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Integrating Art into STEAM Education: An Interview-Based Study of Interdisciplinary Art Educators

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Abstract: Extensive research has shown that students proficient in Science, Technology, Engineering, and Mathematics (STEM) subjects are more likely to succeed later in life. However, by adding the arts to the STEM curriculum (creating STEAM) and providing educators with a more interdisciplinary framework, students can be better prepared to understand and solve global problems and engage more effectively in social activities. This study employs a narrative approach to collect data and interpret results through interviews with three interdisciplinary art educators. The primary research question is: What is the self-perception of interdisciplinary art educators? By exploring how these educators integrate their specific fields into the arts to develop unique, comprehensive curricula, the study aims to highlight their role. Currently, the arts are viewed as optional rather than essential in education. Therefore, to create a truly effective, comprehensive, and engaging interdisciplinary educational system that benefits students, it is crucial to conduct in-depth interviews and research with interdisciplinary art educators, demonstrating that the arts are a vital component of all core curricula.

Keywords: STEAM Education; Interdisciplinary Art; Art Integration; Self-Perception; Curriculum Development.

1. Introduction

1.1. Problem Statement

Evidence suggests that students perform better in interdisciplinary curricula compared to single-discipline curricula, particularly in STEAM (Science, Technology, Engineering, Art, and Mathematics) education, where art is central to the curriculum. Such curricula can create meaningful connections, linking students' learning to real-life situations, making the curriculum more relevant to their lives and increasing engagement. This approach encourages teachers to expand their areas of expertise and design curricula that better meet students' needs. Interdisciplinary education is crucial in contemporary education, driving knowledge production and meeting the needs of practitioners.

However, interdisciplinary teaching, especially in art education, still faces challenges. Conflicts between disciplinary cultures and a lack of empirical research on the development of thinking systems in art education are major obstacles. Advocates argue that the unique value of art education lies in cultivating critical thinking, creativity, and the ability to view problems from multiple perspectives. Overemphasizing the impact of art on test scores, however, may undermine its intrinsic value.

High-quality STEAM education requires integrating art into the core of the curriculum, involving collaboration among art and non-art educators, art institutions, and community organizations. This interdisciplinary approach, supported by John Dewey's principles of progressive education, emphasizes experiential learning and connections between multiple disciplines. Visual art naturally complements STEAM education, providing ideal conditions for embedding interdisciplinary learning within the curriculum.

The integration of art in STEAM education enriches students' learning experiences, fostering critical thinking and creativity. It underscores the need to reform teacher training and collaborative curriculum planning to overcome the challenges of interdisciplinary teaching and ensure that art is regarded as equally important as other STEM subjects.

1.2. The Aim of this Study

The aim of this study is to explore and understand individuals' experiences at different stages in their journey to becoming interdisciplinary educators and practitioners. It will also shed light on how educational art programs foster interaction among diverse global and local groups. Specifically, the study seeks to uncover respondents' experiences with successes and challenges within their practice, particularly in interdisciplinary collaboration, and how they identify and position themselves as interdisciplinary artists, educators, and practitioners. This is achieved through interviews with artists who have experience working in interdisciplinary educational environments. Ultimately, the narrative investigation of their artistic experiences aims to enhance the work of others interested in or engaged with the field, particularly within the context of science, technology, engineering, art, and mathematics (STEAM)[1].

1.3. Research Objectives

This study aims to explore the work of interdisciplinary art educators who operate in diverse environments and across a broad range of subjects. The goal is to understand how these educators conceptualize their practice and their roles within this context. Specifically, I will analyze the experiences of interdisciplinary art practice by reflecting on and understanding the life stories of interdisciplinary artists. Furthermore, I will consider how these experiences provide unique insights and perspectives for interdisciplinary education, particularly in STEAM (Science, Technology, Engineering, Arts, and Mathematics) and arts education, such as art spaces, knowledge production, and creative activities.

