International Journal of Sustainability and Advanced Integrated Research
Volume 2, Issue 1 (January-March 2026) | ISSN: 3107-7854
DOI: https://doi.org/10.65339/ijsair.V2.I1.115

Permu-Nation Fiesta in Developing Math Skills of Grade 10 Students in Public Secondary Schools

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Publication history: Received: February 20, 2026; Revised: March 13, 2026; Accepted: March 14, 2026
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Abstract

This study examined the effectiveness of the Permu-nation Fiesta Learning Activity Sheet as a contextualized instructional intervention for improving the numeracy skills of Grade 10 students in a public secondary school in the Ligao City Division during the school year 2024–2025. The study was anchored on Behavioral Learning Theory, Cognitive Learning Theory, and Closed Gap Learning Theory, which emphasize reinforcement, cognitive processing, and targeted intervention in addressing learning gaps. Using an experimental pre-test and post-test control group design, the study involved 80 Grade 10 students randomly assigned into experimental and control groups, with 40 students in each group, and five mathematics teachers who served as jurors in evaluating the supplementary learning material. Research instruments included a 20-item pre-test and post-test, juror validation sheets, and the Permu-nation Fiesta Learning Activity Sheet. Data were analyzed using frequency count, percentage, weighted mean, arithmetic mean, and z-test for two sample means. Findings revealed that both groups had very low mastery in numeracy skills during the pre-test. After the implementation of contextualized learning activities, both groups improved, but the experimental group showed higher post-test performance, attaining an overall mean of 83.75 compared with 60.25 for the control group. The computed z-value of 6.60, which exceeded the tabular value of 1.96 at the 0.05 level of significance, confirmed a significant difference between the groups. The supplementary learning activity sheet developed in the study was also rated excellent, with a weighted mean of 3.87. The study concluded that the Permu-nation Fiesta Learning Activity Sheet effectively enhanced students' numeracy skills and is a highly acceptable instructional material. It is recommended that teachers integrate contextualized and targeted numeracy interventions, collaborative learning strategies, and regular assessment practices in mathematics instruction. The study is primarily aligned with SDG 4: Quality Education by supporting improved numeracy and learning outcomes, and it also relates to SDG 8: Decent Work and Economic Growth through the development of competencies essential for future employability. Its sustainability impact lies in strengthening educational practice through contextualized instructional materials and supporting long-term institutional and socio-economic development by improving students' mathematics competence.

Keywords: Contextualized learning, Grade 10, Learning activity sheet, Numeracy skills, Permutation, Post-test, Pre-test

1. Introduction

Mathematics plays a crucial role in developing numeracy skills necessary for everyday life and decision-making. The improvement of students' mathematical abilities remains a significant educational priority, particularly in contexts where learners demonstrate persistent low performance in global and national assessments. In the Philippines, international and regional assessments have revealed gaps in numeracy competence, highlighting the need for innovative and contextualized learning strategies. In response to these challenges, the present study examined the effectiveness of the Permu-nation Fiesta Learning Activity Sheet as a contextualized instructional intervention designed to enhance the numeracy skills of Grade 10 students in public secondary schools. The study focused on determining the impact of contextualized learning activities on students' numeracy performance through an experimental approach using pre-test and post-test assessments. It also aimed to develop a supplementary learning activity sheet based on the findings to support mathematics instruction. By exploring how contextualized learning materials influence mathematical skill development, the study contributes to efforts aimed at improving mathematics education and addressing persistent learning gaps among secondary school learners.

1.1 Background of the Study on Permu-nation Fiesta Learning Activity Sheets and Numeracy Skills of Grade 10 Students

Mathematics education is essential in developing numeracy skills that support everyday human activities and decision-making. The Department of Education (2016) emphasized in the K-12 Basic Education Curriculum Guide that mathematics is a subject that permeates life at all ages and circumstances; therefore, it must be learned comprehensively and deeply.

