

Innovative Teaching Practices of Teachers Influencing Learners' Mathematics Performance

Rizalyn C. Tibon

Southern Heights Elementary School

rtibon.teachusa@gmail.com

Article Details:

Received: 28 April 2026

Revised: 2 September 2026

Accepted: 5 September 2026

Published: 22 September 2026

Corresponding Email:

rtibon.teachusa@gmail.com

Recommended Citation:

Tibon, R. C. (2026). Innovative Teaching Practices of Teachers Influencing Learners' Mathematics Performance. *The International Review of Multidisciplinary Research*. 1 (11), 33-39. <https://doi.org/10.67167/vertex.723>

Index Terms:

game-based learning, Mathematics performance, innovative teaching, differentiated instruction, technology integration

Abstract. This study investigated the innovative teaching practices of teachers and their influence on learners' mathematics performance in public elementary schools within South District II, Division of Cebu City, Philippines, during School Year 2018-2019. The research specifically assessed the extent to which teachers employed instructional strategies including active learning, game-based learning, differentiated instruction, technology integration, and problem-based learning, and examined their relationship with learners' mathematics performance. A descriptive-correlational research design was employed, involving 101 out of 135 teachers selected through stratified and simple random sampling. A self-made questionnaire validated by experts and tested for reliability was utilized. Data on teachers' instructional practices were collected via Likert-scale surveys, while learners' mathematics performance was obtained from school records. Quantitative analysis using mean, standard deviation, and Spearman's Rho revealed that teachers highly valued differentiated instruction and technology integration, both rated as very high in practice, and students generally achieved a very satisfactory level in mathematics. Notably, only game-based learning showed a significant positive correlation with learners' performance, indicating its potential impact on learning outcomes. The findings suggested that integrating game-based strategies could enhance engagement and learning outcomes in mathematics. Educational authorities were recommended to promote the adoption of game-based learning, provide relevant training for teachers, and support continuous assessment of instructional practices. Emphasizing game-based methods, alongside sustained use of differentiated instruction and technology, fostered more effective teaching and improved student performance. Future researchers should explore other active learning strategies, conduct longitudinal studies, and include diverse school settings to deepen understanding of effective instructional approaches in mathematics education.

Introduction

The underperformance in mathematics among Filipino students was a significant issue that raised questions about the effectiveness of the educational system. The consistent low-performance levels were emphasized by both national and international assessments, which indicated a deeper systemic problem that demanded careful examination. Despite the country's implementation of the K to 12 educational reforms and the introduction of numerous policies and programs to improve education quality and student achievement, recent results from the Programmed for International Student Assessment (OECD, PISA 2018 Results) and the National Achievement Test (NAT) indicated that students still performed poorly in mathematics. These results served as a starting point for urgent exploration to identify and tackle the core challenges that prevented students from receiving quality mathematics education.

Success was more than just a positive result; it was a powerful, empirically proven method for overcoming the problem of rote memorization, showing students were actively making sense of ideas and forging connections, aligning perfectly with the Philippine Professional Standards for Teachers (PPST) emphasis on mastery and challenging tasks (Livy et al. , 2018).

This widespread, high-level instruction carried profound implications: to eliminate rote learning completely, the successful practices of these top teachers must be immediately formalized and scaled. By creating a library of their effective lessons and using them as the non-negotiable, concrete standard for all instruction, and by shifting professional development (PD) from theoretical talk to practical demonstration, the school system can systematically transition of all teachers to implement truly challenging and engaging curriculum, proving that deep learning is achievable locally.

In this scope students should master four skills, generically emphasized as essential to tackle the challenges of a rapid and dynamic world development, designated as the 4Cs: critical thinking, including problem solving–make informed decisions or judgements, to achieve the best solution; communication–understand and share ideas, thoughts and solutions with others; collaboration–provide opportunities for working together to make decisions in favor of a common goal; creativity–provide opportunities for new and efficient approaches. Active learning calls for the use of the 4Cs through its core dimensions.

Game-based learning has emerged as a dynamic pedagogical approach that encourages and enhances learners' learning through games. Games that are engaging and interactive in nature may help to enhance knowledge and skills.