1.4. Research Question

The interview questions for this study are based on open-ended questions (see Appendix A) designed to gather data about the respondents' backgrounds, specifically focusing on

how they developed an interest in interdisciplinary practice. I aim to have them discuss the challenges they have encountered, their perceived successes, how they envision their role within the larger community, the impact of interdisciplinary education on their own practice, their reflections on their role in this work, and their transformative experiences in collaborative art. Additionally, I seek information about the power dynamics in interdisciplinary collaboration and the strategies they employ to ensure representation of students or other collaborators. The following research question is posed to elicit rich narratives:

How do interdisciplinary artists position themselves as art educators?

1.5. Significance of the Study

This study aims to explore how interdisciplinary artists conceptualize their practice and their roles within interdisciplinary education. By employing a narrative inquiry approach, the research prioritizes the voices of interdisciplinary artists who embody the diverse possibilities of interdisciplinary education and STEAM. This investigation is relevant to interdisciplinary educators and art educators seeking to understand the strategic thinking involved in interdisciplinary art and the practical connections between thinking and creativity across disciplines. This aspect of the study may help justify maintaining a focus on the arts in school interdisciplinary practices and aid in developing curricula relevant to students in art education.

2. Literature Review

This chapter presents a literature review conducted to provide information for the research. The review process used two different methods. A traditional literature review synthesizes various selected sources to provide an overview or key points related to the research question. A systematic literature review, on the other hand, examines all relevant empirical studies that meet specific pre-determined criteria related to the research question.

2.1. Theoretical Background

Definition of Interdisciplinarity:

Interdisciplinarity involves combining components from two or more disciplines, typically applying to knowledge, research, education, and theory. This basic definition, while useful, is simplified and lacks depth in defining what constitutes a discipline.

A more detailed definition describes a discipline as a "thought domain" that evolves over time, consisting of problems, theories, and methods of investigation. Understanding this allows for a richer definition of interdisciplinarity, which includes creating new knowledge through the synthesis or fusion of disciplines[2].

Scholars have developed various typologies of interdisciplinarity, including informed disciplinary scholarship, synthetic interdisciplinarity, transdisciplinarity, and conceptual interdisciplinarity. These categories differ in how they interact with and integrate disciplines. It's important to note that simple departmental interactions may not always qualify as true interdisciplinarity.

In this research, the definition of interdisciplinarity is based on these broader understandings, incorporating elements of synthesis, borrowing, and various types of interdisciplinary activities.

2.2. The Philosophical and Theoretical Basis of Interdisciplinarity

Education and Learning:

Effective education needs a strong philosophical foundation. Dewey criticized traditional and progressive models for lacking this foundation and not accounting for experiential learning. Gardner's multiple intelligences theory broadens the view of cognitive capacities, while Bruner emphasized the role of intuition and motivation in learning outcomes. Ewens highlighted the importance of mediation in communication and learning, advocating for diverse tools to support effective education[1].

Integrated Learning:

Theorists like Dewey, Tyler, and Bloom promoted integrating subjects to reflect real-world experiences and improve learning. Modern models, such as Curriculum 21, build on these ideas to support thematic integration.

Arts-Centered Integrated Learning:

The arts have traditionally facilitated cross-curricular integration, linking the subjects and fostering deep understanding. However, arts education has struggled due to limited resources, standardized testing pressures, and educational reforms. Despite its potential benefits, integrating arts into mainstream education remains challenging.

This research will explore how integrating arts with STEM (STEAM) can address these challenges and improve educational outcomes[3].

2.3. Research Review

STEAM Education:

STEAM integrates the Arts with Science, Technology, Engineering, and Mathematics (STEM). Its purpose is to reframe technical learning as empathetic, enhancing students' understanding of the human aspects of their work. This integration contrasts with traditional STEM methods and fosters creative and critical thinking, which are crucial for innovation and problem-solving. Despite its benefits, STEAM has received limited high-level support and lacks a settled definition and framework for measuring outcomes.

Student and Teacher Perspectives:

Studies on STEAM often focus on teacher perspectives. For instance, middle-school teachers implementing STEAM typically need to increase their arts knowledge. Teachers value STEAM but highlight the necessity of collaboration with artists for successful programs. Exceptional STEAM teachers often have knowledge of various art forms[4].