Despite its importance, many Filipino students continue to demonstrate low levels of numeracy proficiency. Results from the Programme for International Student Assessment (PISA 2022) conducted by the Organization for Economic and Cooperation Development (2018) revealed that the Philippines scored 355 in mathematics and ranked 76th among 81 participating countries, indicating substantial challenges in mathematics learning. Regional performance data further reflect these concerns. In the National Achievement Test in 2017, the Bicol Region ranked 11th at the elementary level and 9th at the secondary level among 13 divisions, highlighting persistent low mathematics performance among learners. In response, the Department of Education (DepEd) Region V (2023) initiated the program "6B Bawat Batang Bicolano Bihasang Bumasa at Bumilang", which aims to improve literacy and numeracy skills of learners from Grades 4 to 10 through collaborative efforts among educators and stakeholders. One approach that supports mathematics learning improvement is the use of formative assessment tools and contextualized learning materials. Learning Activity Sheets are designed to reinforce, remediate, and advance student learning by guiding learners through structured tasks that promote deeper understanding. The use of contextualized activities may provide meaningful learning experiences that help students connect mathematical concepts to real-life situations. In this context, the study investigated the use of Permu-nation Fiesta, a contextualized Learning Activity Sheet, as a strategy for improving numeracy skills among Grade 10 students in public secondary schools. The intervention was tested to determine whether contextualized learning activities could serve as a catalyst for enhancing mathematical performance.

1.2 Themes and Insights from Related Literature on Mathematics Performance and Learning Activities

Previous studies have examined several factors influencing students' mathematics performance, including classroom participation, teacher qualifications, emotional intelligence, learning engagement, and the use of technology in instruction. Attendance and engagement in classroom learning play a critical role in mathematics achievement. Byiringo (2023) found a positive and statistically significant relationship between class attendance and academic performance in mathematics, suggesting that consistent participation in classroom activities contributes to skill development. Teacher qualifications and instructional expertise also significantly influence mathematics outcomes. Omaliko & Okpala (2021) demonstrated that students taught by professionally qualified teachers performed significantly better than those taught by non-professionals. Similarly, Manoah, S.A. et al. (2020) emphasized that teacher experience and qualifications significantly affect the quality of mathematics instruction. Learner characteristics and psychological factors have also been associated with mathematics performance. Diocos (2022) found that students with higher emotional intelligence, particularly in self-motivation and relationship management, tended to perform better in mathematics. Dodongan (2022) reported that mathematics anxiety and perceived usefulness of technology significantly predicted students' mathematics performance. Research has also explored the role of mathematical communication and reasoning in learning. Rohid et al. (2019) emphasized that mathematical communication skills are essential for problem solving and conceptual understanding. Similarly, Ode et al. (2024) highlighted that strong mathematical communication abilities enable students to interpret representations, explain concepts, and construct logical arguments effectively. Gender differences in mathematics performance have also been explored. Chhetri (2022) found that boys demonstrated higher achievement in mathematics compared with girls in certain contexts, while Sibanda, D. & Naido, J.o (2023) observed that gender differences varied depending on content domains and cognitive skills. Technological tools and instructional innovations have been found to enhance mathematics learning. Weinhandl et al. (2020) demonstrated that integrating GeoGebra within flipped classroom models improved students' mathematics performance. Similarly, Hossain et al. (2023) showed that technology-based programs significantly enhanced students' comprehension of mathematical concepts. Other studies emphasized the importance of students' attitudes and perceptions toward mathematics. Hagan et al. (2020) and Kunwar (2021) found that students' perceptions and interest levels influence their motivation and academic performance in mathematics. Overall, these studies highlight that mathematics performance is influenced by a combination of instructional strategies, learner characteristics, and learning environments. However, there remains a need to explore contextualized learning interventions that directly address numeracy skill development.

1.3 Local, National, and Global Context of Mathematics Achievement

Mathematics achievement has become a global concern due to persistent gaps in numeracy skills among learners. International assessments such as the Programme for International Student Assessment (PISA 2022) conducted by the Organization for Economic and Cooperation Development (2018) revealed that Filipino students ranked among the lowest in mathematics performance worldwide. At the national level, these findings reflect systemic challenges in mathematics education. Efforts by the Department of Education aim to address learning gaps through curriculum reforms, targeted interventions, and programs designed to strengthen literacy and numeracy competencies. In the regional context, the Bicol Region has implemented initiatives such as "6B Bawat Batang Bicolano Bihasang Bumasa at Bumilang" to improve learning recovery in literacy and numeracy among learners in Grades 4 to 10 (Department of Education (DepEd) Region V (2023)). These initiatives emphasize collaborative support among teachers, stakeholders, and communities to enhance learning outcomes. The present study contributes to these efforts by examining contextualized learning activities as a potential strategy for improving mathematics performance among Grade 10 students in public secondary schools.

