Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 6 (2026)

Implementation of STEM Education in Secondary Schools in Ilocos Sur, Phillipines: Practices, Stakeholder Involvement, Challenges, and Policy Direction

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Publication Date: June 30, 2026 DOI: **10.5281/zenodo.21055374**

Abstract

Background: Science, Technology, Engineering, and Mathematics (STEM) education has become a priority in Philippine secondary education because of its role in developing learners' scientific literacy, innovation, and future readiness. Despite policy support, variations in implementation continue to exist across schools.

Objectives: This study determined the status of STEM implementation in the secondary schools of the Schools Division of Ilocos Sur. Specifically, it examined the profile of respondents, the level of STEM implementation practices, stakeholder involvement, challenges encountered, and policy directions for strengthening STEM education.

Methods: The study employed a quantitative-descriptive research design. A total of 125 respondents composed of 23 school administrators and 102 STEM teachers participated in the study. Data were gathered using a researcher-made and expert-validated questionnaire. Frequency counts, percentages, weighted means, and Chi-square tests were utilized for data analysis.

Results: Findings revealed that STEM implementation in the Schools Division of Ilocos Sur was generally Highly Practiced, with an overall mean of 4.12. Instruction obtained the highest mean (4.37), followed by student development (4.06), partnership and linkages (4.04), and faculty development (4.02). Teachers demonstrated strong compliance with curriculum standards, extensive use of inquiry-based and hands-on instructional strategies, and effective utilization of ICT resources. Stakeholder involvement and partnership initiatives contributed positively to program implementation.

Conclusion: STEM education in Ilocos Sur secondary schools is being implemented effectively across major dimensions. However, continued investments in faculty development, resource enhancement, stakeholder partnerships, and policy support are necessary to sustain and further strengthen STEM implementation.

Keywords: *STEM Education, Secondary Schools, Stakeholder Involvement, Educational Leadership, Ilocos Sur*

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
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Volume 2 Issue 6 (2026)

1. INTRODUCTION

STEM education has emerged as a strategic priority in Philippine education as the country seeks to improve learners' competencies in science, mathematics, technology, and innovation. The Department of Education continues to strengthen STEM implementation through curriculum reforms and policy initiatives aligned with the K–12 Program.

Recent international and local studies emphasize that effective STEM education extends beyond curriculum compliance and requires integrated instruction, inquiry-based learning, teacher readiness, stakeholder engagement, and institutional support. Despite strong policy foundations, disparities in STEM implementation remain evident due to resource limitations, varying teacher competencies, and contextual challenges experienced by schools.

In Ilocos Sur, understanding the current status of STEM implementation is necessary for evidence-based planning and policy formulation. This study examined STEM implementation practices, stakeholder involvement, challenges encountered, and possible policy directions to strengthen STEM education across secondary schools.

Research Objectives

This study aimed to determine the status of STEM implementation in the Schools Division of Ilocos Sur.

Specifically, it sought to:

1. Describe the profile of teachers, administrators, and schools offering STEM.
2. Determine the level of practice of STEM implementation in terms of:
   - Instruction
   - Student Development
   - Faculty Development
   - Partnership and Linkages
3. Determine the relationship between STEM implementation and respondent profiles.
4. Assess stakeholder involvement in STEM implementation.
5. Develop policy directions and an action plan based on the findings.

Hypothesis

There is no significant relationship between the level of STEM implementation and the teacher-related, administrator-related, and school-related factors.

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Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
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Volume 2 Issue 6 (2026)

2. MATERIALS AND METHODS

Research Design

The study utilized a quantitative-descriptive research design to describe and analyze the status of STEM implementation in secondary schools.

Participants

The respondents consisted of 125 participants from the Schools Division of Ilocos Sur:

- 23 School Administrators (18.4%)
- 102 STEM Teachers (81.6%)

All respondents came from the 23 secondary schools offering STEM programs during School Year 2025–2026.

Research Instrument

A researcher-made survey questionnaire was used as the primary data-gathering instrument. The instrument underwent content validation by experts from the Curriculum Implementation Division (CID) and Schools Governance and Operations Division (SGOD).