The findings of this research provided valuable insights for educational policymakers, school administrators, and teacher, learners of the institutions. By identifying the link between teacher's instructional practices and mathematics performance, the study informed the targeted professional development initiatives aimed at enhancing mathematics instruction. Additionally, contributed to the theoretical understanding of instructional practices in the context of mathematics education, ultimately supporting efforts to improve student achievement and elevate teaching standards in mathematics. Hence, this study was focused on the extent of teachers' instructional practices and the mathematics performance of learners in public elementary schools in the South District II, Division of Cebu City for School Year 2018-2019.

Research Questions

This research aimed to determine the innovative teaching practices of teachers influencing learners' mathematics performance public elementary schools in the South District II, Division of Cebu City for School Year 2018-2019. Specifically, this study aimed to answer the following questions:

1. What is the extent of teachers' instructional practices in terms of;
 - a. active learning strategies
 - b. game-based learning
 - c. differentiated instruction
 - d. technology integration
 - e. problem-based learning strategies?
2. What is the level of learners' Mathematics Performance for school year 2018-2019?
3. Is there a significant relationship between the extent of teachers' instructional practices and learners' mathematics performance?

Methodology

Design

This study employed a descriptive-correlational research design to determine the innovative teaching practices of teachers influencing learners' mathematics performance in schools in the South District II, Division of Cebu City for School Year 2018-2019. As cited in the study by Creswell (2018), this source defines quantitative research as a process of testing objective theories by examining the relationship among variables. Creswell explains the importance of using survey instruments to collect data and utilizing statistical procedures to generalize findings from a sample to a population. He emphasizes that quantitative designs require a deductive approach, focusing on objectivity, the use of numeric data, and the minimization of bias. In this study, the descriptive component focused on identifying the extent of teachers' instructional practices in terms of active learning strategies, game-based learning, differentiated instruction, technology integration, and problem-based learning and the level of learners' mathematics performance. The correlational component examined the relationship between the teachers' instructional practices and mathematics performance of learners. Data collection employed quantitative methods, and the analysis involved descriptive statistics such as the mean, as well as inferential statistics like Spearman Rho to determine the strength and direction of the relationship.

Research Locale

The study was conducted in public elementary schools in the South District II, Division of Cebu City, Philippines, during School Year 2018-2019.

Participants

The study involved a total of 101 teachers out of 135 in public elementary schools in the South District II, Division of Cebu City for School Year 2018-2019.

Research Instrument

The instrument included items across five main categories. Each category contained five items, responded to using a 5-point Likert scale, with ratings interpreted as follows: 5 (Strongly Agree) = very high; 4 (Agree) = high; 3 (Undecided) = neutral; 2 (Disagree) = low; 1 (Strongly Disagree) = very low. On the other hand, the researcher used this rating to determine the mathematics performance of learners such as Outstanding (90-100), Very Satisfactory (85-89), Satisfactory (80-84), Fairly Satisfactory (75-79) and Did Not Met Expectations (Below 75).

The questionnaire underwent validation by three subject matter experts, yielding an average validity rating of 4.03, indicating good content validity. The instrument's reliability was high, with a Cronbach's alpha of 0.85. The reliability respondents were 20 respondents who were not included as the respondents.

Data Collection Procedure

Before conducting the study in public elementary school in the South District II, Division of Cebu City, the researcher ensured compliance with all suggestions and recommendations outlined in the manuscript. The researcher also sought approval from the proper authorities for the conduct of the study. Once approval was obtained, the researcher electronically sent permission letters to ask formally that a study was conducted in their school and nearby school district for the conduct of reliability testing. The respondents were contacted directly through face-to-face and online interactions, with the assistance of their school heads. The purpose and scope of the study were thoroughly explained to each respondent with the help of their respective school heads, along with the steps necessary to ensure the accuracy and authenticity of the data collected. All respondents were requested to answer the questionnaire manually carefully explained by the school heads and the researcher itself during the face-to-face and online sessions. Additionally, teachers were present to assist during the conduct of the study and ensured that 100% of the target respondents were able to respond to the questionnaire. Each teacher-respondent were then asking to provide the average mathematics performance of learners in 2 grading periods based on School Form 5. After the data collection through the survey, the researcher gathered, tallied, tabulated, and analyzed the data using appropriate statistical tools suited to each research problem. Lastly, the statistical tools used in analyzing the data were mean and standard deviation and Spearman Rho using Statistical Package of Social Sciences (SPSS).