1.4 Theoretical and Conceptual Basis of Contextualized Learning Activities in Mathematics

The study was grounded on three major learning theories: Behavioral Learning Theory, Cognitive Learning Theory, and Closed Gap Learning Theory. Behavioral Learning Theory by John B. Watson and B. F. Skinner (1913) explains that behavior is shaped by stimuli and responses, where consequences reinforce learning behaviors. In mathematics instruction, formative assessments and structured learning activities can serve as stimuli that encourage students to improve their academic performance. Cognitive Learning Theory by Jean Piaget (1910) emphasizes the importance of cognitive processes such as understanding, reasoning, and problem solving in learning. Within mathematics classrooms, students actively process information, analyze mathematical concepts, and apply learned principles to solve problems. Closed Gap Learning Theory by Shuichi Ninomiya (1998) focuses on identifying and addressing learning gaps through targeted instructional strategies. In mathematics education, recognizing gaps in numeracy skills allows educators to design interventions that help learners improve their performance and close existing learning deficiencies. Guided by these theoretical perspectives, the study proposed that meaningful and contextualized learning activities can enhance students' mathematical skills by promoting engagement, cognitive development, and targeted learning support.

1.5 Research Gaps and Rationale

Existing literature has extensively explored factors affecting mathematics performance, including teacher qualifications, student attitudes, instructional strategies, and technological integration (Byiringo, 2023; Omaliko & Okpala, 2021; Diocos, 2022; Chilsulo & Penda, 2022). Other studies have examined mathematical communication skills, comprehension strategies, and technology-enhanced learning approaches (Rohid et al. (2019); Ode et al. (2024); Lanya et al. (2023); Hossain et al. (2023). Additionally, research has addressed learning gaps and instructional modalities aimed at improving mathematics achievement (Sibanda & Naidoo (2023); Torres (2021). However, despite the extensive body of research on mathematics education, no previous study has specifically examined the effectiveness of the Permu-nation Fiesta Learning Activity Sheet in developing numeracy skills of Grade 10 students in public secondary schools during the school year 2024–2025. This gap provided the rationale for conducting the present study.

1.6 Alignment with Relevant Sustainable Development Goals (SDGs)

This study aligns primarily with SDG 4 – Quality Education, which aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. Improving mathematics literacy and numeracy skills contributes directly to strengthening educational quality and learning outcomes among secondary school students. The study also contributes to SDG 8 – Decent Work and Economic Growth, as strong numeracy and analytical skills are essential for workforce readiness and participation in knowledge-based economies. By developing contextualized learning materials and improving mathematics instruction, the research supports efforts to enhance students' academic preparedness and future employability.

1.7 Importance of the Study to Multidisciplinary Sustainability

The study contributes to educational sustainability by developing contextualized learning materials that enhance students' numeracy skills and support effective mathematics instruction. Strengthening mathematics competence among learners promotes long-term educational resilience and improved learning outcomes. It also supports socio-economic sustainability, as numeracy skills are fundamental for economic participation, problem solving, and informed decision-making in everyday life. Additionally, the study contributes to community and institutional sustainability by providing evidence-based instructional strategies that can guide policymakers, school administrators, and educators in improving mathematics education. Through the development of supplementary learning activity sheets, the research promotes sustainable educational practices that address persistent learning gaps in mathematics.

2. Material and methods

2.1 Research Design

The study employed an experimental research design using a pre-test and post-test control group approach to examine the effectiveness of the Permu-nation Fiesta learning activity sheet in developing the mathematics skills of Grade 10 students. Experimental research design allows the identification of cause-and-effect relationships between variables by comparing the outcomes of an experimental group and a control group (Banaszak & Williams (2023). In this design, two groups of students were involved. Both groups received contextualized mathematics instruction; however, only the experimental group used the Permu-nation Fiesta learning activity sheet as an intervention. The control group participated in contextualized learning activities without the intervention. Pre-test and post-test assessments were administered to measure the numeracy performance level of the students before and after the instructional process. The comparison of these scores provided evidence regarding the effectiveness of the learning activity sheet in improving students' mathematical performance.

