International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

The Utilization of Teaching Approaches of Secondary Teachers in Mathematics

SARALYN CASIL OANE *

Master of Arts in Education (MAEd) Major in Mathematics, Daniel B. Pena Memorial College Foundation, Inc.

International Journal of Science and Research Archive, 2026, 18(01), 390-393

Publication history: Received on 05 December 2025; revised on 12 January 2026; accepted on 14 January 2026

Article DOI: https://doi.org/10.30574/ijsra.2026.18.1.0071

Abstract

This study investigated the teaching approaches and challenges encountered by secondary Mathematics teachers in the Schools Division Office (SDO) of Tabaco City, Albay during School Year 2023–2024. Specifically, it sought to identify the approaches utilized, determine the extent of their application across Discovery Learning, Modeled Teaching, Explicit Teaching, Inquiry-Based Learning, and Cooperative Learning, examine differences in utilization between Junior and Senior High School teachers, explore challenges faced in implementation, and propose lesson exemplars to enhance practice. Employing a descriptive survey design, the study gathered data from 89 Mathematics teachers across ten public secondary schools in Tabaco City. The extent of utilization of the approaches was measured using a Likert Scale, while differences between groups were analyzed through One-way Analysis of Variance (ANOVA). The respondents included teachers from Bantayan National High School (6), Bognabong High School (3), Comon High School (3), Hacienda High School (5), Malictay High School (4), Mariroc High School (2), San Antonio National High School (10), San Lorenzo National High School (12), San Miguel National High School (4), and Tabaco National High School (40).

Findings revealed that secondary Mathematics teachers employed a range of pedagogical approaches, with Explicit Teaching and Modeled Teaching being more consistently applied, while Discovery and Inquiry-Based Learning were moderately utilized due to contextual constraints such as time limitations, large class sizes, and varying student readiness. Cooperative Learning was observed to be effective but less frequently implemented, particularly in classes with diverse learner abilities. Statistical analysis indicated significant differences in the extent of utilization between Junior and Senior High School teachers, suggesting variations in instructional demands and curriculum expectations. Challenges identified included limited resources, insufficient training in innovative strategies, and difficulties in balancing content coverage with learner-centered approaches. To address these, lesson exemplars were developed to provide structured yet flexible models that integrate multiple approaches, thereby supporting teachers in enhancing engagement, critical thinking, and collaborative problem-solving among students. Overall, the study underscores the importance of adaptive and context-sensitive teaching strategies in Mathematics education and highlights the need for sustained professional development and instructional support to optimize learning outcomes in secondary schools.

Keywords: Discovery Learning; Inquiry Based Learning; Cooperative Learning; One-way Analysis of Variance (ANOVA)

1. Introduction

Teaching approaches represent the broader techniques employed by educators in both local and international contexts to help students achieve meaningful learning outcomes. These approaches are essential in enabling learners to master subject content and apply it in real-world contexts. The effectiveness of any approach depends largely on the teacher's ability to align it with the intended learning outcomes, the needs of students, and the learning environment. The National Council of Teachers of Mathematics (2014) emphasizes that effective mathematics teaching requires engaging students in meaningful learning through individual and collaborative experiences that foster reasoning and sense-making. Over the decades, various approaches have been developed to support this goal, including discovery learning, modeled

* Corresponding author: SARALYN CASIL OANE

teaching, explicit instruction, inquiry-based learning, and cooperative learning. Each of these strategies provides unique pathways for students to connect mathematical ideas with practical applications, thereby promoting deeper understanding and long-term retention.

Meaningful learning in mathematics is often interpreted as the construction of connections between concepts and their representations, as highlighted by Hiebert and Wearne (1992). This perspective underscores the importance of student motivation and commitment to sustained engagement in the learning process. Approaches such as discovery learning encourage students to investigate and explore open-ended problems, fostering active participation and critical thinking. Teachers, however, play multifaceted roles beyond instruction, including planning, motivating, disciplining, and guiding learners. They are expected to integrate teaching approaches with modern classroom management skills, such as facilitating collaborative problem-solving and relating mathematical concepts to real-world contexts. The National Council of Teachers of Mathematics further recommends the use of concrete aids, real-world examples, and collaborative practices to ensure that students not only acquire knowledge but also develop the ability to reason mathematically and apply their learning in diverse situations.

