to generate evidence that may guide schools in designing balanced programs that support both academic success and student well-being. Ultimately, this study positions recreation not as a distraction from learning but as a meaningful contributor to the development of motivated, healthy, and academically capable senior high school learners.

2. Method

2.1 Research Design

The study employed a quantitative research design using cross-sectional, correlational, and comparative approaches to examine the relationship between participation in recreational activities and academic achievement among senior high school students. This design was appropriate because the study aimed to generate measurable evidence on students' engagement in recreational activities and to determine how such participation was associated with academic outcomes. The cross-sectional component enabled the researcher to collect data at a single point in time, providing a clear snapshot of students' recreational involvement and academic performance within the selected learning context. The correlational component was used to determine the strength and direction of the relationship between participation in recreational activities and academic achievement, while the comparative component examined whether significant differences existed between students who participated in recreational activities and those who did not. Recreational participation was measured across physical, creative, social, and outdoor activities, while academic achievement was assessed using Grade Point Average and standardized test scores obtained from school records. Through this design, the study was able to describe participation patterns, compare academic outcomes between groups, and determine whether recreational engagement was meaningfully associated with academic performance. Overall, the research design provided a systematic and objective framework for understanding recreation not merely as a leisure activity but also as a potential contributor to students' academic success and holistic development.

2.2 Participants

The study comprises senior students enrolled in selected educational institutions within the research's defined geographical locale. Focused on determining the relationship between participation in recreational activities and academic achievement, the respondents were drawn from Grades 11 and 12, as these learners represent the final stage of secondary education where academic demands, personal development, and future career or college preparation become increasingly significant. A stratified random sampling technique was employed to ensure that the sample reflected important student characteristics, including grade level, gender, and socioeconomic background. This sampling approach strengthened the representativeness of the participants and allowed the study to capture varied experiences of recreational engagement across different student groups. Participants provided data on their involvement in physical, creative, social, and outdoor recreational activities through a structured self-report questionnaire, while their academic achievement was determined using objective indicators, such as Grade Point Average and standardized test scores, obtained from official school records. By involving senior high school students with diverse backgrounds and recreational participation patterns, the

study generated meaningful evidence on how recreational activities may be associated with students' academic performance and holistic development.

2.3 Instrumentation

The study employed a structured self-report questionnaire and official school records as the primary data collection instruments. The questionnaire was designed to measure senior high school students' participation in recreational activities across four domains: physical, creative, social, and outdoor activities. It gathered information on the frequency, duration, intensity, and perceived enjoyment of students' recreational engagement using a multidimensional Likert scale, allowing responses to be converted into quantitative data for statistical analysis. Open-ended items were also included to provide contextual insights into students' motivations and experiences related to recreational participation. To ensure clarity, relevance, and reliability, the instrument underwent pilot testing among a small group of senior high school students, and revisions were made based on the results. Academic achievement, the dependent variable of the study, was measured using objective data from official school records, specifically students' Grade Point Average and standardized test scores. These records provided reliable indicators of students' academic performance in core subjects and allowed the researcher to compare academic outcomes between participants and non-participants in recreational activities. The combined use of survey data and documentary records strengthened the validity of the study by capturing both students' self-reported recreational behavior and verified academic performance.

2.4 Data Analysis

The data gathered in the study were analyzed using quantitative statistical procedures appropriate to the cross-sectional, comparative, and correlational design. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize the level of student participation in recreational activities across physical, creative, social, and outdoor domains, as well as the level of academic achievement based on Grade Point Average and standardized test scores. To determine whether there were significant differences between students who participated in recreational activities and those who did not, an independent-samples t-test was employed. This allowed the researcher to compare the academic performance of the two groups and determine whether recreational participation was associated with higher achievement outcomes. Pearson product-moment correlation was also used to examine the strength and direction of the relationship between overall recreational activity participation and academic achievement. Where appropriate, regression analysis was considered to determine the predictive contribution of recreational activity participation while accounting for relevant student characteristics. The use of these statistical tools enabled the study to present objective and empirically grounded findings, moving beyond simple description toward a clearer understanding of how recreational engagement may relate to academic success among senior high school students.

3. Results

The findings revealed that senior high school students demonstrated a moderate overall level of participation in recreational activities, with an overall mean score of 3.49. Among the four recreational domains, social activities had the highest mean score of 4.10, indicating high participation, followed by physical activities with a mean score of 3.85, indicating moderately high participation. Creative activities recorded a moderate mean score of 3.20, while outdoor activities obtained the lowest mean score of 2.80, also interpreted as moderate. These results indicate that students were more inclined to participate in activities that involved peer interaction, group affiliation, and social engagement. However, the lower participation in creative and outdoor activities suggests that schools may need to provide more accessible, appealing, and structured

opportunities for learners to engage in arts-based, nature-based, and exploratory recreational experiences.

In terms of academic achievement, the students generally performed well. The mean Grade Point Average was 3.25, interpreted as good, while the mean standardized test score was 80.20, interpreted as satisfactory. This suggests that students were performing reasonably well in classroom-based academic requirements, although their standardized test performance still indicated room for improvement. The difference between GPA and standardized test outcomes may indicate that students met regular classroom expectations but still need additional support in test-taking skills, higher-order thinking, and the application of learned concepts in standardized assessment contexts. These findings emphasize the importance of examining academic achievement using multiple indicators, as GPA and standardized test scores may reflect distinct dimensions of student performance.

The comparison between students who participated in recreational activities and those who did not showed a statistically significant difference in academic achievement. Students who engaged in recreational activities had a higher mean GPA of 3.40 than non-participants (3.10). Similarly, participants recorded a higher mean standardized test score of 83.00 compared with 77.40 among non-participants. The independent-samples t-test indicated significant differences in both GPA and standardized test scores, suggesting that students who participated in recreational activities performed better academically than those with minimal or no participation. This finding implies that recreational engagement may support academic achievement by strengthening motivation, discipline, social confidence, time management, emotional balance, and cognitive readiness.

The correlation analysis further showed a positive relationship between overall participation in recreational activities and academic achievement. Recreational participation was moderately and positively correlated with GPA and standardized test scores, indicating that higher levels of participation were associated with better academic outcomes. Although the correlations do not establish direct causation, they provide meaningful evidence that recreation may contribute to students' academic success when balanced with school responsibilities. Overall, the results suggest that recreational activities should not be viewed as distractions from academic work but as supportive experiences that may enhance student well-being, engagement, and performance. These findings provide a basis for developing a school-based plan of action that promotes physical, creative, social, and outdoor activities as part of a holistic approach to improving academic achievement among senior high school learners.

4. Discussion

The study's findings affirm that senior high school students participated in recreational activities at a moderate level overall, with social activities showing the highest engagement, followed by physical, creative, and outdoor activities. This pattern suggests that learners are naturally drawn to activities that provide belonging, peer interaction, and emotional connection, which are important during adolescence. The result is supported by O'Donnell et al. (2024), who found that extracurricular participation strengthened school belonging and was associated with improved emotional outcomes among adolescents. In the context of the present study, the high participation in social activities indicates that recreation serves not only as leisure but also as a social support mechanism that may help students cope with academic pressure and strengthen their connection to school life.

The favorable academic performance of students, reflected in a good mean GPA and satisfactory standardized test scores, further suggests that recreational participation may coexist positively with academic responsibility. This finding aligns with Loturco et al. (2022), who reported that physical activity interventions may contribute to academic achievement across school-related outcomes. He et al. (2025) similarly found that school-based physical activity had positive effects

on overall academic achievement, although the magnitude of effect may depend on the type, duration, and quality of implementation. These studies support the interpretation that recreational activities can improve students' readiness to learn by enhancing attention, energy regulation, discipline, and cognitive functioning.

The significant difference in academic achievement between recreational activity participants and non-participants also strengthens the argument that recreation may have academic value. Students who engaged in recreational activities obtained higher GPA and standardized test scores than those who had minimal or no participation. This result is consistent with Reeve et al. (2025), who emphasized that behavioral engagement is strongly linked to achievement, while emotional engagement is related to motivation and well-being. Recreational activities may therefore contribute to academic performance by encouraging students to become more active, motivated, socially supported, and emotionally balanced. Rather than distracting students from schoolwork, meaningful recreation may help them develop the self-regulation and confidence needed for better academic performance.

The positive correlation between recreational activity participation and academic achievement further supports the view that students who are more engaged in recreational activities tend to achieve better academic outcomes. However, this relationship should be interpreted with caution because correlation does not establish direct causation. Other factors such as study habits, parental support, socioeconomic background, teacher quality, motivation, and school climate may also influence academic achievement. Still, the finding is consistent with that of Ishiguro et al. (2023), who reported that extracurricular music and visual arts activities were associated with improved academic performance among school-aged learners. This suggests that creative and recreational engagement may support learning through concentration, persistence, expressive confidence, and cognitive flexibility.

Overall, the findings corroborate the growing view that schools should promote balanced educational experiences that integrate academic rigor with structured opportunities for recreation. The World Health Organization and UNESCO (2021) emphasized that schools should become health-promoting environments that support learners' physical, social, emotional, and psychological well-being. In light of this study, recreational activities should not be treated as optional or secondary programs, but rather as meaningful contributors to holistic development and academic success. The results provide a strong basis for developing a school-based plan of action that expands access to physical, creative, social, and outdoor recreational activities while helping students manage their time, reduce stress, and sustain academic performance.

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PSYCHOLOGICAL IMPACT OF SOMATOTYPE LEARNERS IN TAKING UP PHYSICAL EDUCATION

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Abstract

In Physical Education classes, learners often carry not only their physical abilities but also their self-perceptions, body concerns, peer experiences, and motivation shaped by how they understand their own body type. This study examined the psychological impact of somatotype awareness among learners taking up Physical Education. Specifically, it investigated how students' awareness of their endomorphic, mesomorphic, or ectomorphic body type influenced their self-esteem, body image, participation, performance, peer interaction, motivation, psychological well-being, and perception of inclusive teaching strategies. The study employed a quantitative descriptive-correlational research design using a structured survey questionnaire administered to Physical Education learners from selected schools. The instrument measured somatotype awareness and related psychological dimensions, including self-esteem, body image perception, participation, peer socialization, motivation, and satisfaction with teaching adaptations. Findings revealed clear differences across somatotype groups. Mesomorphic students reported the highest levels of self-esteem, positive body image, participation, performance, peer acceptance, intrinsic motivation, and psychological well-being. Endomorphic students experienced greater challenges, including lower self-esteem, negative body image, reduced participation, higher social isolation, bullying experiences, and lower motivation. Ectomorphic students generally demonstrated moderate outcomes, with strengths in selected activities but ongoing concerns about confidence and physical comparisons. The findings further showed that existing Physical Education strategies appeared more favorable to mesomorphic learners, suggesting the need for more inclusive, body-positive, and adaptive instruction. The study concludes that somatotype awareness has meaningful psychological implications in Physical Education and that schools must promote supportive practices that value body diversity, reduce stigma, and encourage equitable participation among all learners.

Keywords: Somatotype Awareness, Physical Education, Self-Esteem, Body Image, Learner Motivation, Peer Interaction, Psychological Well-Being

1. Introduction

Physical Education is one of the most visible learning spaces where students encounter their own bodies, compare their abilities with peers, and form impressions of what they can or cannot do physically. For many learners, PE is a source of enjoyment, confidence, movement, teamwork, and health awareness. For others, however, it may also become a setting where body-related insecurities, fear of judgment, low motivation, and social comparison are strongly felt. This concern becomes particularly meaningful when learners become aware of their somatotype, or body-type classification, commonly described as endomorph, mesomorph, or ectomorph. Although somatotype is often discussed in relation to physical fitness and athletic performance, its psychological implications in school-based PE deserve equal attention because students' body awareness can influence how they see themselves, how they participate, and how they interact with others.

Adolescence is a sensitive developmental period in which body image, self-esteem, and peer acceptance become closely connected to psychological well-being. Gualdi-Russo, Rinaldo, and Zaccagni (2022) reported that physical activity involvement may help protect adolescents from body image concerns and enhance body satisfaction. However, the PE setting can also expose learners to body judgment because performance, appearance, movement competence, strength, speed, endurance, and coordination are often publicly visible. Barker, Varea, Bergentoft, and Schubring (2023) emphasized that PE has strong potential to shape how young people experience their own and others' bodies, but this potential is not always realized in a positive way. This means that PE may either support healthy body appreciation or, depending on how lessons, activities, and teacher interactions are structured, unintentionally reinforce body comparison and dissatisfaction.

The issue becomes more complex when body type is associated with perceived competence. Mesomorphic learners, who are often associated with muscularity and athletic build, may feel more confident in activities that reward speed, power, coordination, and visible performance. Endomorphic learners may be more vulnerable to teasing, weight stigma, or low confidence, especially in competitive activities that emphasize speed, endurance, or body size. Ectomorphic learners may also feel insecure when activities emphasize muscularity, strength, or power. While these classifications should not be used to limit students' potential, learners' awareness of body type may influence their self-esteem, body image, motivation, and willingness to participate. Thus, the psychological impact of somatotype awareness must be examined not to label students, but to understand how PE can become more inclusive and supportive.

Recent evidence shows that body-related concerns are closely connected with participation in PE. Haug, Castillo, Samdal, and Smith (2023) found that body perception, health complaints, gender, and weight-control concerns were associated with adolescents' PE involvement, with autonomous motivation mediating this association. Their findings suggest that students are more likely to engage in PE when they feel internally motivated, accepted, and supported rather than judged or pressured. This is important for somatotype-aware learners because body-related discomfort may reduce participation when activities are perceived as embarrassing, overly competitive, or designed for only one type of physical ability. In contrast, a supportive PE climate can help learners participate with greater confidence, regardless of body type.

Body image is also strongly related to well-being. Sollerhed, Fransson, Skoog, and Garmy (2022) found that adolescents' perceived body appearance, body functioning, and physical activity levels were significantly associated with perceived well-being. This finding is relevant to PE because students not only evaluate how their bodies look, but they also evaluate what their bodies can do. When PE emphasizes body functionality, effort, skill development, and personal progress, students may develop healthier self-perceptions. However, when PE emphasizes appearance, comparison, and uniform performance standards, some learners may feel excluded or inadequate. In this context, the teacher's role becomes essential in shaping a psychologically safe learning environment.

School-based body image interventions further support the need for intentional PE practices. Kerner, Prescott, Smith, and Owen (2022) found that PE-based body image and body-focused programs can positively influence body attitudes, although program design and delivery vary widely. Their review highlights the value of activities that focus on movement experiences, body functionality, sociocultural awareness, and inclusive participation. These ideas align with the present study because learners with different somatypes may require varied opportunities to succeed, including non-competitive movement, cooperative games, fitness tasks adjusted to ability, reflective activities, and teacher feedback that values improvement rather than comparison.

At the policy level, UNESCO (2021) emphasized that inclusive, high-quality physical education should promote physical, social, and emotional skills while respecting diversity and eliminating discrimination. This perspective supports the need to examine whether current PE teaching strategies truly accommodate diverse body types. If PE programs unintentionally favor mesomorphic traits, learners with endomorphic or ectomorphic body types may experience lower satisfaction, reduced participation, or weaker psychological well-being. Therefore, inclusion in PE must go beyond allowing students to join activities; it should ensure that all learners feel capable, respected, safe, and valued.