Challenges and Collaboration:

One study examined student teachers and artists developing an educational performance, revealing conflicts over project content and performance. Another study on K-12 education emphasized the art studio's role in fostering diverse problem-solving skills. However, effective STEAM implementation requires artistic experience among teachers, posing a challenge when teachers lack such skills.

Higher Education and Interdisciplinary Learning:

At the postsecondary level, a STEAM curriculum aimed to develop creativity and multidisciplinary understanding. Although students could customize their majors, the program lacked true transdisciplinary integration and focused on "conceptual interdisciplinarity" without a clear thematic focus[5].

Student Experiences:

Studies on student perceptions of STEAM show generally

positive responses but highlight difficulties in coordinating projects and addressing individual needs. Art students in transdisciplinary environments found their understanding of art and creativity challenged by STEM practices, suggesting mutual learning benefits[6].

Artist-Researcher Perspective:

Few studies address the artist-researcher role in STEAM. One study observed elementary students in a makerspace, concluding it effectively developed problem-solving and creativity. Another discussed the challenges of integrating artistic pedagogies in project-based learning, noting that the artist-researcher's voice was often overlooked[7].

Conclusion:

STEAM education fosters creative and empathetic problem-solving, benefiting both STEM and arts fields. However, effective implementation requires collaboration and artistic knowledge among teachers, and the role of the artist-researcher needs further exploration to fully realize STEAM's potential.

3. Research Methodology

3.1. The Narrative Paradigm

The narrative paradigm suggests that individuals construct their understanding of the world through their experiences and reflections. This approach acknowledges that realities are subjective and shaped by the stories people tell, whether individually or as part of a group[8]. The current study utilizes this paradigm to explore how individuals perceive their journeys toward becoming art educators. By focusing on narrative methodology, which includes analyzing stories and personal artifacts, this research aims to uncover the complexities of lived experiences through participants' subjective realities.

This study is framed by the concept that human experiences are interconnected and evolving, as conceptualized by Deleuze and Guattari's rhizomatic model. This model emphasizes the non-linear, dynamic nature of personal development, suggesting that experiences are continuously interacting and influencing each other. By adopting this perspective, the research highlights how becoming an art educator is not a linear process but a complex network of experiences and influences that continuously shape and redefine personal and professional identities.

3.2. Research Design

Given the objectives of this study, I have chosen to conduct a narrative inquiry followed by thematic analysis of the collected data. The rationale for this design includes:

1.Human Storytelling: Humans are inherently storytellers. To understand how others perceive the world, it is essential to listen to their personal narratives. This approach helps uncover the meanings and representations within their stories.

2.Alignment with Narrative Methodology: Narrative methodology is valuable for both students and educators. It allows individuals to frame their experiences and position themselves through storytelling. This method is based on the assumption that narrative processes can lead to meaningful change and encourage educators to reassess and explore new teaching approaches.

3.Application of Naturalistic Methods: The study will involve interviews with participants from diverse educational and cultural backgrounds, generating dialogues and interactions. These participants include interdisciplinary artists and educators who frequently incorporate interdisciplinary art into their practice[9].

4.Support from Constructivist Frameworks: Narrative inquiry supports the construction and reconstruction of personal and societal stories, positioning educators and learners as storytellers and actors in these narratives. Semi-structured interviews will offer multiple perspectives to convey the complexity and diversity of interdisciplinary practices.

This design aims to explore new possibilities in interdisciplinary art and education practices through narrative and thematic analysis.

3.3. Participants

This research focuses on three respondents representing different aspects of interdisciplinary art. Their diverse experiences are intended to provide a well-rounded view of the field.

Inclusion Criteria: Participants must have experience in practicing or teaching art in various settings and integrating at least one non-art subject into their art education. The integrated subjects included biology, environmental studies, and communication studies[10].

The participants come from varied backgrounds, living and working in different locations. Their interdisciplinary practices span their artistic work, educational activities, and personal lives, offering a broad range of experiences.

