Chapter 13
STEAM Integration in Self-Portrait Art Education:
Cultivating Creativity and Interdisciplinary Thinking

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ABSTRACT

This study investigates the transformative impact of STEAM-based art projects on enhancing creativity and interdisciplinary thinking in art education. Through project-based learning, students explored scientific approaches to develop unique artistic concepts, integrating analytical reasoning with creative expression. The study focused on two case studies: one utilizing biofeedback technology to create an interactive self-portrait and another combining traditional observational techniques with innovative materials. Students engaged in iterative processes, including research, critiques, and discussions, to refine their ideas and solve artistic challenges independently. The instructor played a facilitative role, guiding students with probing questions and feedback to expand their creative and analytical thinking. The findings provide a practical framework for incorporating STEAM principles into art education, emphasizing its potential to prepare students for the multifaceted demands of future society.

INTRODUCTION

In today's evolving technological landscape, creativity and interdisciplinary thinking are essential. The complexity of global challenges, shaped by the Fourth Industrial Revolution, necessitates educational models that integrate scientific inquiry with artistic innovation. According to the World Economic Forum (2020), critical thinking, creativity, and problem-solving rank among the top skills employers seek, highlighting the need for frameworks that develop both analytical and creative competencies.

STEAM education—integrating Science, Technology, Engineering, Arts, and Mathematics—bridges traditionally separate disciplines, offering a holistic learning experience that prepares students for contemporary challenges. Beyond career readiness, STEAM fosters innovative thinking to address global issues such as climate change, technological ethics, and cultural evolution.

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The inclusion of arts within STEM underscores the human-centered nature of innovation (Boy, 2013), aligning with John Dewey's (1934) experiential learning, which emphasizes hands-on engagement in intellectual and creative growth. Similarly, C.P. Snow's (1959) concept of the "two cultures" stresses interdisciplinary learning as key to developing comprehensive solutions.

In art education, STEAM shifts focus from traditional, technique-driven instruction to dynamic, research-based artistic practices. While conventional art education prioritizes technical mastery, integrating science and technology enhances students' critical thinking, adaptability, and collaborative problem-solving.

Self-portrait projects offer an effective framework for STEAM integration. Traditionally associated with identity and artistic skill, self-portraiture in STEAM extends beyond visual representation to incorporate scientific and technological methodologies. Students may use digital modeling, biofeedback technologies, or interactive media to create self-portraits that integrate personal and scientific narratives.

This study examines how STEAM principles enhance creativity and problem-solving in self-portrait art education. Through two case studies, it evaluates how traditional self-portrait techniques evolve with scientific and technological methodologies, offering insights into the effectiveness of STEAM-based art education.

Research Questions and Objectives

This study examines the impact of STEAM-based self-portrait art education on students, focusing on how interdisciplinary approaches influence creativity and problem-solving. This study addresses two key questions:

1. How do STEAM-integrated self-portrait projects differ from traditional approaches?
2. How do these projects contribute to interdisciplinary thinking?

This research highlights STEAM's transformative role in self-portrait art education. By analyzing student work and reflections, it offers insights into curriculum design that fosters adaptive thinking, technical proficiency, and creative expression. Additionally, the findings contribute to STEAM education discourse by providing practical applications for STEAM-based art pedagogy.

Theoretical Background of STEAM Education

STEAM integrates STEM and the arts, fostering both analytical and creative skill development. Yakman (2008) describes STEAM as an interdisciplinary methodology that unifies diverse fields, encouraging problem-solving through a synthesis of scientific methods and artistic exploration. By embedding artistic principles within scientific reasoning, STEAM enhances cognitive engagement and learning. This integration aligns with John Dewey's (1934) advocacy for experiential learning, emphasizing hands-on engagement to cultivate intellectual and creative growth. Additionally, C.P. Snow's (1959) theory of the "two cultures" underscores the divide between sciences and humanities, advocating interdisciplinary learning for innovative solutions.

Howard Gardner's (1983) theory of multiple intelligences supports STEAM's interdisciplinary goals. Gardner identifies cognitive domains such as linguistic, logical-mathematical, and artistic intelligences, illustrating that individuals possess diverse strengths in problem-solving and creativity. STEAM-based