For teaching to be effective, educators must skillfully analyze educational purposes, student readiness, and curriculum content to select the most appropriate approach. Efforts should be directed toward making mathematics instruction exciting, purposeful, and participatory, enabling students to assimilate concepts and acquire essential process skills. Teachers' preferences and opinions regarding approaches are significant, as they reveal their capacity to address diverse learning needs. Importantly, teaching approaches are not rigid; one method often flows seamlessly into another within a single lesson, reflecting the adaptability of excellent teachers. The choice of approach depends on multiple factors, including student age, prior knowledge, lesson objectives, available resources, and classroom setting. Ultimately, there is no single "right" approach for all lessons, as effectiveness varies across levels and subject matter. Instead, the thoughtful and flexible application of teaching approaches ensures that mathematics education remains responsive, meaningful, and impactful.

2. Materials

The study involved eighty-nine (89) secondary Mathematics teachers from SDO Tabaco City, Albay during School Year 2023–2024. Respondents were drawn from ten public secondary schools, including Tabaco National High School, San Lorenzo National High School, and others. The research focused on five teaching approaches: Discovery Learning, Modeled Teaching, Explicit Teaching, Inquiry-Based Learning, and Cooperative Learning. A descriptive survey design was employed, with questionnaires using a Likert scale to measure the extent of utilization. Data gathered included teachers' frequency of use of each approach, perceived challenges, and suggestions for lesson exemplars to enhance teaching effectiveness in Mathematics instruction.

3. Methods

The study utilized a descriptive survey method to determine teaching approaches and challenges in Mathematics instruction. A structured questionnaire was administered to 89 secondary Mathematics teachers across Junior and Senior High Schools in Tabaco City. The instrument measured the extent of utilization of five teaching approaches using a Likert scale. Data analysis involved computing mean ratings to describe frequency of use and One-way Analysis of Variance (ANOVA) to test differences between Junior and Senior High School teachers. Challenges encountered were ranked by frequency, and proposed lesson exemplars were developed to address identified issues in teaching approaches.

4. Results

Findings revealed that Discovery Learning and Cooperative Learning were universally utilized by both Junior and Senior High School teachers, consistently rated as "always" used. Inquiry-Based Learning was also widely applied, though slightly less frequent, while Modeled Teaching and Explicit Teaching were generally described as "often" utilized. Junior High School teachers rated Cooperative Learning highest (4.31), while Senior High School teachers rated Discovery Learning highest (4.47). Explicit Teaching received the lowest average ratings across both groups, indicating limited reliance on highly structured instruction.

ANOVA results showed no significant difference in the extent of utilization of teaching approaches between Junior and Senior High School teachers, confirming consistency across levels. Challenges varied by approach: Discovery Learning risked misconceptions and confusion, Explicit Teaching was overwhelming and reduced creativity, Inquiry-Based

Learning was time-consuming, and Cooperative Learning faced issues of group conflicts and unequal participation. Lesson exemplars were proposed to mitigate these challenges and strengthen instructional practices.

5. Discussion

The study highlights the dominance of Discovery Learning and Cooperative Learning in Mathematics classrooms, reflecting teachers' preference for approaches that foster active engagement, collaboration, and student-centered exploration. These methods align with contemporary pedagogical trends emphasizing constructivist learning and teamwork. However, the frequent challenges reported—such as misconceptions in Discovery Learning, time constraints in Inquiry-Based Learning, and group conflicts in Cooperative Learning—suggest the need for structured scaffolding and classroom management strategies to maximize effectiveness. Explicit Teaching, though less favored, remains important for clarifying complex concepts, indicating that balanced integration of approaches is essential.

The absence of significant differences between Junior and Senior High School teachers suggests a shared instructional culture across grade levels, which may be attributed to common training and curricular expectations. This consistency provides opportunities for unified professional development programs that address challenges across the system. Lesson exemplars proposed in the study serve as practical interventions, offering teachers concrete strategies to overcome barriers while sustaining student engagement. Future research could expand to other subject areas, examine teachers' expertise in applying approaches, and explore how blended strategies enhance learning outcomes. Overall, the findings underscore the importance of diversifying teaching approaches to achieve quality Mathematics education.