2.2 Locale of the Study

The study was conducted in a public secondary school in the Ligao City Division. The selected institution represents a typical secondary education environment where students follow the Basic Education Curriculum and receive instruction in

Mathematics 10. The research focused on the third grading period, during which permutation is taught as a major topic in the Grade 10 mathematics curriculum. Conducting the study within an actual classroom setting allowed the researcher to evaluate the effectiveness of the intervention in a realistic educational context.

2.3 Respondents of the Study

The participants consisted of Grade 10 students and mathematics teachers who served as jurors in evaluating the developed learning material. A total of 80 Grade 10 students participated in the experimental procedure, while five mathematics teachers served as expert evaluators of the supplementary learning activity sheet. The student participants were enrolled in the same curriculum and represented a heterogeneous group with varying academic abilities and learning backgrounds. Grade 10 was selected because permutation is an important topic in the Mathematics 10 curriculum during the third grading period, making it an appropriate context for evaluating instructional strategies designed to improve students' understanding of mathematical concepts.

2.4 Sample and Sampling Procedure

Simple random sampling was used to select the participating student groups. Among the twenty-six Grade 10 sections in the school, two sections were randomly chosen by the curriculum chairman to participate in the study. Simple random sampling ensures that each group in the population has an equal chance of being selected, thereby improving the reliability and representativeness of the sample. The sample size was determined using the Raosoft sample size calculator, an online tool used to estimate appropriate sample sizes based on the total population. From a population of 96 students in the two selected sections, the calculated sample size was 80 students. These 80 students were randomly assigned to two groups: an experimental group and a control group, with 40 students in each group. In addition to the student participants, five mathematics teachers served as jurors who evaluated the supplementary learning activity sheet developed in the study. Table 1 in the original document summarized the distribution of participants, indicating that 40 students belonged to the experimental group, 40 students belonged to the control group, and five mathematics teachers served as jurors, resulting in a total of 85 participants involved in the study.

2.5 Research Instrument

Several instruments were used to collect data and evaluate the effectiveness of the instructional intervention. These included a pre-test, a post-test, juror validation sheets, and the Permu-nation Fiesta learning activity sheet. The pre-test and post-test assessments consisted of 20 items designed to measure students' numeracy performance related to permutation. The test items included multiple-choice, true-or-false, and fill-in-the-blank questions. The pre-test measured students' baseline knowledge prior to the instructional intervention, while the post-test assessed their understanding after exposure to the learning activities. The Permu-nation Fiesta learning activity sheet served as the intervention tool used with the experimental group. The activity sheet consisted of two primary components: the problem section and the answer or option section. These components were designed to guide students through structured problem-solving activities focused on permutation concepts. Students completed the activities using basic classroom materials such as pencils or ballpens and scientific calculators. The researcher used a score-rating scale adopted from the study of Ichsan (2020) to evaluate the performance levels of students in both the experimental and control groups. In addition, a validation instrument was used by mathematics teacher jurors to evaluate the acceptability and effectiveness of the supplementary learning activity sheet developed for the study. Prior to implementation, the research instruments were subjected to expert validation. Mathematics educators reviewed the pre-test, post-test, and activity sheet to ensure content validity, clarity of instructions, and alignment with the study objectives. Feedback from the experts and pilot testing procedures was used to refine the instruments and improve their reliability in measuring students' mathematical performance.