Data Analysis

The following were the statistical tools used to determine the innovative teaching practices of teachers influencing learners' mathematics performance public elementary schools in South District II, Division of Cebu City for School Year 2018-2019. To determine the extent of the extent of instructional practices of teachers, mean and standard deviation was used. To determine the level of mathematics performance of learners, mean and standard deviation was used. To determine the relationship between the extent of teachers' instructional practices and learners' mathematics performance, Spearman Rho was used.

Ethical Considerations

In conducting this study, strict ethical standards were observed. Formal approval was obtained from the school authorities and relevant review boards prior to data collection. Teachers as the respondents of the study, were fully informed about the study's purpose, procedures, and voluntary participation through clear communication facilitated by their school heads and the researchers. Since the respondents were adult educators and assistants, the appropriate ethical procedure involved securing an informed consent, to affirm voluntary participation and understanding of the study's nature. Confidentiality and anonymity of responses were strictly maintained, with data securely stored and used solely for academic purposes. The researchers ensured that data collection methods posed no harm or discomfort to participants, upholding their dignity and rights throughout the process. Approval to use the mathematics performance of learners were also properly

communicated to the school authorities and ensured that the data gathered was strictly confidential and was handled properly with outmost confidentiality.

Results and Discussion

Extent of Teachers' Instructional Practices

The data indicated that among the active learning strategies, differentiated instruction and technology integration received the highest ratings, both classified as Very High, with mean scores of 4.46 and 4.45 respectively. Active Learning Strategies overall also scored very high with a mean of 4.23, while Problem-Based Learning Strategies was rated high with a mean of 4.13. Game-Based Learning received a high rating as well, with a mean score of 3.86. The overall ratings for these strategies reflected a generally positive perception, with most strategies falling into the Very High with the mean score of 4.23 and a standard deviation of 0.56.

The findings implied that educators highly valued differentiated instruction and technology integration as effective active learning strategies, suggesting that these approaches were perceived as particularly impactful in enhancing student engagement and learning outcomes. The overall positive ratings indicated a strong preference for implementing diverse and technology-supported methods in teaching practices. The high mean scores and relatively low standard deviation reflected consistency in perceptions across respondents, implying widespread acceptance and recognition of these strategies' effectiveness. Consequently, these results emphasized the importance of continuing to prioritize differentiated and technology-based learning approaches in educational settings to foster more dynamic and responsive teaching environments.

Research has suggested that students who feel their learning needs are acknowledged may be more inclined to attend classes regularly (Morgan, 2014). However, while this theoretical connection exists, empirical evidence supporting DI's direct impact on attendance remains limited.

Indicators	N	Mean Score	Standard Deviation	Descriptive Interpretation
a. Active Learning Strategies	101	4.23	.55	Strongly Agree (Very High)
b. Game-Based Learning	101	3.86	.57	Very Effective (High)
c. Differentiated Instruction	101	4.46	.54	Always Used (Very High)
d. Technology Integration	101	4.45	.57	Always Used (Very High)
e. Problem-Based Learning Strategies	101	4.13	.56	Very Effective (High)
As a whole	101	4.23	.56	Very High

Legend: Very High (5.00-4.20); High (4.19-3.40); Moderate (3.39-2.60); Low (2.59-1.80); Very Low (1.00-1.79)

Table 1. Extent of Teachers' Instructional Practices

Level of Learners' Mathematics Performance

The findings revealed that the Mathematics Performance of learners has a mean percentage score of 87.90 and a standard deviation of 3.75 which was interpreted as very satisfactory.

This implies that most students achieved a very satisfactory level, reflecting effective teaching strategies, adequate curriculum coverage, and a supportive learning environment. Such performance implies that the current instructional methods were successful in fostering understanding and mastery of mathematical concepts. Furthermore, the consistency in scores suggested that there was minimal variation in student achievement, which could be indicative of equitable access to learning resources and opportunities. These positive results encouraged educators to maintain or even enhanced their instructional approaches, while also identifying and supporting any students who might still needed additional assistance to reach similar levels of mastery.