To address these concerns, the present study investigates the psychological impact of somatotype awareness among learners enrolled in Physical Education. Specifically, it examines how awareness of being endomorphic, mesomorphic, or ectomorphic influences self-esteem, body image, participation, performance, peer interaction, motivation, psychological well-being, and perceptions of teaching-strategy adaptation. By focusing on these variables, the study aims to contribute evidence that may help PE teachers, curriculum developers, school leaders, and counselors design more inclusive and body-positive learning environments. Ultimately, this research positions Physical Education not only as a subject for physical development but also as a vital space for affirming body diversity, strengthening confidence, reducing stigma, and supporting the psychological well-being of all learners.

2. Method

2.1 Research Design

The study employed a quantitative, descriptive-correlational research design to examine the psychological impact of somatotype awareness among learners enrolled in Physical Education. This design was appropriate because the study sought to describe learners' psychological profiles according to somatotype classification (endomorph, mesomorph, and ectomorph) and to determine the relationships between somatotype awareness and key psychological variables, including self-esteem, body image, motivation, participation, peer interaction, and psychological well-being. The descriptive component enabled the researcher to present the distribution and pattern of learners' responses across the different somatotype groups, while the correlational component allowed the study to determine whether students' awareness of their body type was meaningfully associated with their experiences and behavior in Physical Education classes. Since the variables were examined in their natural educational setting without manipulation, the design provided an objective and systematic means of understanding how body-type awareness may influence learners' confidence, participation, socialization, and motivation. Data were gathered through a structured survey questionnaire and analyzed using descriptive and inferential statistical procedures. Overall, the research design provided a rigorous framework for generating evidence on how Physical Education programs may respond more inclusively to learners with diverse somatotypes.

2.2 Participants

The study comprises learners in Physical Education classes from selected schools, representing diverse somatotype classifications, namely endomorphs and ectomorphs. The study included junior high school and senior high school students to capture varied developmental experiences related to body awareness, self-esteem, body image, motivation, participation, peer interaction, and psychological well-being in PE settings. A stratified random sampling technique was employed to ensure equitable representation across somatotype categories, gender, and grade levels. This sampling approach was appropriate because the study aimed to compare and describe the psychological experiences of learners with different body types while reducing the risk of overrepresenting one group. Student participants served as the primary data source,

particularly regarding their awareness of somatotype and its influence on their personal and social experiences in Physical Education. Inputs from PE instructors were also considered to validate students' reported participation, engagement, and social interaction during class activities. Through this participant composition, the study generated a more inclusive and balanced understanding of how body-type awareness may shape learners' confidence, motivation, classroom participation, peer relationships, and overall psychological experience in Physical Education.

2.3 Instrumentation

The study used a structured survey questionnaire as the primary instrument to collect data on the psychological impact of somatotype awareness among learners in Physical Education. The questionnaire was organized into sections that measured demographic information, somatotype classification, self-esteem, body image perception, participation and performance in PE activities, peer interaction, motivation, psychological well-being, and perceptions of the effectiveness of PE teaching strategies. Learners identified their somatotype as endomorph, mesomorph, or ectomorph using descriptive criteria, while the psychological dimensions were assessed through Likert-scale items ranging from strong disagreement to strong agreement. To strengthen the instrument's validity, established measures such as self-esteem, body image, and motivation scales were adapted where applicable, and the questionnaire was pilot-tested before full administration. Feedback from the pilot test was used to refine unclear items and ensure the instrument was suitable for the respondents' age, language level, and context. In addition, observations and inputs from Physical Education instructors were used to support and validate students' reported participation, engagement, and peer interaction. The use of these instruments enabled the study to gather systematic, quantifiable, and contextually meaningful data on how somatotype awareness relates to learners' psychological experiences in PE.

2.4 Data Analysis

The data gathered in the study were analyzed using quantitative statistical procedures aligned with the descriptive-correlational design. Descriptive statistics, including frequency counts, percentages, means, and standard deviations, were used to summarize learners' somatotype classifications and their responses on self-esteem, body image perception, participation and performance in Physical Education, peer interaction, motivation, psychological well-being, and satisfaction with teaching strategies. These procedures enabled the researcher to present the psychological profiles of endomorphic, mesomorphic, and ectomorphic learners in a clear, measurable manner. To determine the relationship between somatotype awareness and the identified psychological variables, inferential statistics, such as Pearson's correlation and, where appropriate, multiple regression, were employed. These tests allowed the study to examine the strength and direction of associations between learners' body-type awareness and their psychological experiences in PE classes. Comparative patterns across somatotype groups were also interpreted to identify which learners experienced greater confidence, participation, peer acceptance, motivation, or psychological difficulty. The results were analyzed using appropriate statistical software, and findings were interpreted based on significance levels and corresponding qualitative descriptions. Overall, the data analysis procedure provided an objective basis for understanding how somatotype awareness relates to learners' psychological well-being and participation in Physical Education.

3 Results

The findings revealed that somatotype awareness influenced learners' self-esteem and body image perceptions in Physical Education. Mesomorphic learners reported the most favorable psychological profile, with 60% indicating high self-esteem and 75% reporting positive

body image. In contrast, endomorphic learners showed greater body-related vulnerability, with 25% reporting low self-esteem and 70% indicating negative body image. Ectomorphic learners demonstrated moderate outcomes, with 35% reporting high self-esteem and an equal distribution between positive and negative body image perceptions. These results suggest that learners' awareness of their body type may shape how they view themselves in PE settings, particularly when physical appearance, movement ability, and peer comparison become visible during class activities.

Participation, engagement, and performance in Physical Education also varied across somatotype groups. Mesomorphic learners reported the highest level of participation (75%) and performance (80%), indicating that learners with more athletic body characteristics may feel more confident and capable in PE activities. Endomorphic learners showed lower participation and performance, with only 30% reporting high participation and 35% reporting high performance. Ectomorphic learners showed moderate participation and performance, suggesting they may perform well in selected activities but may still experience limitations in tasks requiring strength or power. These findings imply that traditional PE activities may unintentionally favor certain body types, particularly those associated with athleticism, while learners with other somatotypes may need more inclusive and differentiated activity options.

The study also found that somatotype was associated with peer interaction and socialization. Mesomorphic learners experienced the highest positive peer interaction at 80% and the lowest reported bullying at 5%. Endomorphic learners, however, reported higher negative peer experiences, including 35% reported bullying and 25% social isolation. Ectomorphic learners showed moderate social outcomes: 55% reported positive peer interactions and 10% reported bullying. These findings indicate that body type may influence students' social experiences in PE classes, where physical ability and appearance can affect peer acceptance. This highlights the need for PE teachers to intentionally build classroom climates that promote respect, teamwork, empathy, and body diversity.

Motivation and psychological well-being were likewise affected by somatotype awareness. Mesomorphic learners showed the highest intrinsic motivation (65%) and the highest positive well-being (85%), while endomorphic learners reported the lowest intrinsic motivation (20%) and the highest negative well-being (70%). Ectomorphic learners again reflected moderate outcomes, with 45% reporting high intrinsic motivation and 60% reporting positive well-being. These results suggest that students who feel physically competent and socially accepted are more likely to enjoy and participate in PE. Conversely, learners who experience body-related discomfort, teasing, or difficulty in activities may show reduced motivation and weaker psychological well-being.

The findings further showed that current PE teaching strategies appeared most favorable to mesomorphic learners, with 75% satisfaction, compared with 55% among ectomorphic learners and only 20% among endomorphic learners. This suggests that existing instructional approaches may not fully accommodate the varied needs of learners with different body types. Overall, the results indicate that somatotype awareness has meaningful psychological implications for learners in Physical Education, particularly regarding self-esteem, body image, participation, peer relationships, motivation, and well-being. These findings support the need for inclusive PE programs that emphasize personal progress, body positivity, cooperative learning, differentiated activities, and psychologically safe participation for all learners regardless of somatotype.

4. Discussion

The study's findings confirm that somatotype awareness has meaningful psychological implications for learners in Physical Education, particularly for self-esteem and body image. Mesomorphic learners reported higher self-esteem and more positive body image, while endomorphic learners experienced greater body dissatisfaction and lower self-esteem. This pattern is consistent with Barker, Varea, Bergentoft, and Schubring (2023), who emphasized that

body image is a significant pedagogical issue in PE because students' bodies are publicly visible, compared, and evaluated during physical activities. Similarly, Gualdi-Russo, Rinaldo, and Zaccagni (2022) found that physical activity and body image are closely related during adolescence, a developmental period when appearance, fitness, and peer acceptance can strongly affect self-perception. These studies support the present finding that PE can either strengthen or weaken students' confidence depending on how body diversity is addressed in the learning environment.

The results also showed that participation, engagement, and performance varied across somatotype groups, with mesomorphic learners reporting the highest participation and performance, while endomorphic learners reported lower participation and weaker performance. This finding may reflect how conventional PE activities often reward speed, strength, agility, endurance, and competitive performance, unintentionally favoring students who already feel physically competent. Haug, Castillo, Samdal, and Smith (2023) explained that body-related concerns are associated with adolescents' participation in PE and that motivation plays an important role in this relationship. In the present study, learners who perceived their body type as less suited to PE tasks appeared more vulnerable to avoidance, low confidence, and reduced participation. This suggests that PE teachers must shift from a one-size-fits-all model toward differentiated activities that allow students with different body types to experience success.

The study further revealed that somatotype was associated with peer interaction and socialization. Mesomorphic learners reported more positive peer interactions and fewer bullying experiences, while endomorphic learners reported higher levels of social isolation and bullying. These findings are important because PE is a highly social setting in which body size, movement ability, and performance are readily observed by classmates. When body-related teasing or exclusion occurs, students may begin to associate PE with embarrassment rather than growth. Sollerhed, Fransson, Skoog, and Garmy (2022) found that perceived body appearance, body functioning, and physical activity levels were related to adolescent well-being, indicating that students' experiences of their bodies can affect how they feel socially and emotionally. Therefore, PE teachers should intentionally promote teamwork, peer respect, cooperative learning, and body-positive communication to reduce body-based stigma.

Motivation and psychological well-being also differed by somatotype: mesomorphic learners showed higher intrinsic motivation and positive well-being, while endomorphic learners reported lower motivation and higher negative well-being. This finding supports the argument that students participate more willingly when they feel capable, accepted, and emotionally safe. Haug et al. (2023) noted that autonomous motivation can mediate the relationship between body-related concerns and PE participation, meaning that students are more likely to engage when they feel personally motivated rather than pressured or judged. In this study, learners whose body type aligned with commonly valued PE performance traits were more motivated, while those who felt physically disadvantaged or socially judged were less motivated. This underscores the need for PE activities that emphasize self-improvement, effort, health, enjoyment, and personal progress instead of comparison and competition.

Finally, the finding that current teaching strategies were most favorable to mesomorphic learners highlights the need for more inclusive and adaptive PE instruction. Kerner, Prescott, Smith, and Owen (2022) reported that PE-based body image and body-focused programs can support body image education, but they must be carefully designed to avoid reinforcing appearance-based comparison. UNESCO (2021) likewise emphasized that inclusive quality physical education should promote physical, social, and emotional skills while respecting diversity and reducing exclusion. In light of these findings, PE programs should offer varied activities for different body types, integrate body positivity and mental health support, discourage body-based teasing, and train teachers in differentiated instruction. Overall, the study affirms that somatotype

awareness should not be used to label or limit learners; rather, it should guide schools in creating PE environments where all students feel respected, capable, motivated, and psychologically safe.

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LEADERSHIP STYLES OF SCHOOL HEADS AS PREDICTORS OF TEACHER PERFORMANCE IN PUBLIC SCHOOLS IN FIRST CONGRESSIONAL DISTRICT

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Abstract

School leadership plays a critical role in shaping teacher performance, instructional quality, professional motivation, and school effectiveness within accountability-driven public education systems. This study examined school heads' leadership styles as predictors of teacher performance in public schools in the First Congressional District. Specifically, it determined the level of school heads' leadership styles in terms of transformational, transactional, and laissez-faire leadership; assessed the level of teacher performance based on RPMS ratings and IPCRF scores; examined the significant relationship between leadership styles and teacher performance; determined the extent to which leadership styles significantly predicted teacher performance; and identified which leadership style best predicted teacher performance. The study was anchored on the Full Range Leadership Theory and employed a quantitative predictive research design. Data on leadership styles were gathered from teacher respondents using a standardized leadership questionnaire adapted from the Multifactor Leadership Questionnaire, while teacher performance data were obtained from official Results-Based Performance Management System ratings and Individual Performance Commitment and Review Form scores. Descriptive statistics, Pearson product-moment correlation, and multiple linear regression analysis were used to analyze the data. Findings revealed that transformational leadership was practiced at a very high level, transactional leadership at a high level, and laissez-faire leadership at a low level. Teacher performance was rated very satisfactory based on RPMS and IPCRF indicators. Correlation results showed that transformational and transactional leadership were positively related to teacher performance, while laissez-faire leadership was negatively related. Regression analysis revealed that leadership styles significantly predicted teacher performance, with transformational leadership emerging as the strongest predictor. The study concluded that engaged, supportive, and vision-oriented school leadership contributes meaningfully to teacher performance in public schools.

Keywords: School Leadership, Leadership Styles, Transformational Leadership, Transactional Leadership, Laissez-Faire Leadership, Teacher Performance, RPMS, IPCRF

1. Introduction

Effective school leadership remains one of the most important institutional factors influencing teacher performance, instructional quality, school culture, and learner outcomes. School heads do not merely perform administrative duties; they establish vision, set expectations, supervise instruction, support teachers, manage school improvement processes, and create conditions that foster teaching and learning. The uploaded manuscript emphasizes that leadership shapes teacher motivation, professional development, instructional practices, and school effectiveness, making it a strategic concern in public education systems.

In contemporary education, the role of school heads has become increasingly complex because public schools operate under accountability systems that require measurable performance, evidence-based management, and continuous improvement. In the Philippine basic education system, the Department of Education institutionalized the Results-Based Performance

Management System through DepEd Order No. 2, s. 2015 to align personnel performance with organizational goals and to provide guidelines for performance planning, monitoring, review, and evaluation. This policy context is important because teacher performance is not viewed only as a general perception of effectiveness but as a measurable professional output connected to standards, indicators, and documented accomplishments.

Teacher performance in public schools is commonly assessed through official performance management mechanisms such as the Results-Based Performance Management System and the Individual Performance Commitment and Review Form. DepEd has also released PPST-aligned RPMS tools to standardize, objectify, and make teacher performance assessment more useful for professional growth. In the present study, this accountability environment strengthens the rationale for examining leadership styles as predictors of teacher performance because school heads are directly involved in supervising, supporting, and monitoring teachers' work.

The leadership role of school heads is also supported by the Philippine Professional Standards for School Heads. DepEd Order No. 24, s. 2020 adopted the Philippine Professional Standards for School Heads were adopted, which provide a continuum of professional practice for school heads and support their role in improving teacher quality and learner achievement. This policy direction confirms that school heads are expected to exercise leadership that goes beyond school maintenance. They are expected to lead instructional improvement, support teachers' professional growth, strengthen school systems, and improve learning outcomes.

The uploaded manuscript anchors the study on the Full Range Leadership Model, which explains leadership through transformational, transactional, and laissez-faire styles. Transformational leadership is described as proactive, inspiring, supportive, and vision-oriented; transactional leadership emphasizes expectations, rewards, monitoring, and corrective feedback; while laissez-faire leadership reflects passive or minimal leader involvement. These leadership styles are important because they may influence teacher performance differently. A transformational school head may motivate teachers through shared vision and professional support. A transactional school head may influence performance through structure, recognition, and accountability. A laissez-faire school head, however, may provide limited guidance, which could weaken teacher support and performance.

