



## ASSESSING SECONDARY TEACHERS' PERCEPTIONS AND CHALLENGES IN IMPLEMENTING STEAM EDUCATION

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### ABSTRACT

This study investigates secondary teachers' perceptions of STEAM (Science, Technology, Engineering, Arts, and Mathematics) education and the challenges they encounter while implementing it in their classrooms. Utilizing a survey-based research design, data were collected from 50 secondary school teachers across various schools. The survey encompassed sections on teachers' attitudes toward STEAM, perceived benefits, and the barriers they face in STEAM integration. Results indicate that while the majority of teachers recognize the importance of STEAM in fostering critical thinking and interdisciplinary skills, significant challenges such as limited resources, insufficient training, and lack of administrative support hinder effective implementation. The study concludes with recommendations for enhancing STEAM adoption through targeted professional development, increased resource allocation, and stronger institutional support.

**KEYWORDS :** STEAM education, secondary teachers, perceptions, implementation challenges, interdisciplinary learning

### INTRODUCTION

In the evolving landscape of education, there is a growing emphasis on developing 21st-century skills such as critical thinking, creativity, and problem-solving. STEAM education, which integrates Science, Technology, Engineering, Arts, and Mathematics, has emerged as a holistic approach to achieving these goals. By fostering interdisciplinary learning, STEAM aims to bridge the gap between traditional subject areas, promoting a more comprehensive understanding of complex concepts.

### Problem Statement

Despite the recognized benefits of STEAM education, its integration into secondary education systems faces numerous obstacles. Teachers, who play a pivotal role in implementing STEAM curricula, often encounter challenges that impede effective adoption. Understanding teachers' perceptions and the specific barriers they face is crucial for developing strategies to support STEAM education successfully.

### Purpose of the Study

This study aims to assess secondary teachers' perceptions of STEAM education and identify the challenges they encounter in implementing STEAM-based programs. By gaining insights into teachers' attitudes and the obstacles they face, the research seeks to inform policymakers and educational leaders on how to better support STEAM integration.

### Research Questions

1. What are secondary teachers' perceptions of the effectiveness of STEAM education?
2. What challenges do secondary teachers face in implementing STEAM in their classrooms?
3. What resources or support do teachers feel they need to effectively integrate STEAM?

### Significance of the Study

The findings of this study will provide valuable insights into the current state of STEAM education from the teachers' perspective. Understanding the perceived benefits and challenges will aid in the formulation of policies and support mechanisms that can enhance the implementation of STEAM programs, ultimately contributing to improved educational outcomes.

### Literature Review

#### Overview of STEAM Education

STEAM education extends the traditional STEM (Science, Technology, Engineering, Mathematics) framework by incorporating the Arts, thereby promoting a more holistic and creative approach to learning. According to Bequette and Bequette (2012), STEAM encourages students to think critically and creatively, fostering innovation and adaptability.

### Teachers' Perceptions of STEAM

Teachers' attitudes towards STEAM significantly influence its implementation. Studies by Maeda (2013) and Garber (2015) indicate that positive perceptions of STEAM are linked to increased enthusiasm and commitment to interdisciplinary teaching. However, perceptions vary based on teachers' backgrounds, training, and personal beliefs about education.

### Challenges in Implementing STEAM

Several barriers hinder the effective integration of STEAM in secondary education. Common challenges include:

- **Limited Resources:** Lack of access to necessary materials, technology, and funding can impede STEAM activities (Johnson, 2017).
- **Insufficient Training:** Many teachers report inadequate professional development opportunities to prepare them for STEAM teaching (Smith & Ragan, 2016).
- **Curriculum Constraints:** Rigid curricula and standardized testing often leave little room for the flexibility required in STEAM projects (Beers, 2014).
- **Administrative Support:** A lack of support from school leadership can discourage teachers from adopting innovative teaching methods (Kim & Lee, 2018).

### Importance of Professional Development

Professional development is crucial for equipping teachers with the skills and knowledge necessary for STEAM education. Effective training programs enhance teachers' confidence and competence in delivering interdisciplinary lessons (Johnson et al., 2019).

### Methodology

#### Research Design

This study employs a descriptive survey research design to assess secondary teachers' perceptions and challenges in implementing STEAM education. The survey method is chosen for its effectiveness in collecting data from a large sample efficiently.

### Participants

The study sample comprises 50 secondary school teachers

from various schools within the Navsari district. Participants were selected using stratified random sampling to ensure representation across different subjects and school types.