Each respondent chose the interview location where they felt most comfortable, which included an office, a quiet library room, and a participant's home.

3.4. Research Method

Qualitative research was conducted using semi-structured interviews. A set of five pre-determined open-ended questions guided the discussions, which allowed for exploration based on respondents' answers. This approach facilitated an organic development of conversations within a structured framework[11].

Transparency about the study's nature and methodology was maintained while avoiding bias during data collection. During analysis, self-criticism and reflection on positionality were crucial for interpreting the narratives. Recognizing that these narratives, though personal, were influenced by broader social, cultural, and institutional contexts added complexity to the findings[12].

3.5. Data Collection and Analysis

Interviews were recorded and transcribed. Both the respondents and the researcher reviewed the transcriptions. The analysis involved identifying codes and classifying them into themes[13].

Different narrative classification methods exist: thematic, structural, dialogic, and visual. Thematic analysis, which focuses on the content of what was said, was chosen for this research, given its relevance to examining the integration of specific non-art subjects (biology, environmental studies, and communication studies) into art education. This method best suited the study's objectives[14].

3.6. Validity

Researchers using narrative inquiry must remain constantly aware of their own positions and the power dynamics present during data collection, and they should employ collaborative approaches to elicit and recount stories[15]. To address this, I

ensured that I integrated myself into the research context to establish a meaningful connection between myself and the respondents. Triangulation of the data through narrative coding incorporated the perspectives and voices of the respondents. Additionally, I acknowledged the limitations of my own views and biases.

4. Analysis

4.1. Emergence as Interdisciplinary Art Educators

The three artists (Li Ming), (Zhang Wei), and (Wang Fang)—each with distinct training backgrounds—Li Ming in interaction studies, Zhang Wei in biology, and Wang Fang in art education—provide diverse perspectives on how they evolved into interdisciplinary art educators. Their pathways reflect varied experiences and interests that converged into their current roles.

Li Ming's journey began with a strong interest in art, which evolved as they became fascinated by patterns and pattern recognition. This interest led Li Ming to explore computing technology as an artistic medium, integrating their art practice with new forms of visual representation.

Wang Fang, who was initially drawn to nature and the outdoors, developed a visual and creative understanding of the world. They chose to channel this perspective through primary education, using artistic skills to engage with and express their appreciation for the natural world.

Zhang Wei's path diverged significantly, starting with a primary focus on biology, specifically ichthyology. Despite early creative inclinations, Zhang Wei initially pursued science. Over time, they began to use art as a tool to enhance scientific communication, blending roles as a scientist and artist through a process of experimentation and learning.

4.2. Self-Role Transition

The transition to a formal role as an artist-educator or artist-researcher varied among them. Zhang Wei utilized their role in science education to integrate art into teaching, viewing the process as one of trial and error. Their role as an artist remained secondary to their primary identity as a science facilitator.

Wang Fang's transition involved a significant period working as an independent studio artist, engaging in large community projects. These experiences, including skills in coordination and public engagement, eventually prepared Wang Fang for a role in art education, allowing them to grow into a community art educator.

Li Ming, with formal training in education, entered their role as an artist-educator with a pre-established identity. Their path was less about evolving from one role to another and more about refining their established identity as an artist-educator, supported by extensive work with educational organizations.

Each artist's journey to becoming an interdisciplinary art educator reflects their unique backgrounds and experiences, highlighting the diversity in how interdisciplinary roles can develop.

4.3. The relationship between art and STEAM

The Role of Art in STEAM Education

In discussions about STEAM education, three artists— (Li Ming), (Zhang Wei), and (Wang Fang)—agree that art and disciplines like science, the environment, and interaction studies are not separate ways of knowing. Instead, they represent different lenses on the same issues. This perspective has significant implications for how art integrates into STEAM education.

Art as a Medium for Science

(Li Ming) and their project illustrates how art and science can intersect. In their work, they created objects that served as colonization surfaces for fungi and lichens. The art emerged as these species took hold, demonstrating a direct interaction between scientific processes and artistic creation. This shows how biology can be utilized as a medium to produce art.