Existing literature cited in the manuscript suggests that transformational leadership is often positively associated with teacher motivation, self-efficacy, job satisfaction, professional commitment, and instructional performance. Transactional leadership may also support performance when clear expectations and fair recognition are present, although its influence may depend on external rewards and compliance mechanisms. Laissez-faire leadership, in contrast, is often associated with weaker guidance and lower organizational support. These distinctions justify the study's focus on identifying which leadership style best predicts teacher performance in public schools.

Despite the established importance of leadership, the uploaded manuscript identifies a methodological and contextual gap. Many studies on leadership and teacher performance remain correlational, perception-based, or focused on broad samples, and do not clearly demonstrate the unique predictive contribution of each leadership style. This limitation is important because correlation can reveal association, but it does not clearly determine which leadership style accounts for the greatest variance in teacher performance. A predictive approach using regression analysis can provide stronger evidence by estimating the contribution of transformational, transactional, and laissez-faire leadership styles to teacher performance.

The study is also significant because it is situated within public schools in the First Congressional District. The uploaded manuscript explains that congressional districts constitute politically and administratively meaningful contexts in which national education policies, local governance structures, resource allocation, and accountability expectations intersect. This

context matters because leadership behavior does not operate in isolation. School heads work within policy mandates, division supervision, community expectations, resource realities, and performance systems. Therefore, examining leadership styles within a defined public school district provides more context-specific evidence than studies that combine schools from broad or unrelated settings.

Another important feature of the study is its focus on system-recognized teacher performance indicators. The manuscript notes that many previous studies rely on indirect measures such as teacher satisfaction, commitment, or self-efficacy, which may be related to performance but are not equivalent to official performance ratings. By focusing on RPMS ratings and IPCRF scores, the study strengthens the connection between leadership styles and formal teacher performance outcomes within the DepEd accountability structure.

Accordingly, this study examined school heads' leadership styles as predictors of teacher performance in public schools in the First Congressional District. Specifically, it sought to determine the level of transformational, transactional, and laissez-faire leadership styles; assess teacher performance using RPMS and IPCRF indicators; determine the relationship between leadership styles and teacher performance; and identify which leadership style significantly predicts teacher performance. Using a quantitative predictive design, the study aimed to generate district-level evidence to guide leadership development, school head training, instructional supervision, teacher support, and performance improvement initiatives in public schools.

4 Method

2.1 Research Design

The study employed a quantitative predictive research design to examine the extent to which school heads' leadership styles predicted teacher performance in public schools in the First Congressional District. This design was appropriate because the study did not merely describe leadership styles or determine simple relationships among variables; rather, it sought to establish the predictive contribution of transformational, transactional, and laissez-faire leadership styles to measurable teacher performance outcomes. The quantitative component enabled the researcher to collect numerical data on leadership styles using a standardized leadership questionnaire and on teacher performance using official RPMS ratings and IPCRF scores. The predictive component was assessed using multiple regression to determine which leadership style significantly predicted teacher performance and which leadership style had the strongest predictive influence. This design was suitable because the study aimed to move beyond correlational analysis by estimating the explanatory power of leadership styles for teacher performance. Through this approach, the study generated empirical evidence useful for leadership development, instructional supervision, teacher support, and performance improvement in public schools within the First Congressional District.

2.2 Participants

The study consisted of heads and teachers employed in public elementary and/or secondary schools within the First Congressional District during the academic year in which the study was conducted. The participating schools were under the supervision of the Department of Education Division Office and implemented standardized teacher performance evaluation systems, particularly the Results-Based Performance Management System and the Individual Performance Commitment and Review Form. School heads were included because they represented the leadership structure of the participating schools, specifically regarding transformational, transactional, and laissez-faire leadership styles. Teachers served as the primary respondents in assessing their school heads' leadership styles because they directly experienced and observed the leadership behaviors being measured. Teacher performance data

were based on official RPMS ratings and IPCRF scores, which provided system-recognized indicators of professional performance. A sampling procedure was employed to obtain a representative subset of teachers from the total population, ensuring that the data reflected the leadership-performance relationship within the public school context of the First Congressional District. These participants were appropriate because the study aimed to determine how school heads' leadership styles predicted measurable teacher performance in an accountability-driven public education system.

2.3 Instrumentation

The study utilized two main sources of data to measure school heads' leadership styles and teacher performance. To assess leadership styles, a structured survey questionnaire adapted from the Multifactor Leadership Questionnaire was used. The instrument was grounded in Bass and Avolio's Full Range Leadership Theory and measured three leadership styles: transformational, transactional, and laissez-faire. Teacher-respondents rated their school heads' leadership behaviors based on observed practices in their respective schools. To measure teacher performance, the study used official Results-Based Performance Management System ratings and Individual Performance Commitment and Review Form scores. These records served as system-recognized, performance-based indicators of teacher effectiveness under the Department of Education's accountability framework. The use of both survey and official performance data strengthened the study because leadership styles were measured through teacher observations, while teacher performance was based on formal evaluation records rather than perception alone. Using these instruments, the study generated quantitative data to determine leadership style levels, assess teacher performance, examine relationships among variables, and test the predictive influence of transformational, transactional, and laissez-faire leadership on teacher performance in public schools in the First Congressional District.

2.4 Data Analysis

The data gathered in the study were analyzed using descriptive and inferential statistical procedures aligned with the objectives of the quantitative predictive research design. Descriptive statistics, particularly mean and standard deviation, were used to determine the level of school heads' leadership styles in terms of transformational, transactional, and laissez-faire leadership, as well as the level of teacher performance based on official RPMS ratings and IPCRF scores. The Pearson product-moment correlation was used to assess the significance, strength, and direction of the relationship between school heads' leadership styles and teacher performance. To determine the extent to which leadership styles predict teacher performance, a multiple linear regression analysis was conducted, with transformational, transactional, and laissez-faire leadership styles as independent predictors and teacher performance as the dependent variable. The regression analysis estimated the predictive contribution of each leadership style using standardized coefficients, significance values, and explained variance. This procedure was appropriate because the study sought to move beyond simple correlation and identify which leadership style best predicted teacher performance in public schools within the First Congressional District. Through these analyses, the study generated empirical evidence on the leadership behaviors most strongly associated with measurable teacher performance outcomes.

3 Results

The results showed that school heads in public schools within the First Congressional District demonstrated active and performance-oriented leadership practices. Among the three leadership styles examined, transformational leadership was practiced at a very high level, indicating that school heads were generally perceived as vision-oriented, motivating, supportive, and capable of encouraging professional growth among teachers. Transactional leadership was

practiced at a high level, showing that school heads also used structured expectations, monitoring, feedback, and recognition to guide teacher performance. Meanwhile, laissez-faire leadership was rated low, suggesting that passive, non-interventionist, or minimally involved leadership behaviors were not commonly exhibited by school heads.

The level of teacher performance in public schools in the First Congressional District was found to be very satisfactory based on official Results-Based Performance Management System ratings and Individual Performance Commitment and Review Form scores. This indicates that teachers generally met established professional and instructional standards under the public school accountability system. The use of RPMS and IPCRF data strengthened the findings by measuring teacher performance through official indicators rather than perceptions alone.

Correlation analysis revealed that leadership styles were significantly related to teacher performance. Transformational and transactional leadership were both positively and significantly associated with teacher performance, indicating that teachers performed better when school heads demonstrated active, supportive, motivating, structured, and performance-oriented leadership behaviors. In contrast, laissez-faire leadership was negatively and significantly associated with teacher performance, suggesting that limited guidance, weak supervision, or passive leadership may be associated with lower teacher performance.

Multiple regression analysis further showed that school heads' leadership styles significantly predicted teacher performance. Collectively, transformational, transactional, and laissez-faire leadership styles explained a substantial proportion of the variance in teacher performance outcomes. This means that leadership style was not only related to teacher performance but also contributed meaningfully to explaining differences in performance among teachers. The findings support the view that leadership behaviors are important predictors of teacher effectiveness in public schools within an accountability-driven education system.

Among the leadership styles, transformational leadership emerged as the strongest and most significant predictor of teacher performance. This suggests that school heads who inspire teachers, communicate a clear vision, provide individualized support, encourage innovation, and promote professional growth are more likely to positively influence teacher performance. Transactional leadership also contributed to teacher performance by reinforcing expectations, accountability, and feedback, while laissez-faire leadership showed a negative predictive effect. Overall, the findings indicate that engaged, supportive, and transformational leadership is most beneficial in strengthening teacher performance in public schools in the First Congressional District.

4. Discussion

The study's findings confirm that school heads' leadership styles are important predictors of teacher performance in public schools in the First Congressional District. The results showed that transformational leadership was practiced at a very high level, transactional leadership at a high level, and laissez-faire leadership at a low level. These findings indicate that school heads were generally perceived as active, supportive, and performance-oriented leaders rather than passive administrators. This is important in the context of public education because school heads are expected to guide teacher performance, supervise instruction, and support professional growth under the Department of Education's Results-Based Performance Management System. DepEd Order No. 2, s. 2015 established the RPMS in DepEd to align individual performance with organizational goals and provide a structure for performance planning, monitoring, review, and evaluation.

The finding that teacher performance was rated very satisfactory based on RPMS and IPCRF indicators suggests that teachers generally met official performance expectations. This strengthens the study because teacher performance was not measured solely through perceptions but also through system-recognized performance indicators. The use of official RPMS

and IPCRF records provides a stronger basis for examining leadership as a predictor of teacher performance. This aligns with the Philippine Professional Standards for School Heads, which position school heads as instructional leaders responsible for improving teacher quality, professional practice, and learner outcomes. DepEd Order No. 24, s. 2020 states that the PPSSH provides a continuum of professional practice that supports school heads in pursuing career-long professional growth.

The positive relationship between transformational leadership and teacher performance supports the claim that teachers perform better when school heads provide vision, motivation, individualized support, professional encouragement, and opportunities for growth. Transformational leadership may influence performance by building teacher commitment, strengthening school culture, encouraging innovation, and promoting shared responsibility for school goals. This finding is consistent with the study's theoretical foundation, the Full Range Leadership Theory, which views transformational leadership as a proactive, developmental leadership style. In the present study, transformational leadership emerged as the strongest predictor, suggesting that teachers benefit most from leaders who inspire, mentor, communicate clearly, and support professional development.

The positive relationship between transactional leadership and teacher performance also indicates that structured leadership remains useful in public schools. Transactional leadership supports performance by clarifying expectations, monitoring work, providing feedback, recognizing accomplishments, and reinforcing accountability. In a DepEd setting where teachers are evaluated through formal performance management systems, transactional leadership can help ensure that teachers understand performance standards and submit expected outputs. However, the results suggest that transactional leadership is less effective than transformational leadership at predicting teacher performance. This implies that while structure and accountability are necessary, they are more effective when combined with inspiration, professional support, and teacher empowerment.

The negative relationship between laissez-faire leadership and teacher performance shows that passive or non-interventionist leadership may weaken teacher support and professional outcomes. When school heads provide limited guidance, avoid decision-making, delay feedback, or fail to monitor instructional needs, teachers may receive less support in improving classroom practice and meeting performance expectations. This result strengthens the argument that school leadership should be active, responsive, and development-oriented. Overall, the findings support the conclusion that engaged school leadership, particularly transformational leadership, contributes meaningfully to teacher performance. The study therefore recommends strengthening leadership development programs that train school heads in vision-setting, instructional supervision, coaching, mentoring, feedback-giving, professional support, and data-informed performance management.

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PROPOSED READING ENHANCEMENT PROGRAM FOR THE GRADE FOUR LEARNERS OF SAPANG ELEMENTARY SCHOOL

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Abstract

Reading proficiency remains a foundational academic skill that enables learners to understand classroom instructions, access subject-area content, participate meaningfully in learning activities, and develop independent study habits. This study assessed the reading performance, reading difficulties, and reading needs of Grade 4 learners of Sapang Elementary School, Bayambang, Pangasinan, as a basis for a proposed Reading Enhancement Program. Specifically, it determined the learners' profiles, assessed their reading performance in word recognition, fluency, vocabulary, and reading comprehension, identified the reading difficulties they encountered, determined their reading needs based on the assessment results, and developed a proposed intervention program responsive to their literacy needs. The study employed a descriptive-developmental research design. The respondents were the 45 Grade 4 learners of Sapang Elementary School, selected through total population sampling or complete enumeration. Data were gathered using a profile sheet, a researcher-made reading performance assessment, and a reading difficulties and needs checklist, all of which underwent expert content validation before administration. Frequency counts, percentages, means, rankings, and descriptive statistics were used to analyze the data. Findings revealed that most respondents were 10 years old, and the sex distribution was nearly balanced, with slightly more male learners. The learners demonstrated an overall moderate level of reading performance, with word recognition as the strongest area and reading comprehension as the weakest. They also encountered significant reading difficulties, particularly in understanding unfamiliar words and in reading smoothly with proper pacing. Correspondingly, their reading needs were high, especially in vocabulary enrichment and guided reading activities to improve fluency. Based on these findings, the study proposed Project BASA-G4: Building Advanced Skills in Reading for Grade 4 Learners, a school-based reading enhancement program designed to strengthen vocabulary, fluency, word recognition, and reading comprehension.

Keywords: Reading Performance, Reading Difficulties, Reading Needs, Grade 4 Learners, Reading Enhancement Program, Sapang Elementary School

1. Introduction

Reading remains one of the most essential competencies in elementary education because it serves as both a literacy skill and a learning tool across subject areas. Learners who can read with accuracy, fluency, and comprehension, and who have strong vocabulary knowledge, are better able to understand instructions, access subject content, participate in classroom activities, and complete written tasks independently. UNESCO (2025) emphasizes that foundational skills include literacy, numeracy, and social-emotional skills, and that these core skills are essential for school success and lifelong learning. In this sense, reading is not simply a language subject outcome; it is a foundational academic capacity that influences learners' ability to succeed in mathematics, science, social studies, values education, and other learning areas.

The importance of reading is especially evident in the elementary grades, where children are expected to gradually move from learning to read to reading to learn. The World Bank (2022) defines learning poverty as the inability of children to read and understand a simple text by age ten, underscoring the importance of reading proficiency during the primary years. This benchmark

is relevant to Grade 4 learners because they are typically at the stage when reading is already expected to support comprehension of longer passages, written directions, informational texts, and content-area lessons. When reading ability remains weak at this stage, learners may struggle not only in English or Filipino but also in subjects that require comprehension of written problems, explanations, and instructions.

Reading development is multidimensional. It does not depend on word calling alone but on the interaction of several skills, including word recognition, fluency, vocabulary, and comprehension. The Institute of Education Sciences and the What Works Clearinghouse identify reading interventions as necessary to help students in Grades 4 to 9 meet their reading needs, particularly when learners continue to experience difficulty beyond the early grades. This is important because two learners may both be classified as struggling readers but may need different forms of support. One learner may have difficulty recognizing words automatically; another may read slowly and without proper phrasing; another may decode words correctly but fail to understand the passage's meaning. Therefore, a school-based reading study must examine specific reading dimensions rather than assume that all learners experience the same difficulty.

Globally, reading difficulties remain a serious concern. The World Bank, UNICEF, and partner organizations reported that learning poverty worsened after pandemic-related school closures and disruptions, with many children unable to read and understand a simple text by age ten (World Bank, 2022; UNICEF, 2022). These findings show that reading gaps are not isolated classroom incidents but part of a broader foundational learning challenge. Although global figures should not be treated as direct equivalents of local school data, they justify the need for schools to assess their own learners' reading performance and identify needs before difficulties become more severe.