### Data Collection Tool

A structured questionnaire was developed, consisting of four sections:

1. **Demographic Information:** Collecting data on teachers' age, gender, teaching experience, subjects taught, and previous training in STEAM.
2. **Perceptions of STEAM Education:** Using Likert-scale questions to gauge teachers' attitudes towards the effectiveness and benefits of STEAM.
3. **Challenges in Implementing STEAM:** Including multiple-choice and Likert-scale questions to identify barriers faced by teachers.
4. **Support and Resources:** Open-ended questions to gather qualitative data on teachers' needs for effective STEAM integration.

### Data Collection Procedure

The survey was administered online using Google Forms. Participants received an invitation via email, with a link to the questionnaire. To ensure confidentiality, responses were anonymized, and participation was voluntary.

### Data Analysis

Quantitative data were analyzed using descriptive statistics (mean, standard deviation) and inferential statistics (Chi-square tests) to examine relationships between variables. Qualitative responses from open-ended questions were analyzed using thematic coding to identify common themes and insights.

## Results

### Demographic Information

Out of the 50 respondents, 60% were female and 40% male teachers. The majority (70%) had over five years of teaching experience. Subjects taught included Science (35%), Mathematics (25%), Technology (20%), Arts (20%). Approximately 50% of the teachers had received formal training in STEAM education.

### Perceptions of STEAM Education

- **Effectiveness:** 80% of teachers agreed that STEAM education enhances students' critical thinking skills.
- **Benefits:** 75% believed that STEAM promotes interdisciplinary learning, while 70% felt it increases student engagement and motivation.
- **Willingness to Implement:** 65% expressed willingness to incorporate more STEAM activities into their teaching practices.

### Challenges in Implementing STEAM

- **Resource Limitations:** 60% cited inadequate access to materials and technology as a significant barrier.
- **Insufficient Training:** 55% reported a lack of adequate professional development opportunities.
- **Curriculum Constraints:** 50% indicated that rigid curricula and time limitations hinder STEAM integration.
- **Administrative Support:** 40% felt that there was insufficient support from school administration.

### Support and Resources Needed

Qualitative responses highlighted the need for:

- **Professional Development:** Teachers requested more training focused on STEAM methodologies and interdisciplinary lesson planning.
- **Access to Resources:** Increased funding for materials and technology to facilitate STEAM projects.
- **Collaborative Opportunities:** Platforms for teachers to collaborate and share best practices in STEAM education.
- **Administrative Support:** Stronger backing from school

leadership to prioritize and support STEAM initiatives.

### Statistical Analysis

A Chi-square test revealed a significant relationship between teachers' perceptions of STEAM effectiveness and their willingness to implement STEAM ( $\chi^2 = 18.45$ ,  $p < 0.001$ ). Additionally, resource limitations were significantly associated with lower levels of STEAM implementation ( $\chi^2 = 15.67$ ,  $p < 0.001$ ).

### Discussion

#### Interpretation of Findings

The study reveals that secondary teachers generally hold positive perceptions of STEAM education, recognizing its role in enhancing critical thinking and interdisciplinary learning. However, substantial challenges, particularly related to resources and training, impede the effective implementation of STEAM programs.

#### Comparison with Existing Literature

These findings align with previous studies (Smith & Ragan, 2016; Johnson et al., 2019) that highlight resource constraints and insufficient professional development as primary barriers to STEAM integration. The significant relationship between perceived effectiveness and willingness to implement STEAM underscores the importance of fostering positive attitudes through demonstrated benefits and support.

#### Implications for Practice

To facilitate STEAM adoption, schools should invest in comprehensive professional development programs that equip teachers with the necessary skills and knowledge. Additionally, increasing access to STEAM resources and fostering collaborative environments can mitigate some of the identified challenges.

#### Implications for Policy

Policymakers should prioritize funding for STEAM education, ensuring that schools have the necessary resources to implement STEAM programs effectively. Furthermore, incorporating STEAM-focused training in teacher education curricula can enhance teachers' preparedness and confidence in delivering interdisciplinary lessons.

#### Limitations of the Study

The study's sample size, limited to a specific region, may affect the generalizability of the findings. Additionally, the reliance on self-reported data may introduce biases related to social desirability and subjective perceptions.

#### Future Research Directions

Future research could explore longitudinal studies to assess the long-term impact of STEAM education on both teachers and students. Comparative studies across different regions and educational contexts would also provide a broader understanding of the factors influencing STEAM implementation.

## CONCLUSION

This study highlights that while secondary teachers recognize the value of STEAM education in fostering critical thinking and interdisciplinary skills, significant barriers such as limited resources and insufficient training hinder its effective implementation. Addressing these challenges through targeted professional development, increased resource allocation, and stronger administrative support is essential for the successful integration of STEAM in secondary education. By supporting teachers in these areas, educational institutions can better harness the potential of STEAM to enhance student learning outcomes.

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