2.6 Data Gathering Procedure

The data gathering process began with the preparation of formal request letters seeking approval from the Dean of the Graduate School of Republic Colleges of Guinobatan, Inc., the Schools Division Superintendent, the school head, and the parents of the participating students. These approvals ensured that the study complied with institutional requirements and ethical research procedures. After receiving the necessary permissions, parent consent forms were distributed to inform them about the purpose and procedures of the study and to obtain their approval for their children's participation. Coordination with school administrators and teachers was then conducted to schedule the implementation of the research activities. The distribution and retrieval of research instruments are summarized in Table 2 of the original document. The table indicates that questionnaires and assessment materials were distributed to 40 students in the experimental group, 40 students in the control group, and five jurors. All distributed instruments were retrieved successfully, resulting in a 100 percent retrieval rate. The sampling process occurred prior to the actual implementation of the study by obtaining the list of Grade 10 students from the school office through the assistance of the Grade 10 level chairman and the department head. The selected students were then randomly assigned to the experimental and control groups. Data collection was conducted over six class days during the third grading period of Mathematics 10. During the first four days, both groups participated in contextualized learning activities and were given the pre-test assessment followed by classroom instruction on permutation concepts. On the fifth day, the experimental group used the Permu-nation Fiesta learning activity sheet, while

the control group proceeded with the post-test assessment. Because the entire class period was used to complete the learning activity sheet, the experimental group took the post-test assessment on the sixth day. Throughout the process, the researcher implemented the prepared instructional materials and strategies related to permutation topics. The pre-test, activity sheets, and post-test instruments were distributed at the beginning of each class period and collected afterward to ensure the accuracy and reliability of the data gathered.

2.7 Data Analysis Techniques

The collected data were analyzed using several statistical tools, including frequency count, percentage technique, weighted mean, arithmetic mean, and the z-test for two sample mean test. Frequency count was used to determine the number of occurrences of responses in the pre-test and post-test assessments and to identify the distribution of students' scores. Frequency count refers to the number of observations or occurrences of a variable (Manikandan, (2011). Percentage technique was applied to determine the proportion of students' performance levels in the numeracy assessment. A percentage represents a value expressed as parts per hundred (Broto, 2007). Weighted mean was used to determine the overall performance level of students in the pre-test and post-test assessments and to evaluate the acceptability of the supplementary learning activity sheet. Weighted mean measures the average value of data when each observation carries a specific weight (Altatres, et al. (2006). Arithmetic mean was also used to compute the average scores obtained by students in the pre-test and post-test assessments and to determine the overall evaluation of the supplementary learning activity sheet as rated by the jurors. Arithmetic mean is calculated by summing all values in a data set and dividing the total by the number of observations (Khan Academy). Finally, the z-test for two sample mean test was used to determine whether there was a statistically significant difference between the mean scores of the experimental and control groups. The z-test is commonly used to compare two population means to determine whether a new process or treatment differs significantly from an existing one (Calmorin, 2000). The test was conducted at a 0.05 level of significance, where the null hypothesis was rejected when the computed value exceeded the tabular value.

3. Results and Discussion

3.1 Numeracy Performance and Instructional Intervention

3.1.1 Pre-test Numeracy Performance of Grade 10 Students

The pre-test results revealed that both the experimental and control groups demonstrated low levels of numeracy performance prior to the instructional intervention. The experimental group obtained mean performance scores of 6 in knowing and understanding and 7 in computing and solving, both interpreted as very low mastery. In estimating, the experimental group obtained a mean score of 13, which was also interpreted as very low mastery, while applying and connecting recorded a score of 0, indicating absolutely no mastery. The overall average mean performance score for the experimental group was 6.5, interpreted as very low mastery. The control group showed slightly higher performance in some areas, obtaining a mean score of 16 in computing and solving and 18 in estimating, both interpreted as low mastery. However, the group also obtained a score of 6 in knowing and understanding and 0 in applying and connecting. The control group had an overall average mean performance score of 10, which was also interpreted as very low mastery. These findings indicate that students from both groups initially demonstrated limited understanding of permutation concepts and numeracy skills prior to the implementation of contextualized learning activities. The results highlight the need for instructional interventions that support students' comprehension of mathematical concepts. Similar findings were noted in the study of Weinhandl (2020), which emphasized that integrating innovative learning environments and technologies such as GeoGebra can enhance mathematics education by making learning more adaptable to students' needs and improving conceptual understanding.