In the Philippine context, the need to strengthen reading is also recognized in policy and school practice. The Department of Education has emphasized learning recovery and foundational skills development through national programs aimed at addressing learning gaps. DepEd Order No. 013, s. 2023, the National Learning Recovery Program was adopted, which aims to support learners affected by learning disruptions and strengthen essential competencies. More recently, DepEd literacy remediation efforts have emphasized the importance of structured, learner-centered support, teacher capacity building, instructional materials, progress monitoring, and school-level intervention planning. These policy directions affirm that reading intervention should be organized, evidence-based, and responsive to learners' actual needs.

The present study is situated in Sapang Elementary School, Bayambang, Pangasinan. The uploaded manuscript identifies Sapang Elementary School as a public elementary school in Bayambang I District, Schools Division of Pangasinan I, and presents Grade 4 learners as the focus of the reading assessment. This local context is important because literacy concerns must eventually be understood at the school level, where teachers directly observe learners' reading behaviors, administer assessments, and design interventions. While national and international reports provide the broader rationale for reading improvement, a school cannot rely only on general data. It must determine the actual reading performance, difficulties, and needs of its own learners.

For Grade 4 learners at Sapang Elementary School, assessing reading performance is timely, as this grade level marks a critical transition point. Learners are expected to read not only short, familiar texts but also longer passages and subject-related materials that require comprehension, vocabulary understanding, and sustained attention. The manuscript emphasizes that reading performance should be examined in terms of word recognition, fluency, vocabulary, and reading comprehension, which are necessary for identifying learners' specific strengths and weaknesses. This approach is appropriate because interventions are more meaningful when based on diagnosed needs rather than broad assumptions about reading difficulty.

The study also responds to the practical problem that reading difficulty can affect academic confidence, participation, and performance across learning areas. Learners who struggle with word recognition may spend too much effort decoding individual words. Learners with weak fluency may read slowly and lose meaning before finishing the passage. Learners with limited vocabulary may fail to understand key ideas even when they can pronounce words correctly. Learners with poor comprehension may be unable to identify main ideas, make inferences, sequence events, or explain what they have read. These difficulties can reduce classroom engagement and limit independent learning.

Accordingly, this study assessed the reading performance, difficulties, and needs of Grade 4 learners of Sapang Elementary School as a basis for a proposed Reading Enhancement Program. Specifically, it examined learners' reading performance in word recognition, fluency, vocabulary, and reading comprehension; identified the reading difficulties they experienced; determined their reading needs; and used the findings to inform a responsive school-based intervention. By grounding the proposed program in actual assessment results, the study aimed to provide evidence-based support for improving Grade 4 learners' reading competence, classroom participation, and academic readiness.

2. Method

2.1 Research Design

The study employed a descriptive-developmental research design to assess the reading performance, reading difficulties, and reading needs of Grade 4 learners of Sapang Elementary School as a basis for a proposed Reading Enhancement Program. The descriptive component was used to determine and present the existing reading condition of the learners in terms of their profile, word recognition, fluency, vocabulary, and reading comprehension, as well as the difficulties and needs that emerged from the reading assessment (Poserio, n.d.). This design was appropriate because descriptive research systematically presents the current status of a group or phenomenon without manipulating variables, making it suitable for identifying learners' actual reading strengths and weaknesses before any intervention is proposed (Creswell & Creswell, 2018; Poserio, n.d.). The developmental component was used to formulate a school-based reading enhancement program grounded in the descriptive phase's results. Developmental research is appropriate when the purpose is to design or improve programs, tools, or interventions to address identified educational needs (Richey & Klein, 2007). In this study, the developmental phase did not involve experimental testing of the program's effectiveness; rather, it focused on translating the identified reading gaps into a practical, needs-responsive intervention framework for Grade 4 learners (Poserio, n.d.). Thus, the descriptive-developmental design was suitable because it allowed the researcher to first establish an evidence-based picture of the learners' reading condition and then use the findings to develop a proposed reading enhancement program aligned with their actual literacy needs.

2.2 Participants

The study was conducted with the 45 Grade 4 learners of Sapang Elementary School, Bayambang, Pangasinan. They served as respondents because they were the specific group identified in the title, the statement of the problem, and the scope of the study (Poserio, n.d.). The learners were considered the most appropriate participants because the study focused on assessing their reading performance, reading difficulties, and reading needs in word recognition, fluency, vocabulary, and reading comprehension, as a basis for a proposed reading enhancement program (Poserio, n.d.). The study employed total population sampling, also known as complete enumeration, in which all members of the identified Grade 4 population were included. This sampling procedure was appropriate because the population size was small and manageable,

and the researcher intended to obtain a complete picture of the reading condition of all Grade 4 learners in the school (Creswell & Creswell, 2018; Poserio, n.d.). By including all 45 learners, the study generated comprehensive school-level data on the learners' reading strengths, difficulties, and instructional needs. However, since the respondents came from one school, the findings were primarily intended to guide the proposed reading enhancement program for Sapang Elementary School and were not meant for direct generalization to all Grade 4 learners in other schools or divisions.

2.3 Instrumentation

The study utilized three main instruments to gather the data needed in assessing the reading performance, reading difficulties, and reading needs of the Grade 4 learners of Sapang Elementary School. First, a learner profile sheet was used to obtain basic demographic information about the respondents, particularly age and sex, which provided descriptive background data for interpreting the learners' reading condition. Second, a researcher-developed reading performance assessment was used to measure learners' reading performance in four domains: word recognition, fluency, vocabulary, and reading comprehension. The use of a reading assessment tool was appropriate because effective reading evaluation should identify specific areas of strength and weakness rather than treat reading as a single general skill (Institute of Education Sciences, 2022). Third, a reading difficulties and needs checklist was prepared to identify recurring reading problems and translate assessment results into instructional support needs. The checklist helped document difficulties such as weak word recognition, slow or labored oral reading, limited vocabulary, and weak text comprehension, which later served as basis for the proposed reading enhancement program. The instruments were developed in alignment with the title, statement of the problem, conceptual framework, and study variables to ensure that the data collected directly addressed the objectives of the study. The reading materials and items were prepared at a level suitable for Grade 4 learners and were arranged for straightforward administration, checking, and interpretation within the school context. To ensure relevance, clarity, and appropriateness, the instruments were subjected to expert content validation before administration. This validation process was important because content validation helps determine whether the items adequately represent the constructs being measured and whether the instrument is suitable for the intended respondents (Creswell & Creswell, 2018). Overall, the instruments generated the exact data required by the study: learner profile, reading performance in the four selected domains, reading difficulties, and reading needs. More importantly, they provided the empirical basis for developing a reading enhancement program that is relevant, practical, and responsive to the actual literacy needs of the Grade 4 learners.

2.4 Data Analysis

The data gathered in the study were analyzed using descriptive statistical tools aligned with the descriptive-developmental nature of the research. Frequency counts and percentages were used to describe the profile of Grade 4 learners by age and sex, allowing the researcher to present the number and proportion of learners in each category. Means and descriptive statistics were used to determine learners' reading performance levels in word recognition, fluency, vocabulary, and reading comprehension, as these measures summarized learners' current reading condition in a clear and organized manner. Rankings were applied to identify the most common reading difficulties and the most urgent reading needs of the learners, particularly those requiring priority attention in the proposed Reading Enhancement Program. The same descriptive approach was used to interpret the results of the reading difficulties and needs checklist, ensuring that the proposed intervention was grounded in actual assessment findings rather than assumptions. Descriptive analysis was appropriate because the study aimed to assess existing reading conditions and develop a responsive school-based program, not to test the effectiveness

of an implemented intervention or establish cause-and-effect relationships (Creswell & Creswell, 2018). No inferential statistical test was necessary because the study focused on describing learners' reading performance, identifying difficulties and needs, and using the findings as a basis for program development.

3 Results

The results showed that the respondents in the study were 45 Grade 4 learners from Sapang Elementary School, and the study used total population sampling, or complete enumeration. In terms of age, most respondents were 10 years old, indicating that the learners were generally within the expected age range for Grade 4. The distribution by sex was nearly balanced, though there were slightly more male learners. This profile suggests that the respondents represented a typical Grade 4 classroom population and provided a suitable basis for assessing reading performance, reading difficulties, and reading needs within the school context.

In terms of reading performance, the Grade 4 learners manifested an overall moderate level. Among the four assessed reading domains, word recognition obtained the highest result, indicating that learners were relatively more capable of identifying printed words. However, reading comprehension yielded the lowest score, indicating that the learners had greater difficulty understanding, interpreting, and making meaning from what they read. This finding suggests that although the learners had developed some basic reading skills, their ability to use reading for deeper understanding and academic learning still required further strengthening.

The pattern of results also showed that learners' reading development was uneven. The manuscript specifically notes that word recognition was stronger, while fluency, vocabulary, and comprehension remained areas needing support. This means that the learners were not beginning readers without any reading foundation; rather, they had a developing reading base that needed systematic improvement. Their moderate performance in fluency, vocabulary, and comprehension suggests they may still struggle with longer texts, unfamiliar words, and passages that require interpretation and inference.

The study further revealed that the learners experienced significant reading difficulties. The most notable difficulties involved understanding the meanings of unfamiliar words and reading smoothly with proper pacing. These findings indicate that vocabulary and fluency were major barriers affecting the learners' reading development. Difficulty in understanding unfamiliar words may limit comprehension, while difficulty in reading smoothly may affect learners' ability to maintain meaning across sentences and paragraphs. These results show that the reading difficulties extended beyond word recognition to more complex reading processes.

Correspondingly, the learners manifested a high level of reading needs. The most needed forms of support were vocabulary enrichment activities and guided reading activities to improve fluency. Based on these findings, the study proposed a school-based Reading Enhancement Program for Grade 4 learners of Sapang Elementary School. The program was designed to address vocabulary development, fluency improvement, word recognition, and reading comprehension. Overall, the findings support the need for a structured, practical, and responsive reading intervention that directly addresses the learners' actual reading difficulties and strengthens their ability to use reading as a tool for learning across subjects.

4. Discussion

The findings confirm that the Grade 4 learners of Sapang Elementary School had a developing but still insufficient reading foundation. Their overall reading performance was moderate, with word recognition as the strongest domain and reading comprehension as the weakest. This pattern suggests that many learners could identify printed words but still experienced difficulty deriving meaning, interpreting ideas, and using reading as a tool for

learning. This finding is consistent with the view that reading is not limited to word calling; it requires integrating decoding, fluency, vocabulary, and comprehension so that learners can construct meaning from texts (Institute of Education Sciences [IES], 2022). The result also supports the broader argument that reading is a gateway skill because learners who cannot read with understanding may struggle across subject areas that require written instructions, explanations, and text-based tasks (World Bank, 2022).

The relatively stronger result in word recognition implies that the learners had already developed some basic literacy foundation. However, the lower reading comprehension score indicates that recognizing words did not automatically lead to understanding. This finding is important because comprehension is the purpose of reading. Learners may pronounce words correctly but still fail to understand unfamiliar vocabulary, identify main ideas, make inferences, or explain what they have read. UNESCO (2025) identifies literacy as one of the foundational skills needed for school success and lifelong learning, which supports the interpretation that reading comprehension must be strengthened if learners are to participate meaningfully in later academic tasks. The manuscript also emphasizes that Grade 4 is a critical transition stage because learners are expected to move from learning to read toward reading to learn.

The high level of reading difficulties further explains why the learners' overall reading performance remained moderate. The most notable difficulties involved understanding unfamiliar words and reading smoothly with proper pacing. These difficulties point to weaknesses in vocabulary and fluency, both of which are closely connected to comprehension. The IES practice guide on reading interventions for Grades 4–9 stresses that reading support should address students' specific reading needs rather than rely on a single general approach for all struggling readers (IES, 2022). Thus, the finding implies that the learners need differentiated activities: vocabulary-building for those who struggle with word meanings, guided oral reading for those who need fluency support, and comprehension strategy instruction for those who need help understanding texts.

The identified reading needs were consistent with the learners' reading difficulties. Since vocabulary enrichment and guided reading activities emerged as the most needed forms of support, the proposed reading enhancement program should prioritize repeated exposure to meaningful words, contextualized vocabulary exercises, oral reading practice, teacher-guided reading sessions, and comprehension activities. The World Bank's learning poverty framework defines learning poverty as the inability to read and understand a simple text by age 10, highlighting the urgency of strengthening reading skills before learners move to more demanding grade levels (World Bank, 2022). In this study, learners' high reading needs indicate that intervention should not be delayed, as unresolved reading gaps may affect participation, confidence, and achievement in other subjects.

Overall, the findings justify the development of a school-based Reading Enhancement Program for Grade 4 learners of Sapang Elementary School. The proposed program is appropriate because it is grounded in actual assessment results rather than assumptions. The manuscript states that the program was developed in response to learners' assessed reading performance, difficulties, and needs, particularly in vocabulary, fluency, word recognition, and comprehension. This supports the conclusion that the proposed intervention should be structured, practical, and responsive to the learners' actual literacy condition. Since reading development affects present academic participation and future learning outcomes, the study contributes to school-level literacy planning by providing evidence for targeted reading support, teacher-guided remediation, and continuous monitoring of learner progress.

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DEVELOPMENT OF A HOLISTIC MENTORING AND COACHING PROGRAM FOR TEACHERS OF NORTH CENTRAL ELEMENTARY SCHOOL

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Abstract

Teachers need sustained, responsive, and school-based professional support to improve instructional competence, classroom management, assessment practices, professional growth, workload management, and personal well-being. This study developed a Holistic Mentoring and Coaching Program for teachers of North Central Elementary School. Specifically, it determined the profile of teacher-respondents in terms of age, sex, civil status, highest educational attainment, length of teaching experience, and grade-level assignment; identified their mentoring and coaching needs; examined the challenges they encountered in professional practice; developed a holistic mentoring and coaching program based on the findings; and validated the proposed program in terms of objectives, content, strategies and activities, usefulness, and feasibility. The study employed a descriptive-developmental research design. The respondents were eight teachers from North Central Elementary School, selected through a total population sampling method to ensure the program reflected the actual needs of the entire teaching force. Data were gathered using a researcher-developed questionnaire checklist and a separate validation checklist, both of which were subjected to expert validation. Frequency counts, percentages, weighted means, and composite means were used to analyze the data. Findings revealed that teachers had high to very high mentoring and coaching needs across major dimensions, particularly instructional competence, classroom management, assessment practices, professional growth, and personal and interpersonal well-being. Teachers also encountered challenges related to lesson delivery, learner behavior, diverse learners, assessment demands, workload pressures, stress, and collaboration. The developed Holistic Mentoring and Coaching Program was found to be highly valid, relevant, useful, and feasible for implementation. The study concluded that a school-based holistic mentoring and coaching program can strengthen teacher support systems and promote continuous professional growth.

Keywords: Holistic Mentoring, Coaching Program, Teacher Development, Professional Growth, Classroom Management, School-Based Support

1. Introduction

Teachers occupy a central role in improving educational quality because classroom learning depends greatly on how they design instruction, manage learner behavior, respond to diversity, assess progress, and sustain meaningful engagement. In contemporary schools, teacher effectiveness is no longer understood solely as mastery of subject matter or lesson delivery; it also includes reflective practice, professional collaboration, emotional resilience, learner-centered decision-making, and the ability to adapt to changing educational demands. The uploaded study emphasizes that teachers need sustained support systems that help them grow professionally and personally, particularly as classrooms become more complex and learner needs become more diverse.

