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Effectiveness of Strategic Intervention Materials (SIM) on the academic performance of grade 7 students

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ABSTRACT

The study aimed to determine the efficacy of Strategic Intervention Materials (SIM) on the academic performance of Grade 7 students. Employing a quasi-experimental design, the research focused on Grade 7 science students at Flora A. Ylagan High School, utilizing a naturally assembled group as the study subjects. To assess academic achievement, the researcher developed a teacher-made multiple-item test covering wave topics from the third quarter curriculum, aligned with the Department of Education's learning competencies. The test items were validated by experts and master science teachers to ensure content validity. The academic performance of students was measured through a 50-item pre-test and post-test administered to both the experimental and control groups. The pre-test was conducted before any instructional treatment to establish baseline knowledge and initial equivalence between groups. The same test was given after the intervention to evaluate the impact of the SIM on students' understanding of wave science concepts. Results indicated that the use of SIM offered a more effective approach to teaching wave concepts compared to traditional methods. However, it was also observed that some students improved their scores through conventional instruction. Findings suggest that instructional approaches should consider students' analytical skills and learning styles. For diverse learners, employing varied teaching strategies is essential. Student-centered approaches are particularly recommended as they provide opportunities for learners to discover their talents and skills while enhancing self-confidence.

Keywords: Strategic Intervention Materials (SIM), academic performance, wave science concepts.

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INTRODUCTION

Science permeates everyday life, evident even in routine activities such as riding a school bus, which exemplifies the integration of various scientific and technological fields like mechanical engineering and innovation. Beyond tangible products, the application of scientific thought, inquiry, and method plays a crucial role in shaping human decision-making. Often driven by curiosity or necessity, the scientific inquiry process enables the discovery and validation of solutions to human problems. Early in their schooling, students tend to form opinions about science; negative perceptions can hinder their engagement and interest in the subject as they grow older. Hence, providing young learners with stimulating materials and meaningful experiences is vital to motivate sustained interest and pursuit of science throughout their education.

Research indicates that science is a challenging subject for many students, influenced by factors such as traditional teaching methods, teacher personality, and limited facilities. While traditional instructional approaches have their merits, they may no longer align with the learning preferences of contemporary students who are more technologically engaged than previous generations. Consequently, the conventional chalk-and-talk method may be outdated or less effective. Education in science aims to foster scientific literacy, commonly defined as the ability to solve problems, make evidence-based decisions, and critically evaluate information. However, the persistent use of teaching methods that fail to address the assumptions and expectations students bring into the classroom contributes to ongoing challenges in science education (Glaze, 2017).

Science teachers today face significant challenges given the subject's demands for concentration, discipline, and mastery of complex skills such as hypothesis formulation, data analysis, and scientific inquiry. Science education remains one of the most crucial subjects due to its relevance in developing lifelong problem-solving and critical thinking skills, enabling students to make informed decisions and understand the evidence behind policies. The rapid advancement of science and technology presents an additional challenge, particularly for developing countries like the Philippines, where keeping pace with societal development requires not only acquiring advanced technologies but also enhancing knowledge and skills essential to a competitive, science-oriented society. The quality of science education remains a critical concern, as it underpins environmental education and broader educational outcomes (Rabino, 2014).

The poor quality of science education in the Philippines is reflected in low student performance in national and international assessments. For instance, only 69.21% of grade six students passed the National Achievement Test in 2014, and the passing rate for high school students was lower at 46.38% in 2010. Additionally, the country's rankings in the Trends in International Mathematics and Science Study (TIMSS) have been consistently low, leading to its withdrawal from the survey after 2008 (Ambag, 2018). Compounding these challenges is the shortage of qualified high school teachers capable of effectively teaching core science subjects such as Physics, Chemistry, Biology, and Mathematics (Jalmasco, 2014).

In response to these challenges, this study explores the effectiveness of Strategic Intervention Materials (SIM) as an innovative teaching practice to enhance the academic performance of Grade 7 science students. Utilizing an experimental research design with control and experimental groups, the study investigates whether the use of SIM can significantly improve students' achievement in science, thereby contributing to improved teaching methodologies and learning outcomes in the Philippine educational context.