Chazan et al. (2016) argued that mathematics teachers have obligations to their discipline, to their students, and to their institutions. In some cases, these obligations are formal rules that mathematics teachers are required to uphold. For instance, mathematicians teaching different sections of the same course may be required to give the same final exams to

their students. In other cases, the obligations may be informal and may relate to commitments that a mathematician feels they should satisfy to be a respectable member of their disciplinary culture. A mathematician may feel obligated to lecture on topics that would be on the final exam, even if there is no formal edict requiring them to do so. As Chazan et al. (2016) noted, mathematics teachers often cite obligations to justify norms and explain why pedagogical actions may be legitimate or illegitimate.

Indicators	N	Mean Score	Standard Deviation	Descriptive Interpretation
Mathematics Performance	101	87.90	3.75	Very Satisfactory

Legend: Outstanding (90-100), Very Satisfactory (85-89), Satisfactory (80-84), Fairly Satisfactory (75-79) and Did Not Met Expectations (Below 75)

Table 2. Level of Learners' Mathematics Performance

Relationship between the Extent of Teachers' Instructional Practices and Learners' Mathematics Performance

The analysis revealed that among the instructional strategies examined, only game-based learning showed a weak but statistically significant positive correlation with the variable of interest, with a correlation coefficient (r) of .206 and a p -value of .039, leading to the rejection of the null hypothesis. This suggested that increased use of game-based learning strategies was associated with greater effects or outcomes being measured. In contrast, active learning strategies ($r = .085$, $p = .399$), differentiated instruction ($r = .116$, $p = .247$), technology integration ($r = .090$, $p = .369$), and problem-based learning strategies ($r = .024$, $p = .815$) all demonstrated weak correlations that were not statistically significant, indicating no meaningful relationship with the variable of interest within the sample studied.

The findings implied that among the instructional strategies analyzed, only game-based learning had a meaningful impact on the variable of interest, as evidenced by its statistically significant correlation. This suggested that increasing the implementation of game-based learning strategies could have positively influenced the outcomes measured in the study. Conversely, the lack of significant relationships for active learning strategies, differentiated instruction, technology integration, and problem-based learning indicated that these approaches did not demonstrate a measurable effect within the context of this research sample.

Sung and Hwang (2013) conducted an experiment integrating educational computer games into elementary science courses and found that students' academic performance improved. Non-digital games, on the other hand, refer to any type of board game, card game, or other games played in physical environments (Uzun et al., 2013). Unlike digital games, non-digital games do not require electronic devices and can be implemented in various settings. They are widely used in STEM education and have been shown to be effective in improving learning outcomes (Liu & Chen, 2013). In addition, a substantial proportion of prior empirical studies rely on single-group research designs or lack systematic comparisons between an EG and CG, which limits the robustness of the conclusions and the precise estimation of effect sizes (Wouters et al., 2013). In sum, GBL has emerged as an innovative pedagogical methodology aimed at increasing student engagement and interest, particularly in areas perceived as complex or abstract, such as the Natural Sciences (Hamari et al., 2016).

Indicators	Correlation Coefficient (r)	p -value	Interpretation	Decision
a. Active Learning Strategies	.085	.399	Not Significant	Accept Ho
b. Game-Based Learning	.206*	.039	Significant	Reject Ho
c. Differentiated Instruction	.116	.247	Not Significant	Accept Ho
d. Technology Integration	.090	.369	Not Significant	Accept Ho
e. Problem-Based Learning Strategies	.024	.815	Not Significant	Accept Ho

Legend: At .05 level of significance.

Table 3. Relationship between the Extent of Teachers' Instructional Practices and Learners' Mathematics Performance

Conclusion and Recommendations

Based on the findings, teachers highly utilized differentiated instruction and technology integration, reflecting strong positive perceptions of these strategies' effectiveness in enhancing learners' engagement and learning outcomes, with overall instructional practices rated very high. Student performance in mathematics was also notably satisfactory, indicating successful instructional approaches and equitable access to learning resources. Importantly, among the various instructional strategies, only game-based learning demonstrated a statistically significant positive correlation with learners' mathematics performance, suggesting its potential to actively influence student achievement. This significant relationship underscores the importance of integrating game-based methods into teaching practices to foster better learning outcomes, possibly due to their engaging and motivating nature, which could enhance learners' participation and understanding. Conversely, the weak and non-significant correlations of other strategies imply that, within this context, their impact on mathematics performance was limited or mediated by other factors. Therefore, emphasizing game-based learning was a key focus for educators aiming to improve student achievement, while still maintaining the use of differentiated instruction and technology integration as foundational elements of effective instruction.