3.1.2 Contextualized Learning Activities Implemented in the Experimental Group

The instructional intervention for the experimental group consisted of a series of contextualized learning activities conducted over six instructional days. The first day involved the administration of a pre-test assessment to determine students' baseline knowledge. The second day introduced permutation concepts involving arrangements of objects using strategies such as flashcards, think-pair-share discussions, short quizzes, and assignments. On the third day, students explored circular and distinguishable permutations through question-and-answer activities, individual and group tasks, board work, and quizzes. The fourth day focused on solving permutation problems using ICT-integrated lessons through PowerPoint presentations, interactive questioning, exercises through games, and online quizzes. On the fifth day, the experimental group used the Permu-nation Fiesta learning activity sheet designed to reinforce their understanding of permutation problems. Finally, on the sixth day, students completed the post-test assessment to measure changes in their numeracy performance. The structured sequence of contextualized activities helped reinforce students' understanding of permutation concepts and supported active learning. The integration of the Permu-nation Fiesta activity sheet provided students with opportunities to apply mathematical reasoning and problem-solving strategies. This finding aligns with the study of Hossain (2023), which demonstrated that structured learning activities supported by interactive tools can significantly improve students' comprehension of mathematical concepts and enhance cognitive development.

3.1.3 Contextualized Learning Activities Implemented in the Control Group

The control group also participated in contextualized mathematics instruction covering the topic of permutations. The learning process began with the administration of the pre-test assessment, followed by instructional activities such as flashcard identification of arrangements, think-pair-share discussions, short quizzes, assignments, and question-and-answer activities. Students also engaged in individual and group tasks, board work, and ICT-supported lessons using PowerPoint presentations and problem-solving exercises. The instructional period concluded with the administration of the post-test assessment. However, unlike the experimental group, the control group did not use the Permu-nation Fiesta learning activity sheet. The results show that the control group experienced structured instruction using standard contextualized learning activities based on curriculum guidelines from the Department of Education. This instructional approach provided a baseline for comparison with the experimental group. Similar instructional strategies were highlighted in the study of Aguhayon et al. (2023), which demonstrated that differentiated instructional activities can help address students' learning gaps in mathematics and improve their academic performance and confidence in solving mathematical problems.

3.1.4 Post-test Numeracy Performance of Grade 10 Students

The post-test results showed substantial improvement in the numeracy performance of both groups, with significantly higher gains observed in the experimental group. The experimental group obtained mean performance scores of 86 in knowing and understanding and 88 in estimating, both interpreted as closely approximating mastery. The group also obtained a score of 78 in computing and solving and 83 in applying and connecting, both interpreted as moving towards mastery. The overall average mean performance score of the experimental group reached 83.75, interpreted as moving towards mastery. In comparison, the control group obtained a mean performance score of 84 in knowing and understanding, interpreted as moving towards mastery, while scores in computing and solving, estimating, and applying and connecting were 50, 55, and 52 respectively, interpreted as average mastery. The control group achieved an overall mean performance score of 60.25, also interpreted as average mastery. These results indicate that while both groups improved after instruction, the experimental group achieved higher levels of numeracy mastery. The findings suggest that the Permu-nation Fiesta learning activity sheet contributed to greater improvement in students' mathematical performance. Similar observations were discussed in the study of Dodongan (2022), which found that learning engagement and perceptions of instructional strategies significantly influence mathematics performance among students.

3.2 Significant Difference in Numeracy Performance Between Experimental and Control Groups

The statistical analysis revealed a significant difference between the numeracy performance levels of the experimental and control groups. The computed z value was 6.60, which exceeded the tabular z value of 1.96 at the 0.05 level of significance. Based on this result, the null hypothesis was rejected and the alternative hypothesis was accepted, indicating that the difference in post-test performance between the two groups was statistically significant. This finding suggests that the use of the Permu-nation Fiesta learning activity sheet had a measurable impact on improving the mathematics skills of Grade 10 students. The intervention provided interactive and structured learning experiences that enhanced students' ability to understand and solve permutation problems. These results are consistent with the findings of Rohid (2019), which emphasized that strengthening students' mathematical communication and reasoning skills through engaging learning activities can significantly improve problem-solving abilities in mathematics.