Art as a Problem-Solving Tool

On the flip side, (Zhang Wei) and Wang Fang) highlight how art serves as a tool for problem-solving. Zhang wei's work involved using art to address anthropogenic futures and climate change, turning abstract concepts into tangible explorations. Similarly, 's project aimed to visualize extinct species, making scientific issues more comprehensible and engaging. Art can render abstract systems observable and fulfill the human drive for order, thus aiding science and its objectives.

Art's Role Beyond Requirements

(Wang Fang) emphasizes that art in STEAM should counterbalance the rigid focus of STEM on requirements and outcomes. Art encourages curiosity and critical thinking, offering an alternative perspective to quantitative measures and scientific analysis. It creates a shared language for communication and enhances student engagement, turning abstract ideas into accessible and participatory experiences.

Art as a Framework for Understanding

(Li Ming) points out that art provides a framework for discussing complex issues. For example, art can be used to explore ecological and social contexts, integrating scientific and societal narratives into a cohesive dialogue. This suggests that art, like science, transcends individual ownership and serves as a means of embedding and making sense of scientific concepts.

Challenges and Marginalization

Finally, (Zhang Wei) notes that art's role within STEAM can be contentious. There are preconceived notions about what art is, which can hinder collaboration. Often, interdisciplinary art projects are considered secondary or elective rather than integral to mainstream education. This marginalization limits the impact of art and its potential to influence other fields, like science. Practitioners like (Li Ming), who bridge art and science, are relatively rare, highlighting the need for greater integration of art into STEAM education[16].

4.4. Discussion

The experiences of the interviewed artists as both artist-educators and artist-researchers bring up several key points that align with the literature presented in Chapter 2. These points include:

Educational Theory and the Role of the Arts

The artists' experiences highlight significant aspects of educational theory, particularly regarding the role of the arts in intelligence and learning. The integration of art in education is shown to be more than an additional element; it is crucial for cognitive development and creative thinking. This supports the broader argument that arts education contributes fundamentally to a well-rounded educational approach.

Position of Arts in STEAM

The discussion also emphasizes the position of the arts within the STEAM framework (Science, Technology, Engineering, Arts, and Mathematics). The artists agree that art and science are interconnected rather than separate domains. Their work demonstrates that art can both serve as a medium for scientific exploration and act as a problem-solving tool. This integration underscores the importance of incorporating art into STEAM education to encourage a more interdisciplinary approach.

Interdisciplinary Arts Environment

The personal experiences of the artists in balancing their roles as artist, educator, and researcher within an interdisciplinary environment provide valuable insights. One artist shows how art can communicate scientific concepts, another addresses environmental and social issues through art, and a third emphasizes the role of art in fostering curiosity and critical thinking. These experiences reveal both the challenges and benefits of navigating these roles, highlighting the need for greater integration of arts into educational and research contexts.

Overall, these insights illustrate the dynamic role of art in education and research, reinforcing the need for a more integrated and interdisciplinary approach.

5. Conclusion

This chapter provides a concise summary of the research findings, their implications, and recommendations for future study.

Summary of Findings:

1. Diverse Paths to Interdisciplinarity: The artists interviewed each followed a unique path to integrating art with other disciplines. Their experiences highlight that there is no single route to becoming an interdisciplinary artist-educator or researcher.

2. Role Tension and Collaboration: Balancing the roles of artist, educator, and researcher involves navigating tension and interdependence. Successful interdisciplinary work relies heavily on collaboration with students, institutions, and other stakeholders.

3. Marginalization of Art in STEAM: Art remains marginal compared to science within STEAM education. Addressing this requires advocating for a more integral role for art, emphasizing its value in solving complex problems.

The findings underscore the need for educational reform to better integrate art within STEAM. This integration can enhance problem-solving and engagement, moving beyond isolated teaching practices to a more interconnected approach.

Future studies should expand the scope to include a broader range of interdisciplinary practices and settings. Investigating how different educational environments influence the integration of art into STEAM could provide deeper insights and support more effective reforms.

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