

Implementation of Constructivist Pedagogies and Associated Challenges among Science Teachers in Public Secondary Schools in Santa Maria, Isabela

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ABSTRACT

Constructivist pedagogies have become a dominant approach in science education, emphasizing active learning, inquiry, collaboration, and technology integration to enhance student understanding and critical thinking. However, limited empirical evidence exists on how these pedagogies are implemented in specific local contexts, particularly in public secondary schools in Santa Maria, Isabela. This study examined the level of implementation of constructivist pedagogies and the challenges encountered by science teachers using a descriptive-correlational research design. A total of 50 science teachers were selected through simple random sampling. Data were collected using a validated survey questionnaire and analyzed using statistical tools. Findings revealed that teachers often implement constructivist strategies, especially in inquiry-based learning, collaborative activities, and technology integration. Challenges related to resources and teacher beliefs were minimal, while institutional support and curriculum constraints were significant. A significant negative relationship was found between implementation and challenges, indicating that increased barriers reduce effective practice.

Keywords: Constructivist pedagogies, inquiry-based learning, collaborative learning, technology integration, institutional support, science education.

Date Submitted: April 3, 2026
Date Accepted: April 7, 2026
Date Published: April 15, 2026

INTRODUCTION

Constructivist pedagogies have emerged as a powerful approach to science education, emphasizing the active construction of knowledge by students through hands-on experiences, inquiry-based learning, and collaboration (Liu et al., 2009). This student-centered approach has gained significant global traction due to its effectiveness in fostering deeper understanding, critical thinking skills, and a sustained interest in science (Herro, 2016).

Globally, educational reforms advocate a shift from traditional teacher-centered instruction to learner-centered approaches such as constructivism. This transition is driven by the need to prepare students for a rapidly changing world that requires critical thinking, problem-solving abilities, and independent learning (Organization for Economic Co-operation and Development [OECD], 2018).

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DOI: <http://doi.org/10.69651/PIJHSS0502960>

Recommended citation:

Vinasoy, V. T., Jr. (2026). Implementation of constructivist pedagogies and associated challenges among science teachers in public secondary schools in Santa Maria, Isabela. *Pantao (The International Journal of the Humanities and Social Sciences)* 5 (2), 1066-1073. <http://doi.org/10.69651/PIJHSS0502960>

In the Philippines, the Department of Education (DepEd) recognizes the importance of constructivist pedagogies within the K to 12 Curriculum. The curriculum emphasizes student-centered learning experiences, inquiry-based investigations, and the development of higher-order thinking skills (Department of Education [DepEd], 2013). At the regional level, DepEd Region II reinforces this direction through training programs and initiatives aimed at equipping science teachers with the competencies necessary for effective implementation.

Similarly, the Schools Division of Isabela supports this shift by providing professional development opportunities, disseminating best practices, and allocating resources for inquiry-based learning. Despite these efforts at the national, regional, and division levels, there remains a need to examine how constructivist pedagogies are actually implemented in specific local contexts.

In the Municipality of Santa Maria, Isabela, limited research exists on the extent to which science teachers adopt constructivist approaches in public secondary schools. Understanding their current practices is essential in identifying factors that influence implementation and effectiveness.

Thus, this study aims to bridge this gap by examining the implementation of constructivist pedagogies among science teachers in Santa Maria's public secondary schools. The findings will contribute to a deeper understanding of science teaching practices and inform future initiatives to enhance the effective use of constructivist approaches for improved student learning outcomes.

This study is anchored in constructivist learning theory, which posits that learners actively construct knowledge through interaction with their environment (Piaget, 1954). Learning is viewed as an active, experiential process where new knowledge is built upon prior understanding through engagement with tasks, peers, and teachers.

Vygotsky's (1978) socio-cultural theory further strengthens this perspective by emphasizing the role of social interaction and cultural tools in cognitive development. Learning occurs most effectively within the Zone of Proximal Development (ZPD), where learners achieve higher levels of understanding through guidance and collaboration.

In science education, constructivist pedagogies promote inquiry-based learning, encouraging students to engage in experimentation, question phenomena, and collaboratively solve problems (National Research Council, 2000). This approach aligns with the Next Generation Science Standards (NGSS), which advocate for engaging students in scientific practices to deepen conceptual understanding (NGSS Lead States, 2013).

Moreover, technology integration complements constructivist teaching by providing innovative tools such as simulations, virtual laboratories, and interactive platforms that enhance student engagement and conceptual understanding (Jonassen, 2000).