Professional development has therefore become a strategic concern in school improvement. The OECD describes teacher professional learning as a career-long process that includes formal training, seminars, online learning, mentoring, supervision, and other forms of support that help teachers improve practice over time. This perspective is relevant to North

Central Elementary School because teacher growth should not depend only on occasional seminars or compliance-based training. Instead, professional learning should be continuous, school-based, contextualized, and responsive to the actual instructional and personal challenges teachers face.

Mentoring and coaching are especially important because they bring professional learning closer to classroom practice. Mentoring generally provides guidance, encouragement, and career-related support from more experienced educators, while coaching focuses more directly on improving specific aspects of teaching through observation, feedback, modeling, reflection, and targeted assistance. The OECD's recent work on teacher professional learning emphasizes that mentorship, coaching, and support during real classroom practice are essential in helping teachers develop and sustain effective teaching. In the present study, these ideas support the development of a holistic mentoring and coaching program that addresses not only instructional competence but also classroom management, assessment practices, professional growth, workload concerns, collaboration, and well-being.

The Philippine basic education system also provides strong policy support for school-based teacher development. DepEd Order No. 35, s. 2016 institutionalizes the Learning Action Cell as a school-based continuing professional development strategy and describes it as a professional learning community intended to improve teacher practice and learner achievement. Similarly, DepEd Order No. 42, s. 2017 establishes the Philippine Professional Standards for Teachers as the basis for teacher learning and development programs, ensuring that teachers are equipped with the competencies needed to improve student learning outcomes. These policies justify the need for a structured mentoring and coaching program that translates professional standards into practical, school-level support.

A holistic mentoring and coaching program is necessary because teacher development is multidimensional. Teachers do not only need assistance with lesson planning and instructional delivery; they also need support with managing learner behavior, addressing differentiated needs, coping with workload pressure, communicating with colleagues, and maintaining professional motivation. UNESCO's work on education in 2025 emphasized the need to protect learning, support teachers and learners, and keep education central to global development priorities. UNESCO also highlights the importance of collaboration, mentorship, and school leadership in strengthening education quality and teacher retention. These points support the study's argument that mentoring and coaching should treat teachers as whole professionals, with their instructional, emotional, social, and professional needs interconnected.

Teacher well-being is likewise an important concern in developing a holistic program. The uploaded thesis discusses that teaching involves stress, workload demands, shifting policies, diverse learner needs, and professional relationships that influence both morale and performance. UNESCO-supported work on teacher well-being describes well-being as a foundation for retention, classroom effectiveness, and wider school impact, especially among novice teachers and those working in demanding contexts. Thus, a mentoring and coaching program that focuses only on technical teaching skills may fail to address the deeper conditions that affect teacher effectiveness. A more responsive approach should include reflective dialogue, emotional support, collegial collaboration, professional identity formation, and practical strategies for coping with classroom and workload pressures.

The local context of North Central Elementary School strengthens the need for this study. While national policies and professional standards provide broad expectations, each school has its own teacher profile, instructional concerns, classroom management issues, assessment challenges, and professional support needs. The uploaded study sought to determine the profile of teachers, identify their mentoring and coaching needs, examine the challenges they encountered, develop a holistic mentoring and coaching program, and validate the proposed program in terms of objectives, content, strategies, and activities, usefulness, and feasibility. This

local grounding is important because an effective program must be based on actual school-level evidence rather than generic professional development assumptions.

Accordingly, the present study developed a Holistic Mentoring and Coaching Program for teachers of North Central Elementary School. It employed a descriptive-developmental approach to describe teachers' needs and challenges and to develop a validated program to guide school-based teacher support. By focusing on the overall professional development of teachers, the study contributes to improving instructional practice, classroom management, assessment, collaboration, well-being, and sustained professional growth. Ultimately, the study positions mentoring and coaching as essential school-based mechanisms for strengthening teacher competence and improving the quality of teaching and learning.

5 Method

2.1 Research Design

The study employed a descriptive-developmental research design to develop a Holistic Mentoring and Coaching Program for teachers of North Central Elementary School. The descriptive component was used to determine the profile of the teacher-respondents, identify their mentoring and coaching needs, and examine the challenges they encountered in relation to instructional competence, classroom management, assessment practices, professional growth, workload concerns, collaboration, and personal and interpersonal well-being. The developmental component was applied in designing a school-based mentoring and coaching program grounded in teachers' actual needs and challenges. After the proposed program was developed, it was validated against objectives, content, strategies, activities, usefulness, and feasibility. This design was appropriate because the study did not merely describe existing conditions but also produced a practical output intended to improve teacher support and professional development. Through this approach, the study generated evidence-based inputs for creating a responsive, holistic, and context-specific mentoring and coaching program that may strengthen teacher competence, well-being, collaboration, and continuous professional growth.

2.2 Participants

The study consisted of eight teachers from North Central Elementary School, the research locale where the proposed Holistic Mentoring and Coaching Program was intended to be developed and implemented. Total population sampling was employed because the number of teachers in the school was manageable and because the study aimed to capture the needs, challenges, and professional realities of the entire teaching force. The respondents provided data on their profile, mentoring and coaching needs, and challenges encountered in professional practice, particularly in relation to instructional competence, classroom management, assessment practices, professional growth, workload concerns, collaboration, and personal and interpersonal well-being. Their responses served as the primary basis for designing a school-based program that was grounded in actual school conditions rather than generalized assumptions about teacher development. This participant group was appropriate because the study aimed to develop a context-specific intervention that directly addressed teachers' professional support needs at North Central Elementary School.

2.3 Instrumentation

The study used a researcher-developed questionnaire checklist as the primary instrument for collecting data to develop the Holistic Mentoring and Coaching Program for teachers at North Central Elementary School. The instrument was designed to align with the study's objectives and was organized into three major parts. The first part gathered the respondents' profiles, including age, sex, civil status, highest educational attainment, length of teaching experience, and grade-

level assignment. The second part identified the mentoring and coaching needs of teachers regarding instructional competence, classroom management, assessment practices, professional growth, collaboration, workload concerns, and personal and interpersonal well-being. The third part identified the challenges teachers face in their professional practice, particularly those that could be addressed through a holistic mentoring and coaching program. In addition, a separate validation checklist was prepared to evaluate the developed program against its objectives, content, strategies, activities, usefulness, and feasibility. The instruments underwent expert validation to ensure clarity, relevance, and alignment with the study's objectives. Necessary revisions were made based on the comments and suggestions of the validators before the questionnaire was administered to all eight teacher-respondents. Using these instruments, the study generated reliable, school-based data that served as the foundation for designing and validating the proposed mentoring and coaching program.

2.4 Data Analysis

The data gathered from the researcher-made questionnaire checklist and validation checklist were analyzed using descriptive statistical tools aligned with the study's objectives. Frequency counts and percentages were used to summarize the profile of the teacher-respondents by age, sex, civil status, highest educational attainment, length of teaching experience, and grade-level assignment. Weighted means were computed to determine the extent of teachers' mentoring and coaching needs across key dimensions, including instructional competence, classroom management, assessment practices, professional growth and development, collaboration, workload concerns, and personal and interpersonal well-being. The same procedure was used to analyze the challenges teachers face in their professional practice. Composite means were used to determine the overall level of need and the general extent of challenges across the identified dimensions. To validate the developed Holistic Mentoring and Coaching Program, weighted and composite means were also used to evaluate the program across objectives, content, strategies, and activities, usefulness, and feasibility. Through these statistical procedures, the study generated clear, organized evidence that served as the basis for developing and validating a responsive, school-based mentoring and coaching program for teachers at North Central Elementary School.

3 Results

The results showed that the teacher-respondents of North Central Elementary School came from varied personal and professional backgrounds. The study involved eight teachers, and a total population sampling was used to include the entire teaching force of the school. In terms of profile, the respondents differed in age, sex, civil status, educational attainment, length of teaching experience, and grade-level assignment. Most respondents were female, and the group included teachers from different age brackets and teaching experience levels. This profile indicated that the proposed mentoring and coaching program needed to be responsive to teachers at different career stages, grade-level assignments, and professional development needs.

The findings further revealed that teachers had high to very high mentoring and coaching needs across major areas of professional practice. These needs included instructional competence, classroom management, assessment practices, professional growth and development, workload concerns, collaboration, and personal and interpersonal well-being. The results suggest that teachers require support not only in technical teaching skills but also in broader areas affecting their effectiveness and well-being. This finding confirmed the need for a holistic mentoring and coaching program that would address interconnected professional, instructional, relational, and personal dimensions of teacher growth.

In terms of challenges, the teachers experienced the identified difficulties to a great extent, with an overall composite mean of 3.38. Among the five challenge areas, classroom management had the highest sub-composite mean of 3.52, followed by instructional challenges (3.44), professional and work-related challenges (3.38), assessment and evaluation challenges (3.28), and personal and interpersonal challenges (3.27). The highest-rated specific challenge was managing learner behavior and discipline problems, with a weighted mean of 3.75. Other major concerns included difficulty in addressing the needs of diverse learners, balancing teaching duties and administrative tasks, maintaining classroom order and learner engagement, and managing workload and time effectively.

Based on these findings, the study developed a Holistic Mentoring and Coaching Program for North Central Elementary School. The program was designed to respond to the identified needs and challenges of teachers, particularly in instructional competence, classroom management, assessment practices, professional growth, workload management, and personal and interpersonal well-being. The results justified the need for a school-based intervention that was not limited to lesson delivery or compliance-based professional development, but one that provided sustained support for teachers' competence, confidence, collaboration, reflective practice, and overall professional growth.

The validation results showed that the developed Holistic Mentoring and Coaching Program was highly valid, with an overall composite mean of 3.78. Validators found the program clear in its purpose, relevant in its content, appropriate in its strategies and activities, useful for addressing teachers' needs, and feasible for implementation in the school setting. The highest-rated indicators were the program's usefulness in addressing mentoring and coaching needs and its contribution to teachers' personal and professional growth, both with weighted means of 4.00. The lowest-rated indicator was the manageability of program activities in terms of time and resources, with a mean of 3.50, yet it was still considered highly valid. Overall, the findings confirmed that the proposed program was acceptable, relevant, practical, and suitable for implementation at North Central Elementary School.

4. Discussion

The study's findings confirm the need for a school-based Holistic Mentoring and Coaching Program for North Central Elementary School teachers. The results showed that teachers needed support across several interconnected areas, particularly instructional competence, classroom management, assessment practices, professional growth, workload management, collaboration, and personal and interpersonal well-being. This finding supports the view that teacher development should not be limited to technical classroom skills alone but should also address the broader professional and human dimensions of teaching. The OECD describes teacher professional learning as a career-long process that should support teachers from the beginning of their careers through sustained development, mentorship, coaching, collaboration, and reflective practice. Thus, the present findings are consistent with the idea that effective teacher support must be continuous, contextualized, and embedded in actual school practice.

The high level of need in instructional competence and classroom management suggests that teachers require practical guidance in lesson delivery, learner engagement, classroom order, and differentiated instruction. This is supported by DepEd Order No. 42, s. 2017, which institutionalizes the Philippine Professional Standards for Teachers and emphasizes content knowledge, pedagogy, learning environment, learner diversity, curriculum planning, assessment, and professional growth as essential domains of teacher quality. Since the study found that teachers needed mentoring and coaching in areas directly aligned with these professional standards, the proposed program is strongly justified as a mechanism for translating national teacher standards into school-based practice.

The challenges teachers face further underscore the need for the proposed program. The study found that teachers experienced significant difficulties, particularly in classroom management, instructional concerns, professional and work-related demands, assessment and evaluation, and personal and interpersonal challenges. Classroom management had the highest sub-composite mean, and managing learner behavior and discipline problems was the highest-rated specific challenge. These results indicate that teachers require support not only in planning and delivering lessons but also in sustaining classroom order, responding to diverse learners, managing workload, and maintaining professional well-being. The study itself explains that these concerns are exactly the types of issues that require sustained, responsive, and collaborative school-based support.

The development of the Holistic Mentoring and Coaching Program was therefore appropriate because it was grounded in teachers' actual needs and challenges rather than imposed as a generic professional development activity. The use of total population sampling strengthened the relevance of the findings by including all eight teachers at North Central Elementary School, ensuring that the proposed intervention reflected the realities of the entire teaching force. This approach is consistent with DepEd Order No. 35, s. 2016, which identifies the Learning Action Cell as a school-based continuing professional development strategy and as a professional learning community intended to improve teacher practice and learner achievement.

The validation results also support the acceptability and practicality of the proposed program. The developed Holistic Mentoring and Coaching Program was found highly valid in terms of objectives, content, strategies, activities, usefulness, and feasibility. This indicates that the program was considered relevant, appropriate, and suitable for possible implementation at North Central Elementary School. The study concluded that a school-based holistic mentoring and coaching program is essential in strengthening teacher support systems and promoting continuous professional growth. UNESCO's education work likewise emphasizes the importance of supporting teachers and strengthening professional development as part of quality education efforts, while its work on teacher well-being recognizes that teachers' mental health, professional development, self-efficacy, and collective efficacy are important factors in sustaining effective teaching. Overall, the findings justify the implementation of a holistic, collaborative, and context-responsive mentoring and coaching program that strengthens teacher competence, confidence, collaboration, well-being, and professional growth.

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MASTER TEACHERS' COACHING AND MENTORING PRACTICES AND TEACHERS' CLASSROOM PERFORMANCE

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Abstract

Master teachers serve as instructional leaders who support teacher development through coaching, mentoring, classroom observation, feedback, modeling, and professional guidance. This study examined the relationship between master teachers' coaching and mentoring practices and teachers' classroom performance in public elementary schools in Sta. Barbara II District, Schools Division Office, Pangasinan, during School Year 2024–2025. Specifically, it assessed coaching and mentoring practices across planning and goal-setting, observation and modeling, feedback and reflection, and support and professional development. It also assessed teachers' classroom performance in instructional delivery, classroom management, and student engagement. The study employed a descriptive-correlational research design using expert-validated Likert-scale questionnaires. Data were analyzed using weighted mean, Pearson product-moment correlation, and multiple regression at the 0.05 level of significance. Findings revealed that master teachers' coaching and mentoring practices were highly observed, with an overall mean of 3.68. Planning and goal-setting obtained the highest rating, while observation and modeling emerged as the strongest predictors of classroom performance. Teachers' classroom performance was also rated highly proficient, particularly in instructional delivery and student engagement. A very strong positive relationship was found between coaching and mentoring practices and classroom performance, with $r = 0.96$ and $p < .001$. Regression analysis further showed that coaching and mentoring practices accounted for 95.6% of the variance in overall classroom performance. The study concluded that effective coaching and mentoring significantly enhance teachers' instructional competence, classroom management, and learner engagement.

Keywords: Coaching And Mentoring, Master Teachers, Classroom Performance, Instructional Leadership, Professional Development, Teacher Competence

1. Introduction

Education remains a central driver of national development because it prepares learners with the knowledge, skills, values, and competencies needed to participate productively in society. At the heart of this process are teachers, whose instructional competence, classroom management, and ability to engage learners directly shape the quality of learning outcomes. However, effective teaching is not sustained by individual effort alone. Teachers need continuous professional support, instructional guidance, and opportunities for reflective practice. Within the Philippine public school system, Master Teachers play a crucial role in this professional development process, serving not only as experienced classroom practitioners but also as instructional leaders, mentors, coaches, and models of effective teaching practice.

Coaching and mentoring are important mechanisms for improving classroom performance because they provide teachers with structured assistance in planning lessons, improving instructional delivery, managing classroom behavior, assessing learners, and responding to diverse learning needs. In the uploaded study, coaching and mentoring practices were examined through four major domains: planning and goal-setting, observation and modeling, feedback and reflection, and support and professional development. These domains represent essential elements of instructional leadership because they move professional development beyond

general training and place it within the actual classroom context where teaching challenges occur. Through these practices, Master Teachers can help classroom teachers set growth targets, observe and analyze instruction, receive constructive feedback, reflect on practice, and access relevant professional support.