Statement of the problem

The purpose of this study was to determine the effectiveness of teacher - made Science Strategic Intervention Materials or SIM in increasing the level of academic performance of Flora A. Ylagan High School grade seven students. In particular, this study expected for answers to the following questions:

1. What is the academic performance of grade seven students in Science in the third quarter?
2. Is there a significant difference in the pretest mean score of the students in the control group and experimental group?
3. Is there a significant difference between the pretest and posttest mean score of the students in the control group and experimental group?
4. Is there a significant difference in the posttest mean score of the students in the control group and experimental group?
5. Is there a significant difference between the mean gain score of the students in the control group and experimental group?

METHODOLOGY

This study employed a quasi-experimental design involving a non-equivalent pretest-posttest group to examine the effect of Strategic Intervention Materials (SIM) on Grade 7 students' academic performance in science. The naturally assembled groups consisted of two sections of Grade 7 students from Flora A. Ylagan High School, both handled by the researcher to maintain consistency and minimize disruptions. These two sections, considered homogeneous in terms of learner characteristics, were designated as the experimental group, which received instruction using SIM, and the control group, which was taught through traditional classroom methods. Both groups were administered a pretest prior to the instructional intervention to establish baseline equivalence and assess prior knowledge on wave concepts, which formed the focus of the third quarter curriculum. Following the instructional period, both groups took the same test as a posttest to measure any changes in academic achievement.

The primary instrument for data collection was a teacher-made multiple-item test comprising 50 questions related to the scientific concepts of waves, aligned with the Department of Education's prescribed learning competencies. This instrument was subjected to validation and reliability testing by administering it initially to Grade 8 students who had previously covered the same topics, enabling refinement of test items and assurance of its effectiveness in measuring student comprehension. The test results were categorized using a predetermined scale ranging from "Very Poor" to "Outstanding" to facilitate interpretation of academic achievement levels.

Prior to data collection, the researcher secured approval from the School Division Superintendent of Quezon City through formal channels endorsed by the school principal. After validation, the test was administered to the Grade 7 control and experimental groups during regular class hours, under the researcher's supervision to avoid interruption to other classes. Instructional delivery differed between groups: the control group experienced a conventional classroom approach, whereas the experimental group engaged with the Strategic Intervention Materials. Upon completion of the intervention, a posttest identical in content to the pretest was

administered to both groups to evaluate the effectiveness of SIM in improving student performance.

Data analysis employed descriptive and inferential statistical methods to examine differences within and between groups. Means were calculated to represent the central tendency of test scores for each group, both pre- and post-intervention. Independent samples t-tests were utilized to determine whether significant differences existed between the control and experimental groups' mean scores on the pretest and posttest, while paired samples t-tests assessed the significance of score changes within each group from pretest to posttest. This statistical treatment allowed for a rigorous evaluation of the instructional approaches and their impact on student learning outcomes.

RESULTS AND DISCUSSION

Academic performance of grade seven students in Science in the third quarter

The academic profile of the Grade 7 students in Science during the third quarter was reflected through their report card grades. The majority of respondents, specifically 51.11%, scored within the 75-79 range, which corresponds to a fairly satisfactory descriptor. This was closely followed by 46.67% of students who earned grades between 80-84, categorized as satisfactory. Only a small fraction, 2.22%, achieved an 85-89 grade scale with a very satisfactory descriptor, while no student scored below 75 or above 89, indicating no failing or outstanding grades. The overall mean grade was 79.56, placing the group as satisfactory learners. This finding aligns with Heick's (2019) assertion that academic performance is influenced by student motivation and resources, suggesting that even in limited-resource settings, motivated students tend to perform better.

Difference in the pretest mean score of the students in the control group and experimental group

Regarding the pretest mean scores of the control and experimental groups, the results reflected the students' prior knowledge of the wave concepts before instruction. Both groups displayed similar score distributions, with approximately 44.44% of students in each group scoring between 15 and 19 out of 50. Frequencies for scores between 20 and 24 were also comparable. The highest score obtained by a few students was 29, representing 58% of the test items answered correctly, though the vast majority—96%—scored below 50%, indicating limited initial understanding of the wave lessons. The experimental group had a smaller percentage (4.44%) scoring in the lowest range (5-9) compared to 17.78% in the control group. The mean pretest score was slightly higher for the experimental group (17.56) compared to the control group (16.78), with respective standard deviations of 4.48 and 5.35, suggesting a somewhat wider dispersion of scores in the control group. A t-test confirmed no statistically significant difference between the groups' pretest means ($t = 0.72$, $p > 0.05$), indicating the groups were equivalent in baseline knowledge. This supports Helmenstine's (2019) principle that in experimental designs, control and experimental groups should be comparable prior to intervention.