The application of constructivist pedagogies in public secondary schools, particularly in Santa Maria, has the potential to transform traditional classrooms into dynamic, interactive, and student-centered learning environments. This approach supports contemporary educational reforms and addresses the diverse needs of learners in a complex and evolving world.

By fostering hands-on learning, critical thinking, and collaborative problem-solving, science teachers can enhance students' understanding of scientific concepts and their real-world applications. Consequently, this study seeks to examine the extent of implementation of constructivist pedagogies and their implications for improving science education in the municipality.

Statement of the problem

This study investigated the implementation of constructivist pedagogies by science teachers in public secondary schools in the Municipality of Santa Maria.

Specifically, it sought to answer the following questions:

1. What is the current level of implementation of constructivist pedagogies by science teachers in terms of use of inquiry-based learning strategies, engagement in collaborative learning activities, and integration of technology in teaching?
2. What is the degree of challenges faced by science teachers in adopting constructivist pedagogies in terms of availability of resources, teacher beliefs and attitudes toward constructivist pedagogies, and institutional support and curriculum requirements?
3. Is there a significant relationship between the level of implementation of constructivist pedagogies and the challenges faced by science teachers in adopting these approaches?

METHODOLOGY

This study utilized both descriptive and correlational research designs, as described by Creswell and Creswell (2018), to examine the implementation of constructivist pedagogies among science teachers in public secondary schools in the Municipality of Santa Maria, Isabela. The descriptive design provided an overview of teachers' practices in inquiry-based learning, collaborative activities, and technology integration, while the correlational design examined the relationship between the level of implementation and the challenges encountered.

The research was conducted in public secondary schools in Santa Maria, Isabela. The respondents consisted of 50 public secondary school science teachers, selected through simple random sampling to ensure that each member of the population had an equal chance of participation, thereby enhancing the reliability of the findings (Thomas, 2020).

Data were collected using a researcher-developed survey questionnaire. The instrument underwent expert validation and pilot testing to ensure content validity and internal consistency before final administration.

The data gathering procedure involved securing formal approval from the Schools Division Superintendent, distributing the survey to respondents, conducting follow-ups to ensure a high response rate, and adhering to ethical standards such as informed consent, confidentiality, and anonymity.

All collected data were systematically organized and analyzed using statistical tools, including measures of central tendency and correlation analysis, to determine the level of implementation of constructivist pedagogies, identify challenges faced by teachers, and examine the relationship between these variables.

RESULTS AND DISCUSSION

The findings reveal that science teachers often implement constructivist pedagogies, particularly in terms of inquiry-based learning, collaborative activities, and technology integration. Specifically, inquiry-based learning strategies obtained a high level of implementation, indicating that teachers regularly engage students in questioning, experimentation, and real-world application of scientific concepts. This suggests that teachers are actively promoting student-centered learning environments where learners construct knowledge through exploration. This finding supports the assertion of Bybee (2013) and Driver et al. (2014) that inquiry-based learning enhances critical thinking and deep understanding of scientific concepts. However, relatively lower emphasis on student reflection and independent experiment design indicates a partial limitation in fostering full learner autonomy, which is a key element of constructivist teaching (Windschitl, 2002).

In terms of collaborative learning, the results indicate that teachers also frequently engage students in group-based and peer-assisted activities, particularly through discussions,

debates, and peer review. This demonstrates that social interaction is recognized as an essential component of learning. The findings align with the socio-cultural perspective of learning, which emphasizes collaboration as a mechanism for knowledge construction (Vygotsky, 1978; Webb, 2017). However, the relatively lower implementation of structured group projects and collaborative problem-solving tasks suggests that collaboration is more discussion-oriented rather than task-oriented. This partially supports the findings of Naidoo and Mabaso (2023), who noted that while teachers value constructivist approaches, practical constraints may limit their full implementation.

With regard to the integration of technology, the results show that teachers often incorporate technological tools such as simulations, multimedia resources, and virtual laboratories into their instruction. This indicates a growing adoption of digital tools to support constructivist learning environments. The findings support the claim of the National Science Teachers Association (2023) and Jonassen (2000) that technology enhances experiential and interactive learning. Nonetheless, the lower utilization of technology for higher-order applications, such as data analysis and modeling, suggests that technology is more commonly used for content delivery rather than for deeper student engagement. This observation aligns with the study of Chuaungo et al. (2022), which emphasizes the need for more meaningful integration of technology in constructivist classrooms.