Data Collection Procedure

Permission to conduct the study was secured from the Schools Division Superintendent. Survey questionnaires were distributed through face-to-face and online modalities. Data were collected, consolidated, analyzed, and interpreted. Selected administrators and teachers also participated in interviews and focus group discussions to identify implementation challenges.

Data Analysis

The following statistical tools were utilized:

- Frequency Counts and Percentages
- Weighted Mean
- Chi-Square Test of Independence

Ethical Considerations

Participation was voluntary. Confidentiality, informed consent, privacy protection, and ethical research standards were observed throughout the conduct of the study.

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Volume 2 Issue 6 (2026)

3. RESULTS

Profile of Respondents

Most STEM teachers were aged 31–35 years (28%), female (63%), master's degree holders (38%), and occupied Teacher I positions (43%). Most had ten years or less of teaching experience (51%) and had attended 1–5 STEM-related trainings (37%).

Most school administrators were above 55 years old (35%), female (70%), and doctoral degree holders (87%).

Most schools enrolled 101–150 STEM students (39%), employed 1–5 STEM teachers (74%), and had implemented STEM for 6–10 years (35%).

Level of STEM Implementation

Table 1. Overall Level of STEM Implementation

Dimension	Mean	Interpretation
Instruction	4.37	Highly Practiced
Student Development	4.06	Highly Practiced
Faculty Development	4.02	Highly Practiced
Partnership and Linkages	4.04	Highly Practiced
Overall Mean	4.12	Highly Practiced

Key Findings

Instruction

Instruction registered the highest level of implementation. Teachers consistently followed curriculum standards, utilized inquiry-based and hands-on learning approaches, integrated ICT, and maintained effective classroom management practices.

Student Development

Schools regularly conducted science investigatory project trainings, provided student development opportunities, and encouraged participation in STEM-related activities.

Faculty Development

Professional development opportunities were available but represented the lowest-rated domain, indicating opportunities for enhancement in specialized STEM training and advanced professional learning.

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Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
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Volume 2 Issue 6 (2026)

Partnership and Linkages

Schools demonstrated strong collaboration with parents, local government units, and external organizations, contributing positively to STEM program implementation.

4. DISCUSSION

The findings indicate that STEM education in the Schools Division of Ilocos Sur is effectively implemented across major operational domains. Strong instructional practices suggest high compliance with Department of Education standards and demonstrate teachers' commitment to quality STEM instruction.

The extensive use of inquiry-based learning, hands-on experimentation, and ICT integration reflects contemporary STEM pedagogical approaches. These practices align with current literature emphasizing experiential learning as a key contributor to student engagement and achievement.

Although faculty development was rated highly, it received the lowest mean among the implementation dimensions. This finding suggests the need for more advanced professional development opportunities, industry immersion experiences, and specialized STEM training programs.

Partnerships with stakeholders were also found to be strong, reinforcing the importance of collaborative support systems in sustaining STEM initiatives. Stakeholder engagement enhances resource mobilization, student opportunities, and institutional capacity-building.

The findings support the theoretical perspectives of Social Cognitive Theory, Ecological Systems Theory, and Lewin's Force Field Analysis, highlighting the importance of teacher readiness, institutional support, and enabling conditions in successful STEM implementation.

5. CONCLUSION

The implementation of STEM education in secondary schools in the Schools Division of Ilocos Sur is highly practiced. Schools demonstrate strong instructional delivery, effective student development initiatives, productive stakeholder engagement, and positive institutional support for STEM education.

While implementation is generally strong, improvements are still needed in faculty development, resource enhancement, and specialized STEM training opportunities. Strengthening these areas will further improve the quality, sustainability, and effectiveness of STEM education.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
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Volume 2 Issue 6 (2026)

Recommendations

1. Expand professional development opportunities for STEM teachers.
2. Strengthen partnerships with higher education institutions and industry partners.
3. Increase investments in STEM laboratories, equipment, and technological resources.
4. Develop division-wide policies that support continuous STEM innovation.
5. Conduct further studies examining learner outcomes and long-term STEM program impacts.

Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
https://journals.aloysianpublications.com
Volume 2 Issue 6 (2026)

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Online ISSN: 3082-5121
Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields
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Volume 2 Issue 6 (2026)

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