Difference between the pretest and posttest mean score of the students in the control group and experimental group

The comparison of pretest and posttest mean scores revealed notable improvements in both groups. The experimental group's mean increased from 17.56 to 22.78, a gain of 5.22 points. The highest frequency of posttest scores shifted to the 25-29 range, with 44.44% of students achieving this score, compared to a pretest concentration in the 15-19 range. The posttest also showed elimination of the lowest scoring range (5-9), indicating that students who previously scored poorly improved their understanding. Similarly, the control group improved from a pretest mean of 16.78 to a posttest mean of 19.56. While improvement was evident, the increase was less pronounced than in the experimental group. The control group showed scattered gains across several score ranges, with the highest frequency shifting from 15-19 in the pretest to 20-24 in the posttest. The standard deviation for the control group increased slightly from 5.35 to 6.41, reflecting a wider spread of scores due to gains at the higher end. These results suggest that both instructional approaches contributed to learning gains, though the experimental group demonstrated greater improvement.

Difference in the posttest mean score of the students in the control group and experimental group

Analysis of posttest mean scores between the two groups further substantiated these findings. Both groups had equal sample sizes of 45 students. The mean gain from pretest to posttest was 5.22 for the experimental group and 2.78 for the control group. Calculated t-values for both groups exceeded the critical value ($t = 6.74$ and 9.38 respectively, critical value = 1.676), leading to rejection of the null hypothesis and confirming that both groups significantly improved following instruction. This indicates that teaching wave concepts using Strategic Intervention Materials as well as the traditional approach was effective in enhancing student performance.

Difference between the mean gain score of the students in the control group and experimental group

The comparison of the posttest scores between the experimental and control groups demonstrated the relative efficacy of the two instructional methods. The experimental group's highest frequency of scores was in the 25-29 range, representing 44.44% of the class, whereas the control group's highest frequency was in the 20-24 range with 35.56% of students. Additionally, a higher proportion of the experimental group (4.44%) achieved scores in the 30-34 range compared to the control group (2.22%). The distribution of scores in the experimental group yielded a higher mean and a greater spread, as indicated by standard deviations, reflecting stronger and more varied achievement. The t-test comparing posttest means produced a calculated value of 2.10, which exceeded the critical value of 1.984 at the 5% significance level, resulting in rejection of the null hypothesis. This indicates that the use of Strategic Intervention Materials was significantly more effective than traditional methods in teaching wave concepts.

A proposed Strategic Invention Material (SIP)

Strategic Intervention Materials offer several advantages as teaching tools for Grade 7 Science topics. They foster a positive teacher-student dynamic and motivate students to develop critical thinking skills while applying learned concepts to real-life situations. The results of this study suggest that SIM provides a superior instructional approach for teaching wave concepts. Nonetheless, the administration of a pretest prior to instruction remains essential to assess initial knowledge. It is also important to recognize that some students taught via traditional methods still experienced score improvements. Therefore, educators must consider students' analytical skills when selecting or combining instructional approaches to optimize learning outcomes.

CONCLUSION

The study revealed that the respondents' mean grade positioned them as satisfactory learners in the subject of Science. Prior to the instructional intervention, both the experimental and control groups demonstrated no significant difference in their understanding of wave concepts, indicating that the groups were appropriately matched for the experimental design. Following the instructional phase, both groups exhibited performance gains, with the experimental group receiving instruction through Strategic Intervention Materials (SIM) and the control group taught via traditional methods. It can be concluded that both instructional approaches facilitated learning of wave concepts, although the use of SIM proved to be more effective compared to the traditional approach.

Based on these findings, several recommendations are proposed. It is advisable to administer a pretest before instruction to identify students' existing knowledge, strengths, and areas requiring improvement. Educators should adopt diverse teaching strategies tailored to different learner types, with a strong emphasis on student-centered approaches that encourage students to explore their talents, enhance their abilities, and build self-confidence. Furthermore, individual differences among students must always be taken into account when planning and delivering lessons. Teachers are encouraged to continuously update and refine their educational skills and pedagogical practices to better address the evolving needs of today's learners. To support this professional development, school administrations and governing bodies should consider providing incentives for teachers who actively pursue such growth. Finally, it is recommended that future studies investigate the effectiveness of Strategic Intervention Materials on other science topics covered in the third quarter to further validate and extend these findings.

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