The need for effective mentoring is especially significant because teaching is widely recognized as a demanding profession. The early and middle years of teaching often involve challenges related to lesson planning, classroom management, learner behavior, assessment, instructional adjustment, and professional confidence. Without sufficient support, teachers may experience stress, professional isolation, and difficulty sustaining instructional effectiveness. Mentoring and coaching address these concerns by fostering a collegial environment in which teachers are guided by more experienced instructional leaders. As discussed in the article, teachers who receive adequate coaching and mentoring are more likely to strengthen their competencies, remain committed to the profession, assume leadership roles, and contribute positively to school culture.

In the Philippine context, the role of Master Teachers is supported by policy frameworks that emphasize instructional leadership and continuous professional development. Republic Act No. 9155, or the Governance of Basic Education Act of 2001, provides the basis for school-based management and instructional leadership. DepEd Order No. 2, s. 2015 on the Results-Based Performance Management System strengthens performance monitoring and professional accountability. DepEd Order No. 35, s. 2016 institutionalizes the Learning Action Cell as a school-based continuing professional development strategy, while DepEd Order No. 42, s. 2017 establishes the Philippine Professional Standards for Teachers. Together, these policies highlight the importance of mentoring, reflective practice, collaboration, and continuous improvement in teacher development.

Despite the recognized value of coaching and mentoring, there remains a need to examine how these practices are implemented in actual school settings and how they relate to teachers' classroom performance. The presence of a mentoring program does not automatically guarantee improved teaching quality. Its effectiveness depends on the consistency, relevance, and quality of coaching practices. For example, planning and goal-setting may help teachers identify specific instructional priorities; observation and modeling may provide concrete examples of effective teaching; feedback and reflection may help teachers refine their practices; and support and professional development may sustain long-term growth. Therefore, empirical evidence is needed to determine which mentoring practices are most strongly associated with classroom performance.

Teachers' classroom performance in the study was examined across instructional delivery, classroom management, and student engagement. These domains are directly aligned with the daily responsibilities of classroom teachers. Instructional delivery refers to the teacher's ability to present lessons clearly, use appropriate teaching strategies, align activities with learning objectives, and differentiate instruction. Classroom management involves establishing routines, creating safe learning environments, and managing positive behavior. Student engagement involves the use of interactive activities, questioning strategies, and opportunities for learners to express their ideas. These domains are important because they represent the visible outcomes of teacher competence inside the classroom.

The uploaded study was conducted among public elementary schools in Sta. Barbara II District, Schools Division Office Pangasinan, during School Year 2024–2025. It sought to determine the relationship between Master Teachers' coaching and mentoring practices and teachers' classroom performance. The study further examined whether specific mentoring domains predicted performance in instructional delivery, classroom management, and student engagement. This focus is important because it provides district-level evidence on how Master Teachers contribute to teacher development and instructional quality.

Accordingly, the study aimed to provide empirical support for strengthening structured coaching and mentoring programs in public elementary schools. By identifying the mentoring practices that significantly influence classroom performance, the study contributes to improving instructional leadership, teacher professional development, and learner-centered teaching. Ultimately, the study positions Master Teachers as key agents of school improvement whose coaching and mentoring practices can enhance teacher competence, promote reflective practice, and support improved learner outcomes.

6 Method

2.1 Research Design

The study employed a descriptive-correlational research design to examine the relationship between Master Teachers' coaching and mentoring practices and teachers' classroom performance in public elementary schools in Sta. Barbara II District, Schools Division Office Pangasinan. The descriptive component was used to determine the level of coaching and mentoring practices implemented by Master Teachers across planning and goal-setting, observation and modeling, feedback and reflection, and support and professional development. It was also used to assess teachers' classroom performance in terms of instructional delivery, classroom management, and student engagement. The correlational component was applied to determine whether a significant relationship existed between coaching and mentoring practices and classroom performance. This design was appropriate because the study sought to describe existing instructional leadership practices and determine the strength and direction of their association with teachers' classroom performance without manipulating any variables. Through this approach, the study generated empirical evidence on how Master Teachers' mentoring practices were related to teachers' instructional competence, classroom management, and learner engagement.

2.2 Participants

The study was public elementary school teachers from Sta. Barbara II District, Schools Division Office Pangasinan, during School Year 2024–2025. The study focused on the coaching and mentoring practices of Master Teachers and the classroom performance of Teacher I–III respondents. The teacher-respondents provided data on the extent to which Master Teachers implemented coaching and mentoring practices across planning and goal-setting, observation and modeling, feedback and reflection, and support and professional development. They also assessed classroom performance in terms of instructional delivery, classroom management, and student engagement. Stratified sampling was used to ensure representation among respondents from the district's public elementary schools. This participant group was appropriate because the study required responses from teachers with direct experience with Master Teachers' mentoring practices and whose classroom performance could be examined in relation to this instructional support. Through these respondents, the study generated empirical evidence on how coaching and mentoring practices were associated with teacher competence and classroom effectiveness.

2.3 Instrumentation

The study used two structured, expert-validated Likert-scale questionnaires as the primary instruments for data collection. The first questionnaire measured the extent of Master Teachers' coaching and mentoring practices across four domains: planning and goal-setting, observation and modeling, feedback and reflection, and support and professional development. These indicators captured how Master Teachers assisted teachers in setting professional growth goals, conducting classroom observations, modeling teaching strategies, providing constructive feedback, encouraging self-reflection, recommending professional development activities, and

monitoring instructional progress. The second questionnaire assessed teachers' classroom performance in terms of instructional delivery, classroom management, and student engagement. The classroom performance indicators were aligned with the Philippine Professional Standards for Teachers and focused on lesson clarity, instructional strategies, alignment of objectives with activities and assessment, differentiated instruction, classroom routines, positive behavior management, safe learning environment, interactive activities, learner participation, and questioning strategies that promote critical thinking. The use of Likert-scale items allowed the responses to be quantified and interpreted using weighted means. Prior to administration, the instruments were validated by experts to ensure relevance, clarity, and alignment with the study's objectives. Using these instruments, the study generated measurable data to determine the levels of coaching and mentoring practices, teachers' classroom performance, and the relationship between the two variables.

2.4 Data Analysis

The data gathered from the questionnaires were analyzed using descriptive and inferential statistical procedures aligned with the study's objectives. A weighted mean was used to determine the level of Master Teachers' coaching and mentoring practices in planning and goal-setting, observation and modeling, feedback and reflection, and support and professional development. The same procedure was used to assess teachers' classroom performance in terms of instructional delivery, classroom management, and student engagement. Pearson product-moment correlation was employed to determine the strength and direction of the relationship between coaching and mentoring practices and teachers' classroom performance. To further determine the extent to which specific mentoring domains predicted classroom performance, a multiple regression analysis was conducted, with the coaching and mentoring dimensions as predictors and the classroom performance domains as outcomes. The hypotheses were tested at the 0.05 level of significance. Through these statistical procedures, the study identified the overall relationship between Master Teachers' coaching and mentoring practices and teachers' classroom performance, as well as the specific mentoring practices that most strongly influenced instructional delivery, classroom management, and student engagement.

3 Results

The results showed that Master Teachers' coaching and mentoring practices were highly observed by the teacher-respondents. The overall weighted mean was 3.68, interpreted as Highly Observed. Among the four mentoring domains, planning and goal-setting obtained the highest rating, particularly in the collaboration between Master Teachers and teachers in setting professional growth goals, which received a mean of 3.89. Other highly rated practices included planning coaching sessions aligned with teachers' needs, providing constructive feedback, monitoring teacher progress, and recommending continuing professional development programs. These findings indicate that Master Teachers actively supported teachers through structured, goal-oriented, and developmental mentoring practices.

In terms of specific domains, feedback and reflection, support and professional development, and planning and goal-setting were strongly evident in the mentoring process. Master Teachers were perceived as helping teachers identify strategies to address classroom challenges, encourage self-reflection, monitor instructional progress, and provide professional guidance. However, observation and modeling, while still interpreted as Highly Observed, received lower ratings than the other domains. Indicators related to classroom modeling, demonstration of teaching strategies, and the use of observation data for mentoring discussions received comparatively lower mean scores. This suggests that although Master Teachers provided instructional support, demonstration-based mentoring may still need further strengthening.

The results also revealed that teachers' classroom performance was rated Highly Proficient, with an overall weighted mean of 3.68. Among the classroom performance domains, instructional delivery emerged as one of the strongest areas. Teachers reported high proficiency in differentiating instruction, aligning learning objectives with activities and assessments, and presenting lessons clearly and logically based on the curriculum guide. Student engagement was also highly rated, particularly in the use of interactive activities, questioning strategies that promote critical thinking, and opportunities for learners to express their ideas. These findings suggest that teachers demonstrated effective instructional competence and learner-centered classroom practices.

Classroom management was likewise rated positively, especially in maintaining a safe and conducive learning environment and managing learner behavior through positive and proactive strategies. However, the indicator on establishing routines and procedures to promote order and efficiency received a comparatively lower rating, although it remained within the Proficient level. This finding indicates that while teachers generally managed classrooms effectively, there is still a need to strengthen consistency in routines, classroom procedures, and time management practices. These areas may be addressed through more focused mentoring, modeling, and follow-through support from Master Teachers.

The relationship analysis showed a very strong positive relationship between Master Teachers' coaching and mentoring practices and teachers' classroom performance, with a correlation coefficient of $r = 0.96$. This indicates that higher levels of coaching and mentoring were closely associated with higher classroom performance in instructional delivery, classroom management, and student engagement. Regression analysis further revealed that coaching and mentoring practices accounted for 95.6% of the variance in overall classroom performance. Among the mentoring domains, observation and modeling emerged as the strongest predictor, with $B = 0.71$ and $p < .001$. Feedback and reflection, planning and goal-setting, and support and professional development also contributed significantly. Overall, the findings confirm that effective coaching and mentoring practices, particularly observation and modeling, substantially influence teachers' classroom performance.

4. Discussion

The study's findings confirm that Master Teachers' coaching and mentoring practices were highly observed by Teacher I–III respondents, indicating that instructional support was actively implemented in Sta. Barbara II District. The high overall mean of 3.68 suggests that teachers perceived Master Teachers as consistently providing guidance in planning and goal-setting, feedback and reflection, observation and modeling, and support and professional development. This finding supports the instructional leadership role of Master Teachers within the Philippine basic education system, where mentoring and professional guidance are essential in strengthening teacher competence. It is also aligned with DepEd Order No. 35, s. 2016, which institutionalizes the Learning Action Cell as a school-based continuing professional development strategy that promotes collaborative learning, reflective practice, and improvement of teaching and learning.

The strong rating for planning and goal-setting indicates that Master Teachers were effective in helping teachers identify professional growth priorities and align coaching activities with instructional needs. This result supports the idea that mentoring becomes more meaningful when it is structured, intentional, and connected to teachers' actual classroom challenges. Goal-oriented mentoring enables teachers to focus on specific areas for improvement, such as lesson planning, assessment alignment, differentiated instruction, and learner engagement. This is consistent with the principles of the Results-Based Performance Management System under DepEd Order No. 2, s. 2015, which emphasizes performance improvement, professional accountability, and evidence-based development planning. Thus, the high rating in planning and

goal-setting reflects a mentoring practice that is not merely informal assistance but a systematic process of professional growth.

The study also found that teachers' classroom performance was rated highly proficient, particularly in instructional delivery and student engagement. This suggests that teachers demonstrated competence in presenting lessons clearly, aligning objectives with activities and assessments, differentiating instruction, using participatory strategies, and encouraging learners to express ideas. These findings are consistent with the Philippine Professional Standards for Teachers under DepEd Order No. 42, s. 2017, which emphasizes content knowledge and pedagogy, learning environment, diversity of learners, curriculum and planning, assessment and reporting, and professional growth. The high classroom performance ratings suggest that mentoring practices may have helped teachers strengthen their instructional delivery, classroom management, and learner-centered teaching.

The very strong positive relationship between coaching and mentoring practices and classroom performance ($r = 0.96$, $p < .001$) provides strong empirical support for the importance of Master Teachers as instructional leaders. This means that higher levels of coaching and mentoring were closely associated with stronger classroom performance among teachers. Regression analysis further showed that coaching and mentoring accounted for 95.6% of the variance in overall classroom performance, indicating substantial predictive value. These findings support the view that teacher development is most effective when professional support is embedded in classroom practice through observation, feedback, modeling, reflection, and follow-through guidance.

Among the mentoring domains, observation and modeling emerged as the strongest predictor of classroom performance, with $B = 0.71$ and $p < .001$. This finding is especially important because it shows that teachers benefit greatly from seeing effective teaching practices demonstrated in real or simulated classroom contexts. Observation and modeling allow teachers to connect theory with practice, observe classroom management techniques, examine instructional strategies, and apply demonstrated approaches in their own teaching. Although this domain received relatively lower implementation ratings than planning and feedback, it had the strongest predictive influence, suggesting that schools should strengthen demonstration teaching, peer observation, classroom walkthroughs, and post-observation conferences. Overall, the study supports the institutionalization of structured coaching and mentoring programs that prioritize modeling, reflective feedback, collaborative planning, and continuous professional development to improve teacher competence and learner outcomes.

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THE IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY ON LEARNING IN INTERMEDIATE GRADE

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Abstract

Information and Communication Technology has become an essential component of modern instruction as schools seek to improve digital literacy, learner engagement, and classroom performance in the intermediate grades. This study determined the impact of Information and Communication Technology integration on learning among intermediate-grade learners. Specifically, it described the profile of ICT teachers in terms of highest educational attainment, ICT competency, years of teaching, relevant ICT training attended, and gadgets used for instruction; assessed the ICT performance of intermediate-grade learners; examined the relationship between teacher profile and learner ICT performance; identified student-related and teacher-related problems encountered in ICT integration; and proposed intervention measures to improve performance. The study employed a descriptive-correlational research design involving 150 ICT teachers from St. Columban College in Lingayen, St. Columban Institute in Labrador, and Domalandan Center Elementary School in Lingayen, Pangasinan. Data were gathered using a researcher-developed questionnaire and analyzed using frequency, percentage, weighted average, and correlation analyses. Findings revealed that most ICT teachers possessed bachelor's degrees, high self-rated ICT competency, relevant ICT training, and access to basic instructional gadgets such as laptops, smartphones, desktops, and projectors. Intermediate-grade learners demonstrated a high level of ICT performance, particularly in basic computer operations and use of productivity tools. Teacher ICT competency, relevant ICT training, and gadget use were significantly and positively related to learner ICT performance, whereas educational attainment and years of teaching were not. Major challenges included limited student access to devices, low digital literacy, poor connectivity, insufficient teacher training, and outdated equipment. The study concluded that practical ICT competency, sustained training, and adequate digital resources are critical to improving ICT-based learning.

Keywords: Information And Communication Technology, ICT Integration, Intermediate-Grade Learners, Teacher Competency, Digital Literacy, Student Performance

1. Introduction

Information and Communication Technology has become a defining feature of contemporary education as schools increasingly use digital tools to support instruction, assessment, communication, collaboration, and learner engagement. In the intermediate grades, ICT integration is especially important because learners are developing foundational academic competencies while also beginning to acquire digital skills needed for lifelong learning. At this stage, students are expected not only to operate devices but also to use productivity tools, search for information, collaborate digitally, observe online safety, and produce simple multimedia outputs. For this reason, ICT is no longer viewed merely as an optional instructional aid but as a necessary component of twenty-first-century teaching and learning.