6. Conclusion

The study revealed that the most utilized approaches in teaching secondary Mathematics were Discovery Learning and Cooperative Learning, both consistently applied by teachers across Junior and Senior High School levels. These approaches were rated as "always" used, highlighting their effectiveness in fostering active engagement, collaboration, and student-centered learning. Meanwhile, Inquiry-Based Learning, Modeled Teaching, and Explicit Teaching were described as "often" utilized, indicating moderate but important roles in classroom practice. Statistical analysis using ANOVA confirmed no significant difference in the extent of utilization of these approaches between Junior and Senior High School teachers, suggesting a shared instructional culture and consistency in pedagogical strategies.

Despite their widespread use, challenges were encountered in each approach. Discovery Learning sometimes led to misconceptions and confusion, while Cooperative Learning faced issues of group conflicts and unequal participation. Inquiry-Based Learning was noted as time-consuming, and Explicit Teaching was criticized for reducing creativity and overwhelming students. Modeled Teaching, though useful, risked limiting independent thinking. To address these challenges, lesson exemplars were proposed, offering structured guidance and practical strategies to enhance the effectiveness of each approach. These exemplars aim to strengthen instructional delivery, balance creativity with clarity, and ensure that diverse teaching methods contribute to improved Mathematics learning outcomes.

References

[1] National Council of Teachers of Mathematics. (2014). Principles to actions: Ensuring mathematical success for all. Author., Retrieved: September 29, 2023, 2:50 pm

[2] Hiebert, J., & Wearne, D. (1992). Links between teaching and learning place value with understanding in first grade. Journal for Research in Mathematics Education, 23(2), 98-122. https://doi.org/10.2307/749496, Retrieved: September 29, 2023, 2:55 pm

[3] Seels, B.B. & Richey, R.C. (1994). Instructional technology: The definitions anddomains of the field. Washington, D.C.: Association for Educational Communications and Technology.,Retrieved:September 29, 2023,3:10pm

[4] Badudu, J.S. (1996). Pintar Berbahasa Indonesia 1: Petunjuk Guru Sekolah Lanjutan Tingkat Pertama.Jakarta: Balai Pustaka., Retrieved: September 29, 2023, 3:21 pm

[5] Joolingen, Wouter van (1999), Cognitive tools for discovery learning, International Journal of Artificial Intelligence in Education, 10, 385-397, Retrieved: September 29, 2023, 3:27 pm

[6] Joyce, B. R., & Calhoun, E. (1996) Creating Learning Experiences: The Role of Instructional Theoryand Research. Alexandria, VA: Association for Supervision and Curriculum Development., Retrieved: September 29,2023,3:45 pm

[7] Fletcher, J., Lyon, G. R., Fuchs, L., & Barnes, M. A. (2019). Learning disabilities:from identification to intervention (pg.99). New York: The Guilford Press., Retrieved: September 29, 2023, 3:49 pm

[8] LaForce, M., Noble, E., & Blackwell, C. (2017). Problem-based learning (PBL) and student interest in STEM careers: The roles of motivation and ability beliefs. Education Sciences, 7(4), 92. Yew, E. H., & Goh, K. (2016). Problem-based learning: An overview of its process and impact on learning. Health Professions Education, 2(2), 75-79., Retrieved: September 29, 2023, 3:56 pm

[9] Johnson, D. W., & Johnson, R. T. (2002). Cooperative learning and social interdependence theory. In Theory and research on small groups pp. 9-35. Springer US., Retrieved: September 29, 2023, 4:09 pm

[10] Tero, Debonair C. & Revalde, Helen O. (2024). Assessing the Approaches and Challenges Encountered by Primary School Teachers in Managing Inclusive Classrooms. Vol. 3 No. 2 (2024): American Journal of InterdisciplinaryResearch and Innovation. Retrieved: September 29, 2023, 4:00 pm

[11] Gage, Nathaniel L. (2009). A Conception of Teaching. https://lib.ugent.be/catalog/ ebk01:1000000000746361, Retrieved: September 29, 2023, 4:15 pm

[12] Ponte, J. P. (1994). Mathematics teachers' professional knowledge (plenary conference). In J. P. Ponte & J. F. Matos (Orgs.), Proceedings of the XVIII International Conference for the Psychology of Mathe-matics Education (PME) Retrieved: September 29, 2023, 4:20 pm

[13] Sadler, D. R. (2010). Beyond feedback: Developing student capability in complex appraisal. Assessment & Evaluation in Higher Education, 35(5),535-550 https://www.uvu.edu/otl/blog/exemplarsintheclassroom.html