3.3 Evaluation of the Supplementary Learning Activity Sheet

The supplementary learning activity sheet developed in this study, titled worknPray, was designed to enhance students' understanding of permutation concepts through problem-solving activities. The activity sheet contained structured problems requiring students to determine permutation solutions and reveal hidden patterns by identifying the first digit of their answers within a grid. The material was developed based on references from the DepEd Learner's Module in Mathematics 10 and the textbook Mathematics Patterns and Practicalities by Nivera and Lapinid. The activity required the use of basic materials such as pencils, ballpens, and calculators. The acceptability of the supplementary learning activity sheet was evaluated by jurors composed of mathematics educators and experts. The overall evaluation resulted in a weighted mean of 3.87, interpreted as excellent. High ratings were obtained across several indicators, including content validity, construct validity, criterion-related validity, reliability measures, clarity of instructions, presentation and layout, language and terminology, engagement and motivation, appropriate difficulty level, and alignment of learning outcomes. These findings indicate that the developed instructional material was considered highly acceptable and effective for improving students' numeracy skills. The positive evaluation supports the use of contextualized learning materials in mathematics instruction. This observation is consistent with the study of Lanya, H. et al. (2023), which emphasized that strengthening students' logical-mathematical intelligence through structured learning tasks enhances mathematical communication skills, reasoning ability, and problem-solving competence. The development of supplementary learning materials such as the Permu-nation Fiesta activity sheet therefore provides teachers with practical tools to support student engagement and improve learning outcomes in mathematics.

4. Conclusion & Recommendations

The study examined the effectiveness of the Permu-nation Fiesta learning activity sheet in developing the mathematics skills of Grade 10 students in public secondary schools. Findings revealed that both the experimental and control groups initially demonstrated very low mastery in numeracy skills during the pre-test assessment. After the implementation of contextualized learning activities, the post-test results showed improved performance in both groups, with the experimental group achieving a higher level of mastery compared to the control group. Statistical analysis confirmed a significant difference between the post-test performance levels of the two groups, indicating that the Permu-nation Fiesta learning activity sheet contributed to the improvement of students' numeracy skills. The study also produced a supplementary learning activity sheet designed to enhance students' understanding of permutation concepts, which was evaluated by jurors and found to be highly acceptable as an instructional material for mathematics learning.

Based on the findings of the study, it is recommended that teachers implement early and targeted numeracy instruction for Grade 10 students to address gaps in mathematical proficiency. Educators may develop and integrate contextualized learning activities that emphasize structured and engaging exercises to strengthen students' numeracy skills. Collaborative learning strategies should also be consistently incorporated in mathematics instruction to enhance students' understanding and application of mathematical concepts. Schools may establish regular assessments to monitor students' numeracy development and create repositories of instructional materials that support mathematics learning across grade levels. In addition, interdisciplinary learning opportunities may be encouraged to further develop numeracy competencies, while future research may explore the long-term impact of mathematics instruction on students' academic performance to improve instructional practices.

The study was limited to Grade 10 students from a selected public secondary school in the Ligao City Division during the third grading period of the school year 2024–2025. Only eighty students participated in the experimental and control groups, and the intervention focused specifically on permutation topics within the Mathematics 10 curriculum. The research also relied on pre-test and post-test assessments and the evaluation of jurors to determine the effectiveness and acceptability of the developed supplementary learning activity sheet. As such, the findings reflect the results within this specific group, instructional context, and timeframe, which may limit the generalization of the results to other grade levels, schools, or mathematical topics.

Compliance with ethical standards

The study adhered to standard academic research practices and respected the rights and welfare of all participants throughout the research process. Participation of the students was voluntary, and confidentiality and anonymity of the collected data were maintained during data gathering and reporting. The procedures were conducted in a manner that ensured respect for participants and avoided harm or discomfort.

Acknowledgements

The author expresses appreciation to the participating Grade 10 students, mathematics teachers who served as jurors, and the school authorities who facilitated the conduct of the study. Their cooperation and support made the successful completion of the research possible.

Conflict of interest statement

The authors declare that there are no financial, personal, or professional conflicts of interest related to this study.

Statement of ethical approval

The study involved non-invasive educational research procedures conducted within a classroom setting using instructional activities and assessments. Formal ethics committee approval was not sought or required for this study.

Statement of informed consent

Informed consent was obtained from the parents or guardians of the participating students prior to the implementation of the study. Participation was voluntary, and the confidentiality and anonymity of all responses were ensured, with no personal identifiers included in the reported data.

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