The global education sector recognizes that technology can expand learning opportunities when it is used purposefully and equitably. UNESCO's Global Education Monitoring Report on technology in education emphasized that digital technology can improve access to learning

resources, support inclusion, and enrich teaching, but it must be used in line with learner needs and educational goals rather than adopted for its own sake. Similarly, UNESCO's work on digital education promotes human-centered, ethical, and equitable technologies in education, underscoring that technology should strengthen teaching and learning while protecting inclusion and quality. These perspectives are directly relevant to intermediate-grade ICT instruction because technology integration must be accompanied by teacher readiness, adequate devices, learner support, and appropriate pedagogy.

In the uploaded study, ICT integration was examined through the ICT teacher profiles, the ICT performance of intermediate-grade learners, the relationship between teacher profiles and learner performance, and the problems encountered during implementation. The study involved 150 ICT teachers from St. Columban College in Lingayen, St. Columban Institute in Labrador, and Domalandan Center Elementary School in Lingayen, Pangasinan. It used a descriptive-correlational research design to determine how teacher-related factors, such as educational attainment, ICT competency, teaching experience, relevant ICT training, and gadgets used, were associated with learner ICT performance. This focus is important because effective ICT integration depends not only on the presence of technology but also on teachers' ability to use it meaningfully in instruction.

Teacher competency remains a critical factor in ICT-based learning. The World Bank notes that digital technologies in education can support personalized learning, real-time feedback, virtual tutoring, and improved teaching support, but these benefits depend on foundational digital skills, connectivity, and implementation capacity. In classroom practice, this means that teachers need both technical skills and pedagogical judgment. They must know how to select appropriate tools, design ICT-based activities, guide learners in responsible use, troubleshoot basic issues, and align technology with learning objectives. Without sufficient teacher preparation, ICT may become a superficial classroom feature rather than a tool for deeper learning.

The study's emphasis on the teacher profile is therefore justified. Educational attainment and years of teaching may indicate professional experience, but ICT-specific competency, training, and access to devices are likely to influence how effectively teachers integrate technology into lessons. The uploaded thesis reported that teachers generally had high ICT competency and commonly used laptops, smartphones, desktop computers, and projectors. However, access to more advanced tools, such as interactive whiteboards, was limited. This condition reflects a common challenge in many schools: basic digital tools may be available, but advanced infrastructure and sustained technical support may still be insufficient. Thus, ICT integration must be understood as a combination of teacher capability, institutional support, and learner access.

Learner ICT performance is another essential concern. Intermediate-grade learners may be capable of basic computer operations and use of productivity tools, but they still need support in higher-level digital skills such as information evaluation, safe online behavior, digital collaboration, multimedia creation, and basic coding. The study found that intermediate-grade learners showed a high overall level of ICT performance, with stronger ratings in basic computer operations and productivity tools, while digital collaboration and multimedia or coding skills received comparatively lower ratings. This suggests that learners may be comfortable with routine digital tasks but require richer learning experiences that promote creativity, collaboration, digital citizenship, and problem-solving.

The relationship between teacher profile and learner ICT performance also deserves careful examination. The uploaded study found that teacher ICT competency, relevant ICT training, and gadget use were significantly and positively related to learners' ICT performance, whereas educational attainment and years of teaching were not. This indicates that practical digital skills and continuous professional development may be more influential than tenure or academic credentials alone in improving ICT learning outcomes. Such findings support the need

for schools to prioritize hands-on ICT training, peer coaching, technology-supported lesson planning, and access to updated instructional devices.

Despite its benefits, ICT integration continues to face barriers. The study identified student-related problems, including limited access to personal devices, low digital literacy, poor internet connectivity, limited engagement, and distractions. Teacher-related problems included insufficient ICT training, outdated equipment, limited technical support, time constraints, and difficulty adapting to new technologies. These issues show that ICT integration is both a pedagogical and equity concern. If learners lack devices or connectivity, and if teachers lack training or updated equipment, the promise of ICT-enhanced learning cannot be fully realized.

Accordingly, this study determined the impact of Information and Communication Technology on learning in intermediate grades. Specifically, it described the profile of ICT teachers, assessed learners' ICT performance, examined the relationship between teacher profiles and learner performance, identified problems encountered in ICT integration, and proposed interventions to improve performance. By focusing on intermediate-grade ICT instruction in selected schools in Pangasinan, the study contributes localized evidence that may guide teacher development, infrastructure planning, learner support programs, and school-based ICT improvement initiatives.

2. Method

2.1 Research Design

The study employed a descriptive-correlational research design to determine the impact of Information and Communication Technology on learning among intermediate-grade learners. The descriptive component described the profile of ICT teachers in terms of highest educational attainment, ICT competency, years of teaching experience, relevant ICT training attended, and the gadgets used for ICT instruction. It was also used to determine the level of ICT performance of intermediate-grade learners and to identify the problems encountered by teachers in ICT integration, particularly student-related and teacher-related challenges. The correlational component was applied to examine whether significant relationships existed between teacher profile variables and learners' ICT performance. This design was appropriate because the study sought to describe current ICT teaching practices and learner performance while determining the degree of association between teacher-related factors and student outcomes without manipulating any variables. Through this approach, the study generated empirical evidence on how teacher competency, professional training, and access to instructional gadgets were related to ICT learning performance among intermediate-grade learners.

2.2 Participants

The study comprised 150 ICT teachers from three selected educational institutions in Pangasinan: St. Columban College in Lingayen, St. Columban Institute in Labrador, and Domalandan Center Elementary School in Lingayen. These teachers were selected because they were directly involved in teaching Information and Communication Technology or ICT-integrated subjects at the intermediate-grade level, particularly Grades 4, 5, and 6. Stratified random sampling was employed to ensure fair and proportionate representation from the participating schools. The respondents served as the primary sources of data on teacher profile, ICT competency, teaching experience, ICT-related training, gadgets used for instruction, learner ICT performance, and problems encountered in ICT integration. Their responses were essential in determining how teacher-related factors were associated with the ICT performance of intermediate-grade learners. This participant profile was appropriate because the study focused on teachers' instructional roles in technology-based learning and on the conditions that support or hinder effective ICT integration in intermediate-grade classrooms.

2.3 Instrumentation

The study used a researcher-developed questionnaire as the primary instrument to collect data on ICT integration and learning in the intermediate grades. The instrument was developed to align with the study's objectives and organized into three major parts. The first part gathered data on ICT teachers' highest educational attainment, ICT competency, years of teaching experience, relevant ICT training attended, and the gadgets used for instruction. The second part assessed the level of ICT performance of intermediate-grade learners through indicators such as basic computer operations, use of productivity tools, internet research and information use, online safety and responsible behavior, digital collaboration, and basic multimedia or coding skills. The third part identified the problems encountered by teachers in integrating ICT, particularly student-related problems such as lack of access to personal devices, low digital literacy, poor internet connectivity, limited engagement, and short attention span, as well as teacher-related problems such as insufficient ICT training, lack of updated equipment, limited technical support, time constraints, and difficulty adapting to new technologies. The questionnaire used checklist items and Likert-scale statements to generate quantifiable responses. To ensure validity, the instrument was reviewed by experts in education, ICT, and research, and a pilot test was conducted among respondents who were not part of the final sample. Necessary revisions were made to improve clarity, relevance, and reliability before full administration.

2.4 Data Analysis

The data gathered from the researcher-designed questionnaire were analyzed using descriptive and inferential statistical procedures aligned with the study's objectives. Frequency counts and percentages were used to describe the profile of ICT teachers in terms of highest educational attainment, ICT competency, years of teaching experience, relevant ICT training attended, and gadgets used for ICT instruction. A weighted average was used to determine the level of ICT performance of intermediate-grade learners in areas such as basic computer operations, productivity tool use, internet research, online safety, digital collaboration, and multimedia or coding skills. The same procedure was used to assess the seriousness of student-related and teacher-related problems encountered in ICT integration. To determine the relationship between teacher profile variables and learners' ICT performance, a correlation analysis was conducted, focusing on ICT competency, relevant training, gadget use, educational attainment, and teaching experience. The results were interpreted using prescribed descriptive scales and tested at the 0.05 level of significance. Through these statistical procedures, the study identified the teacher-related factors significantly associated with learner ICT performance and provided an empirical basis for proposing intervention measures to improve ICT integration in intermediate-grade classrooms.

3 Results

The results showed that the ICT teachers were generally academically qualified and had sufficient teaching experience to support ICT integration in intermediate-grade classrooms. Most respondents held a bachelor's degree: 95 teachers, or 63.3%, were in this category, while 30 teachers, or 20%, were pursuing a master's degree, and 20 teachers, or 13.3%, had already completed a master's degree. In terms of teaching experience, the largest group had 6–10 years of experience, comprising 60 teachers (40%), followed by 35 teachers (23.3%) with 11–15 years of experience. These findings indicate that the respondents had an adequate professional foundation for classroom instruction, although further graduate education and advanced ICT specialization may still strengthen their instructional capacity.

The study further revealed that ICT teachers generally perceived themselves as highly competent in using and integrating ICT in instruction. The mean ICT competency rating was 4.00, indicating a high level of competence. Specifically, 70 teachers (46.7%) rated themselves as

highly competent, while 45 (30%) rated themselves as very highly competent. In terms of professional development, 110 teachers (73.3%) had attended basic ICT training, while 35 teachers (23.3%) had attended advanced ICT training. These findings suggest that most teachers had received ICT-related training and had practical confidence in their technology use. However, the lower percentage of teachers with advanced training underscores the need for deeper, more specialized professional development.

Regarding instructional gadgets, laptops were the most commonly used device, with 145 teachers (96.7%) reporting their use, followed by smartphones (80%), projectors or televisions (70%), desktop computers (53.3%), and tablets (40%). Interactive whiteboards were the least used, with only 25 teachers, or 16.7%, reporting access to this tool. These results show that teachers had access to basic ICT devices necessary for classroom instruction, but access to advanced digital tools remained limited. This suggests that while ICT integration was already in place, the modernization of classroom technology still required stronger institutional support and greater infrastructure investment.

The level of ICT performance among intermediate-grade learners was rated high, with an overall weighted mean of 3.98. Learners performed very highly in basic computer operations, with an average weighted mean of 4.36, and in the use of productivity tools such as word processing and presentation software, with an average weighted mean of 4.22. They also obtained high ratings in internet research and information use, online safety and responsible behavior, digital collaboration, and basic multimedia or coding skills. However, digital collaboration and multimedia or coding skills received lower ratings than basic computer operations and productivity tool use. This indicates that learners were more proficient in basic ICT tasks but still needed enrichment in higher-order digital skills such as collaboration, creative production, and coding.

Correlation results showed that teacher ICT competency, relevant ICT training, and gadgets used in teaching were significantly and positively related to learners' ICT performance. ICT competency had the strongest relationship with learner performance, with an r -value of 0.532 and a p -value of 0.000. Relevant ICT training was also significantly related, with an r -value of 0.415 and a p -value of 0.002, while gadgets used in teaching showed a significant weak-to-moderate relationship, with an r -value of 0.361 and a p -value of 0.005. In contrast, the highest educational attainment and years of teaching experience showed no significant relationship with learners' ICT performance. The study also found serious ICT integration problems, including limited student access to personal devices, low digital literacy, poor internet connectivity, insufficient teacher ICT training, outdated equipment, limited technical support, time constraints, and difficulty adapting to new technologies. Overall, the findings indicate that practical ICT competency, continuous training, and adequate technology access are more influential in improving learner ICT performance than academic credentials or teaching tenure alone.

4. Discussion

The finding that ICT teachers generally possessed high ICT competency supports the central role of teacher digital readiness in effective technology integration. In the study, teachers reported high ICT competency, and most had attended basic or advanced ICT training, suggesting that they had foundational skills for using digital tools in instruction. This result is consistent with UNESCO's position that technology in education must be guided by educational purpose, teacher capacity, and learner needs rather than by technology use alone. UNESCO's 2023 Global Education Monitoring Report emphasizes that digital technology can support learning, but its value depends on appropriate, equitable, and evidence-based use. Therefore, the high level of ICT competency among teachers in the present study is an important enabling factor for meaningful ICT integration.

The high level of ICT performance among intermediate-grade learners further indicates that technology integration has contributed positively to learners' digital literacy. Learners

performed very well in basic computer operations and productivity tools, and showed strong performance in internet research, online safety, digital collaboration, and multimedia or coding skills. These results suggest that learners had already developed essential operational and productivity-based ICT skills, although higher-order digital competencies still require further enrichment. The World Bank notes that digital skills are increasingly essential for students to thrive in school and work, which supports the importance of strengthening ICT learning at the intermediate level. In this context, the study's findings show that ICT instruction can equip learners with the practical digital competencies needed for current academic tasks and future learning demands.

The significant positive relationship between teacher ICT competency and learner ICT performance confirms that digitally capable teachers are more likely to support stronger ICT learning outcomes. The study found that ICT competency had the strongest relationship with learner performance, followed by relevant ICT training and gadget use. This means that practical digital knowledge and continuous professional development are more influential than educational attainment or teaching experience alone. The OECD reported that many education systems have invested in guidance and professional learning to strengthen teachers' capacity for digital education, recognizing that teacher preparation is critical to effective use of digital resources. Thus, the present findings reinforce the need for regular, hands-on, and competency-based ICT training for teachers.

The significant relationship between gadget use and learner ICT performance also highlights the importance of accessible instructional technology. In the study, laptops, smartphones, desktops, and projectors were commonly used, while interactive whiteboards were less available. This suggests that teachers had access to basic digital tools but limited access to more advanced classroom technologies. The World Bank explains that digital technologies can enhance teaching, support learners, and strengthen equitable and innovative learning systems when implemented effectively. However, the benefits of ICT depend on adequate infrastructure, connectivity, and instructional support. Therefore, the study's findings imply that schools should not only train teachers but also provide sufficient, up-to-date ICT equipment to ensure that technology-enhanced instruction is consistent, interactive, and inclusive.

Finally, the serious student-related and teacher-related problems identified in the study show that ICT integration remains constrained by equity and capacity issues. Student-related problems included lack of access to personal devices, low digital literacy, poor internet connectivity, limited engagement, and distractions. Teacher-related problems included insufficient ICT training, outdated equipment, limited technical support, time constraints, and difficulty adapting to new technologies. These findings are consistent with UNESCO's warning that technology can widen inequalities when access and support are uneven. The proposed interventions should therefore prioritize device access, improved connectivity, updated school equipment, technical support, advanced teacher training, and structured ICT-based learning activities. Overall, the study confirms that ICT can improve learning in the intermediate grades, but its impact depends on teacher competency, sustained training, sufficient digital tools, and systemic support.