In examining the challenges encountered by teachers, the findings indicate that resource availability and teacher beliefs are generally not perceived as major barriers. Teachers largely disagreed that lack of materials, negative beliefs, or resistance to innovation significantly hinder their implementation of constructivist pedagogies. This suggests a positive disposition among teachers toward learner-centered approaches, supporting the claim of Vaishali and Misra (2020) that teachers are increasingly shifting toward facilitative roles in the classroom. However, specific concerns such as limited access to digital devices and outdoor learning environments indicate that certain resource gaps still exist and may affect the quality of implementation.

In contrast, institutional support and curriculum requirements emerged as the most significant challenges. Teachers strongly indicated a lack of administrative encouragement, limited professional development opportunities, and insufficient curricular flexibility to implement constructivist approaches effectively. This finding highlights a systemic issue that constrains pedagogical innovation. It supports the findings of Khan (2013) and Loucks-Horsley et al. (2009), which emphasize that institutional support and continuous professional development are critical for successful implementation of constructivist teaching. Moreover, the lack of recognition and encouragement from school leadership reflects a misalignment between policy intentions and actual practice.

Finally, the study revealed a significant negative correlation between the level of implementation of constructivist pedagogies and the challenges faced by teachers. This indicates that as challenges increase, the level of implementation decreases, and vice versa. This relationship confirms that barriers—particularly institutional constraints—directly affect teachers' ability to apply constructivist strategies effectively. This finding is consistent with Tobin (2018), who emphasized that successful implementation of constructivist pedagogy depends on contextual factors such as support systems, resources, and teacher readiness.

On the whole, the findings suggest that while science teachers demonstrate a strong inclination toward constructivist teaching practices, the depth and consistency of implementation are influenced by systemic and contextual factors. The results affirm the principles outlined in the reviewed literature that constructivist pedagogies are effective but require adequate support, resources, and professional development to be fully realized in classroom practice.

CONCLUSION

Based on the findings of the study, it can be concluded that science teachers in public secondary schools in the Municipality of Santa Maria, Isabela demonstrate a consistent and favorable implementation of constructivist pedagogies, particularly in inquiry-based learning, collaborative activities, and technology integration. Teachers frequently engage students in questioning, experimentation, and real-world application of scientific concepts, indicating alignment with learner-centered instructional practices. However, aspects such as student-led experiment design and reflective learning are less emphasized, suggesting the need for deeper facilitation of higher-order thinking and learner autonomy.

Collaborative learning is also widely practiced through discussions and peer interactions, although more structured and sustained group work activities require further strengthening. Similarly, while technology is regularly utilized to support instruction through simulations, multimedia, and virtual laboratories, its application in higher-level tasks such as data analysis, modeling, and differentiated instruction remains limited.

Furthermore, the study reveals that teachers generally maintain positive beliefs and attitudes toward constructivist pedagogies and do not perceive resource availability as a major barrier. Nonetheless, specific gaps persist, including limited access to digital devices, laboratory materials, and flexible learning environments. More critically, institutional support and curriculum requirements are identified as the most significant constraints, as teachers report insufficient administrative encouragement, limited professional development opportunities, and rigid curricular structures. The presence of a significant negative relationship between the level of implementation and the challenges encountered further confirms that reducing these barriers is essential to enhancing the effective use of constructivist approaches.

In light of these conclusions, it is recommended that educational stakeholders adopt a more comprehensive and systemic approach to strengthening constructivist teaching practices. Professional development programs should be intensified, with particular focus on enhancing teachers' competencies in facilitating student-led inquiry, reflective learning, and advanced technology integration. Schools should also promote structured collaborative learning by encouraging the use of group-based projects, cooperative learning frameworks, and problem-based tasks that extend beyond classroom discussions. In addition, investments in educational resources—such as laboratory equipment, digital tools, and inclusive learning materials—should be prioritized to address existing gaps and support more effective implementation.

Equally important, school administrators and policymakers must strengthen institutional support by fostering a culture that values and encourages constructivist pedagogies. This may include providing incentives, recognizing innovative teaching practices, establishing Learning Action Cells (LACs), and allowing greater flexibility in curriculum implementation and assessment strategies. Support mechanisms should also be developed to address teachers' concerns regarding time management and classroom control in student-centered environments.

Finally, a coordinated effort to minimize systemic and contextual challenges will enable science teachers to more effectively implement constructivist pedagogies, thereby enhancing the quality of science education and promoting meaningful student learning outcomes.

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