Acknowledgement

The researcher would like to acknowledge and extend sincere gratitude to all the educators and learners who participated in this study. Special appreciation was expressed to the teachers whose innovative teaching practices served as the foundation for this research, as well as to the learners whose performance provided valuable insights. The researcher also acknowledged the support of colleagues and institutions that facilitated the data collection process. Without their cooperation and commitment, this study would not have been possible.

Funding

This research received no external funding from any public, commercial, or not-for-profit funding agency, and no organization provided financial support for the conduct of the study, authorship, or publication of this article.

Competing Interests Statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study; all data used were obtained from previously published sources as cited in the reference list.

References

- CCR. (2015). Four-dimensional education: the competencies learners need to succeed. Center for Curriculum Redesign. <https://curriculumredesign.org/our-work/four-dimensional-21st-century-education-learning-competencies-future-2030/>
- Chazan, D., Herbst, P., & Clark, L. (2016). Research on the teaching of mathematics: A call to theorize the role of society and schooling in mathematics instruction. *Handbook of research on teaching*, 5, 1039-1097.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Hamari, J., Shernoff, D. J., Rowe, E., Coller, B., Asbell-Clarke, J., & Edwards, T. (2016). Challenging games help students learn: An empirical study on engagement, flow, and immersion in game-based learning. *Computers in Human Behavior*, 54, 170–179. Retrieved from: <https://www.sciencedirect.com/science/article/abs/pii/S074756321530056X?via%3Dihub>
- Hashim, N. H., Abas, A., & Hashim, N. H. (2019). The effectiveness of game-based learning in health sciences education: A systematic review. *Journal of Educational Computing Research*, 57(3), 565–591.
- Liu, E. Z. F., & Chen, P. K. (2013). The effect of game-based learning on students' learning performance in science learning—A case of “conveyance go”. *Procedia-Social and Behavioral Sciences*, 103, 1044–1051. Retrieved from: <https://www.sciencedirect.com/science/article/pii/S1877042813038755?via%3Dihub>

- Livy, S., Sullivan, P. & Muir, T., "Challenging tasks lead to productive struggle!" Australian Journal of Primary Health, Volume 23, No. 1, (2018), pp: 14-19, <https://api.semanticscholar.org/CorpusID:187559803>.
- Morgan, H. (2014). Maximizing student success with differentiated learning. The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 87(1), 34–38. <https://doi.org/10.1080/00098655.2013.832130>
- OECD, PISA 2018 Results (Volume I): What students know and can do (Summary). Paris: OECD Publishing, (2019), <https://doi.org/10.1787/5f07c754-en>.
- OME. (2016). Capacity building series: Communication in the mathematics classroom. Ontario Ministry of Education, Queen's Printer for Ontario. <https://www.onted.ca/monographs/capacity-building-series>
- Roy, A., Guay, F., & Valois, P. (2013). The effect of differentiated instruction on students' self-determined motivation, achievement, and positive learning behaviors. Educational Psychology, 33(2), 143–161.
- Sung, H. Y., & Hwang, G. J. (2013). A collaborative game-based learning approach to improving students' learning performance in science courses. Computers & education, 63, 43-51. Retrieved from: <https://www.sciencedirect.com/science/article/abs/pii/S0360131512002849>
- Uzun, L., Çetinavci, U. R., Korkmaz, S., & Salihoglu, U. M. (2013). Developing and applying a foreign language vocabulary learning and practicing game: The effect of VocaWord. Digital Culture & Education, 5(1), 50–70. Retrieved from: <https://eric.ed.gov/?id=ED571553>
- WEF. (2016). New vision for education: Fostering social and emotional learning through technology. World Economic Forum. http://www3.weforum.org/docs/WEF_New_Vision_for_Education.pdf

Appendices

No appendices are attached to this study.