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ENHANCING GRADE 11 STEM LEARNERS' CONCEPTUAL UNDERSTANDING OF CHEMICAL REACTION TYPES THROUGH A MICRO-SCALE WASTE-PREVENTIVE LABORATORY APPROACH: EVIDENCE FROM A QUASI-EXPERIMENTAL STUDY

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Abstract

Chemistry learners often struggle to understand chemical reaction types because the topic requires them to connect symbolic equations, molecular changes, and observable laboratory phenomena. This study evaluated the effectiveness of a micro-scale waste-prevention laboratory approach in enhancing Grade 11 STEM learners' conceptual understanding of types of chemical reactions. Grounded in Green Chemistry principles and experiential learning theory, the intervention used small-scale experimentation and safer household materials to provide sustainable, inquiry-based, and learner-centered laboratory experiences. The study employed a one-group pre-test/post-test quasi-experimental design involving 44 Grade 11 STEM learners from Urdaneta City National High School during Academic Year 2025–2026. A validated 20-item multiple-choice test aligned with Chemistry 2 curriculum competencies was administered before and after the intervention. The laboratory activities focused on synthesis, decomposition, single-replacement, and double-replacement reactions using materials such as steel wool, vinegar, hydrogen peroxide, yeast, aluminum foil, copper sulfate, and baking soda. Data were analyzed using descriptive statistics and a paired-samples t-test. Results showed that learners' mean score increased from 8.18 in the pre-test to 16.39 in the post-test, while the mean percentage score improved from 40.90% to 81.95%. The paired t-test result yielded a t-value of -91.66 and a p-value of .000, indicating a statistically significant improvement. The study concluded that the micro-scale waste-preventive laboratory approach effectively improved learners' conceptual understanding while promoting safety, environmental responsibility, and engagement in chemistry learning.

Keywords: Green Chemistry, Micro-Scale Laboratory, Chemical Reactions, Conceptual Understanding, STEM Education, Waste-Preventive Approach

1. Introduction

Chemistry is a foundational discipline in Science, Technology, Engineering, and Mathematics education because it explains the composition, structure, properties, and transformations of matter. For senior high school STEM learners, chemistry provides essential preparation for future studies in medicine, engineering, environmental science, pharmacy, health sciences, agriculture, and technology-related fields. However, chemistry remains one of the more difficult science subjects for many learners because it requires them to understand abstract concepts, interpret symbolic equations, visualize submicroscopic particles, and connect these representations with observable laboratory phenomena. The difficulty becomes more pronounced when instruction emphasizes definitions and equation balancing without sufficient inquiry-based experimentation.

One topic that commonly challenges learners is the classification and interpretation of chemical reaction types. To understand synthesis, decomposition, single-replacement, and double-replacement reactions, learners must recognize patterns in reactants and products, interpret changes in substances, predict possible outcomes, and connect the symbolic form of chemical equations with actual evidence of reaction. In the uploaded study, Grade 11 STEM learners initially obtained a mean pre-test score of 8.18 out of 20 and a mean percentage score

of 40.90%, indicating low conceptual mastery before the intervention. This baseline finding supports the need for laboratory experiences that help learners move from memorizing reaction categories toward understanding how chemical transformations occur.

The need to strengthen science learning is also reflected in international assessment data. The OECD reported that students in the Philippines scored below the OECD average in mathematics, reading, and science in PISA 2022, and only 23% of students in the Philippines attained Level 2 or higher in science compared with the OECD average of 76%. These results indicate that many Filipino learners still struggle to apply scientific knowledge to explain familiar phenomena and to evaluate conclusions based on evidence. Although PISA assesses 15-year-old learners rather than specifically Grade 11 STEM students, the results provide a broader context for why Philippine science instruction needs approaches that promote conceptual understanding, inquiry, and evidence-based reasoning.

Laboratory learning is central to chemistry education because it allows learners to observe, manipulate, test, compare, and infer from chemical phenomena. However, traditional laboratory activities may be limited by large class sizes, high reagent costs, insufficient laboratory equipment, safety concerns, and waste-disposal issues. In some cases, laboratory tasks become procedural rather than conceptual, with learners following steps mechanically without understanding the scientific principles behind the reaction. When this happens, the laboratory becomes a demonstration of compliance rather than an environment for inquiry and meaning-making. Therefore, chemistry instruction needs laboratory models that are safer, more affordable, environmentally responsible, and capable of strengthening conceptual understanding.

A micro-scale waste-preventive laboratory approach addresses these concerns by using very small quantities of reagents, compact reaction surfaces, drop-wise application, and safer materials to conduct experiments. In the uploaded study, the intervention used household and accessible materials, including steel wool, vinegar, hydrogen peroxide, yeast, aluminum foil, copper sulfate, and baking soda, to demonstrate major types of chemical reactions. This approach reduced waste, minimized hazards, and enabled learners to observe chemical changes directly. Because the experiments were small-scale and manageable, learners could focus on interpreting reaction evidence rather than worrying about complicated apparatus or hazardous chemicals.

The approach is strongly aligned with Green Chemistry. The American Chemical Society identifies waste prevention, less hazardous chemical syntheses, safer solvents and auxiliaries, and inherently safer chemistry for accident prevention among the 12 principles of Green Chemistry. Microscale chemistry has also been described as complementary to Green Chemistry, emphasizing smaller quantities, reduced hazards, and waste minimization while maintaining meaningful laboratory learning. In science education, this alignment is important because laboratory instruction should not only produce correct answers but also develop responsible scientific practice. Through Green Chemistry-based laboratory work, learners can connect chemical concepts with sustainability, safety, and environmental responsibility.

Recent literature further supports the educational relevance of Green Chemistry. Sánchez Morales, Sáenz-López, and de las Heras Pérez (2024) conducted a systematic review on Green Chemistry didactics and emphasized its role in chemistry education in response to environmental concerns. Similarly, STEM teaching literature emphasizes that learners benefit when they are actively engaged, assessed for conceptual understanding, and guided to develop problem-solving, critical thinking, collaboration, and self-directed learning skills. These principles are reflected in the micro-scale waste-preventive laboratory approach, as learners actively performed experiments, observed changes, interpreted evidence, and connected results to chemical reaction classifications.

The present study, therefore, evaluated the effectiveness of a micro-scale waste-prevention laboratory approach in enhancing Grade 11 STEM learners' conceptual understanding of types of chemical reactions. Specifically, it determined learners' performance before the

intervention, assessed their performance after the intervention, and tested whether there was a significant difference between pre-test and post-test results. Using a one-group pre-test/post-test quasi-experimental design with 44 Grade 11 STEM learners from Urdaneta City National High School, the study generated evidence on the potential of safe, sustainable, and inquiry-based laboratory instruction to improve chemistry learning. The findings are expected to support science teachers, curriculum planners, and school administrators in adopting Green Chemistry-based micro-scale experiments that promote conceptual mastery, learner engagement, laboratory safety, and environmental responsibility.

7 Method

2.1 Research Design

The study employed a one-group pre-test/post-test quasi-experimental research design to determine the effectiveness of a micro-scale waste-preventive laboratory approach in enhancing Grade 11 STEM learners' conceptual understanding of types of chemical reactions. This design was appropriate because the same group of learners was assessed before and after exposure to the intervention, allowing the researcher to measure changes in performance attributable to the laboratory-based instructional approach. Prior to the intervention, a validated 20-item multiple-choice pre-test was administered to assess learners' baseline understanding of synthesis, decomposition, single-replacement, and double-replacement reactions. The learners then participated in micro-scale experiments using safer and more accessible materials, including steel wool, vinegar, hydrogen peroxide, yeast, aluminum foil, copper sulfate, and baking soda. After the intervention, the same competency-aligned assessment structure was used through a post-test to determine improvement in conceptual understanding. Although the design did not include a control group, it allowed the researcher to compare pre-intervention and post-intervention performance and determine whether the Green Chemistry-based micro-scale laboratory approach produced a statistically significant improvement in learners' chemistry achievement.

2.2 Participants

The study was forty-four Grade 11 STEM learners enrolled in Chemistry 2 at Urdaneta City National High School, Urdaneta City, Pangasinan, during Academic Year 2025–2026. The learners were selected through purposive sampling because they were directly enrolled in the subject and competency area covered by the intervention, particularly the topic on types of chemical reactions. This participant group was appropriate because the study aimed to determine whether a micro-scale waste-prevention laboratory approach could improve learners' conceptual understanding of synthesis, decomposition, single-replacement, and double-replacement reactions. Prior to the intervention, the learners completed a validated 20-item pre-test to determine their baseline performance. They then participated in micro-scale laboratory activities using safer and more accessible materials, including steel wool, vinegar, hydrogen peroxide, yeast, aluminum foil, copper sulfate, and baking soda. After the intervention, the learners completed the post-test to measure gains in conceptual understanding. Through this group of participants, the study generated focused evidence on the effectiveness of Green Chemistry-based micro-scale experimentation in improving chemistry learning among senior high school STEM learners.

2.3 Instrumentation

The study utilized researcher-developed 20-item multiple-choice pre-test and post-test instruments to measure Grade 11 STEM learners' conceptual understanding of types of chemical reactions. The tests aligned with the Department of Education Chemistry 2 curriculum

competencies and covered the major reaction types: synthesis, decomposition, single-replacement, and double-replacement reactions. The pre-test was administered before implementing the micro-scale waste-preventive laboratory approach to determine learners' baseline knowledge and identify their initial level of conceptual mastery. After the intervention, the post-test was administered to measure improvement in learners' understanding of reaction classification, prediction, and interpretation. The instruments underwent expert validation to ensure content validity, curriculum alignment, item clarity, and appropriateness for Grade 11 STEM learners. Using these assessment tools, the study generated measurable data to compare learners' performance before and after the intervention and to determine the effectiveness of the Green Chemistry-based micro-scale laboratory approach in improving conceptual understanding of chemical reaction types.

2.4 Data Analysis

The data gathered from the pre-test and post-test were analyzed using descriptive and inferential statistical procedures. Descriptive statistics, including mean, median, standard deviation, and Mean Percentage Score, were used to determine the performance level of Grade 11 STEM learners before and after the implementation of the micro-scale waste-preventive laboratory approach. These measures provided a clear summary of learners' baseline conceptual understanding and post-intervention achievement in identifying and interpreting synthesis, decomposition, single-replacement, and double-replacement reactions. To determine whether a statistically significant difference existed between the pre-test and post-test scores, a paired-samples t-test was employed. This statistical test was appropriate because the same group of learners was measured before and after the intervention. The null hypothesis was tested at the 0.05 significance level. Through this analysis, the study determined whether the Green Chemistry-based micro-scale laboratory approach produced a measurable improvement in learners' conceptual understanding of chemical reaction types.

3 Results

The results showed that before the implementation of the micro-scale waste-preventive laboratory approach, Grade 11 STEM learners demonstrated low conceptual mastery of types of chemical reactions. The learners obtained a pre-test mean score of 8.18 out of 20, with a Mean Percentage Score of 40.90%. The highest score obtained was 11, while the lowest score was 5. The median score was 8, and the standard deviation was 1.59, indicating that most learners performed within a relatively narrow range of low performance. These findings suggest that, prior to the intervention, learners had difficulty classifying, predicting, and interpreting synthesis, decomposition, single-replacement, and double-replacement reactions.

After implementing the micro-scale waste-prevention laboratory approach, learners' performance improved substantially. The post-test mean score increased to 16.39 out of 20, with a Mean Percentage Score of 81.95%. The highest score obtained was 20, while the lowest score was 13. The median score also rose to 16, and the standard deviation was 1.60. These results indicate that learners moved from low conceptual mastery before the intervention to a much higher level of understanding after participating in the micro-scale laboratory activities.

The improvement in post-test performance suggests that the laboratory intervention helped learners connect abstract chemical concepts with observable phenomena. Through micro-scale activities using materials such as steel wool, vinegar, hydrogen peroxide, yeast, aluminum foil, copper sulfate, and baking soda, learners observed chemical changes directly and related them to different types of reactions. The use of small quantities and safer household materials also made the laboratory experience more manageable, reducing possible anxiety and allowing learners to focus on conceptual understanding.

The paired-samples t-test confirmed that the improvement between pre-test and post-test scores was statistically significant. The pre-test mean of 8.18 increased to a post-test mean of 16.39, yielding a mean difference of -8.20. The computed t-value was -91.66 with 43 degrees of freedom and a p-value of .000. Since the p-value was lower than the 0.05 level of significance, the null hypothesis was rejected. This indicates a significant difference in learners' performance before and after the implementation of the micro-scale waste-preventive laboratory approach.

Overall, the findings provide strong evidence that the micro-scale waste-preventive laboratory approach effectively enhanced Grade 11 STEM learners' conceptual understanding of types of chemical reactions. The increase in the mean score and the mean percentage score demonstrates that the intervention improved learners' ability to understand and classify chemical reactions. The results further suggest that Green Chemistry-based micro-scale experiments can support safer, more sustainable, and more engaging chemistry instruction while promoting both academic learning and environmental responsibility.

4. Discussion

The study's findings show that Grade 11 STEM learners had low conceptual mastery of types of chemical reactions prior to the intervention. The pre-test mean score of 8.18 out of 20, equivalent to an MPS of 40.90%, indicates that learners had difficulty classifying, predicting, and interpreting synthesis, decomposition, single-replacement, and double-replacement reactions. This result is understandable because chemical reaction types require learners to connect three levels of chemical understanding: symbolic equations, observable changes, and particle-level transformations. The result is also consistent with the broader concern in science education that learners may struggle when instruction focuses mainly on memorization and symbolic manipulation rather than active inquiry and conceptual engagement. OECD data from PISA 2022 show that Filipino learners performed below the OECD average in science, with only 23% reaching at least Level 2 proficiency, highlighting the continuing need for stronger inquiry-based, evidence-centered science instruction.

The substantial increase in post-test performance demonstrates that the micro-scale waste-preventive laboratory approach effectively improved learners' conceptual understanding. After the intervention, the post-test mean increased to 16.39 out of 20, while the MPS rose to 81.95%, showing that learners moved from low mastery to a much stronger level of achievement. This improvement may be attributed to the experiential nature of the intervention, in which learners directly observed chemical changes using small amounts of readily available materials such as steel wool, vinegar, hydrogen peroxide, yeast, aluminum foil, copper sulfate, and baking soda. By connecting laboratory observations with reaction classifications, learners were able to construct meaning from concrete evidence rather than relying only on textbook explanations or equation memorization.

The statistically significant paired t-test result further strengthens the conclusion that the intervention produced meaningful learning gains. The computed t-value of -91.66 and p-value of .000 indicate that the difference between pre-test and post-test scores was significant at the 0.05 level. Thus, the null hypothesis was rejected. This result confirms that the micro-scale waste-preventive laboratory approach was not merely an engaging classroom activity but an effective instructional strategy for improving conceptual mastery. The finding supports the claim that laboratory instruction becomes more powerful when learners actively manipulate materials, observe outcomes, discuss evidence, and relate results to scientific concepts.

The intervention's effectiveness is also supported by Green Chemistry principles. The American Chemical Society identifies waste prevention as a core principle of Green Chemistry, emphasizing that it is better to prevent waste than to treat or clean it after it has been created. In the present study, the use of micro-scale reaction surfaces and drop-wise reagent application reduced chemical waste and minimized safety risks. This is consistent with Singh, Szafran, and

Pike's explanation that microscale chemistry and Green Chemistry are complementary pedagogies because microscale experiments help incorporate waste reduction, hazard minimization, and pollution prevention into chemistry education. Therefore, the intervention promoted both conceptual learning and responsible laboratory practice.

Finally, the study contributes to sustainable science education by showing that effective chemistry learning does not always require large quantities of reagents or complex laboratory setups. Safer, smaller-scale, and environmentally responsible experiments can still yield strong learning outcomes when aligned with curriculum competencies and guided by inquiry. A 2024 systematic review on Green Chemistry education emphasized the relevance of Green Chemistry didactics in responding to environmental concerns and strengthening sustainable chemistry education. The findings of the present study, therefore, support the integration of Green Chemistry-based micro-scale laboratory activities in STEM instruction. Such an approach may improve learner engagement, reduce laboratory anxiety, enhance conceptual understanding, and promote environmental responsibility among senior high school learners.

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