Exploring the Integration of STEAM Education in the Creation

and Production of Musical Theater Performances: A Qualitative Study

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Chapter I. Introduction

Statement of the Problem

In recent years, there has been an increasing emphasis on the integration of science, technology, engineering, arts, and mathematics (STEAM) in education. When students are actively involved, they acquire knowledge (Freeman et al., 2014). Utilizing a transdisciplinary method that permits students to acquire fresh insights "can impact their learning and recollection, aptitude to work together, and inventive problem-solving abilities by offering more profound engagement with the subject matter, facilitating better retention of material, and cultivating emotional investment in the learning journey" (Hardiman et al., 2009, p. 15). This integration aims to provide students with a well-rounded education that prepares them for a wide range of careers in the 21st century. One area where STEAM programs can make a significant impact is in school theatrical musicals. Theatrical musicals are a popular form of performing arts that require a wide range of skills, including acting, singing, dancing, and stage design.

Integrating STEAM into school theatrical musicals can enhance the quality of these productions in several ways. For example, incorporating engineering and technology can improve the design and construction of sets, while the arts can provide a more comprehensive approach to storytelling and character development. Pollard et al., (2017) states that STEAM education needs to be more adaptable and innovative. Educators are being called upon to teach and create curriculum in a way that is different from what they are used to, requiring them to think creatively about their approach. Creative teaching requires determination, a willingness to embrace unexpected ideas, and a willingness to take confident risks.

If STEAM educators think outside the box and create lessons that can help aid the school as a whole, students will have even more opportunities to learn design learning. To encourage these qualities, schools will need to have effective communication with all departments (including all major school musicals, plays, and functions).

Although school theatrical musicals are a popular form of performing arts, many schools struggle to produce high-quality productions due to limited resources, lack of expertise, and limited student engagement. Integrating a STEAM program into school theatrical musicals could potentially address these challenges by providing students with a well-rounded education that incorporates science, technology, engineering, arts, and mathematics. However, there is limited research on how STEAM integration can specifically improve the quality of school theatrical musicals.

Therefore, this study will answer questions regarding how a STEAM program can be effectively integrated into school theatrical musicals to enhance the quality of these productions. Involvement will improve student engagement and prepare students for careers in the 21st century. This study aims to explore the various components of a STEAM program and how they can be incorporated into the production of school theatrical musicals, as well as the impact of STEAM integration on student learning outcomes, such as improved problem-solving skills, increased engagement with the subject matter, and better preparation for careers in the performing arts industry. The research gathered in this study will aim to identify the challenges associated with integrating STEAM into school theatrical musicals and provide guidance for educators and administrators interested in implementing STEAM programs in their schools.

The purpose of this dissertation is to investigate how the integration of a STEAM program can enhance the quality of school theatrical musicals, improve student engagement, and

prepare students for careers in the 21st century performing arts industry. This study will explore the various components of a STEAM program and how they can be effectively incorporated into the production of school theatrical musicals, such as set design, lighting, sound engineering, and character development.

This study will also analyze the impact of STEAM integration on student learning outcomes, such as critical thinking, problem-solving, and creativity. By examining the effects of STEAM integration on student engagement, this study aims to provide insights into how educators and administrators can better engage students in the performing arts and inspire them to pursue careers in this field.

Furthermore, this study will aim to identify the challenges associated with integrating STEAM into school theatrical musicals and provide guidance for educators and administrators interested in implementing STEAM programs in their schools. This research will contribute to the existing body of literature on STEAM education and provide valuable insights into how STEAM can be effectively integrated into the performing arts. The findings of this study can be used to inform curriculum development, instructional practices, and future research on STEAM education in the performing arts.

Research Questions

RQ1: How does incorporating STEAM principles, such as technology and engineering, into school musical productions impact students' creative problem-solving skills and enhance the overall quality of the performance?

RQ2: In what ways can a STEAM program help students better understand the technical aspects of stage design, sound engineering, and lighting, and how can this knowledge be applied to enhance the production value of school musicals?

RQ3: How can incorporating STEAM-related subjects, such as math, physics, and computer programming, into music composition and sound design contribute to the artistic and technical quality of school musical productions?

Limitations and Delimitations

The limitations of this study are restricted to a specific geographic location (Hudson County), types of schools, and a broad demographic group of students, which may affect the generalizability of the findings. The availability of resources, such as funding, equipment, and skilled personnel, may vary across different schools, which could impact the implementation and outcomes of STEAM programs. The study may not consider other factors that may influence the success of school musicals, such as student interest, teacher expertise, and community support.

Regarding the delimitations of this study, the research will concentrate solely on investigating the influence of STEAM programs on the quality of school musicals, while disregarding other academic subjects or extracurricular activities. The research design will involve a pre- and post-intervention evaluation, which implies that any changes observed in student outcomes cannot be solely attributed to the STEAM program. Additionally, the data collected for this study will rely only on self-reported information provided by students and teachers, thus omitting objective measures of student learning or engagement.

Assumptions

The STEAM program is assumed to be implemented with fidelity and consistency across all participating schools. The students and teachers involved in the STEAM program are assumed to have the necessary knowledge, skills, and interest to participate fully in the program. The study assumes that the benefits of the STEAM program will be applicable across different types of school musicals, such as plays, operas, and musical revues.

Chapter II. Literature Review

In recent years, there has been a growing interest in the integration of Science, Technology, Engineering, Arts, and Mathematics (STEAM) education in various fields, including the arts. One such field is musical theater, which has long been a popular form of artistic expression that combines various disciplines, such as music, dance, drama, and visual arts. The integration of STEAM education in the creation and production of musical theater performances has the potential to enhance the learning experience and outcomes for students, as well as promote innovation and creativity in the arts.

"STEAM education comes to the forefront by conceptualizing in the form of (1) project-based learning, (2) technology in the context of creativity and design, (3) a multi-faceted approach to question a problem, (4) science, technology, engineering, art/human sciences and mathematics, all of which must be embedded in the problem (5) cooperative problem solving (Herro and Quigley 2016, p. 5). While there has been some research on the integration of STEAM education in the arts, there is a lack of literature specifically exploring its use in musical theater. This literature review aims to fill this gap by examining existing research on STEAM education in the arts and its potential benefits for musical theater education. Additionally, this

review will analyze the different approaches and strategies used in integrating STEAM education in musical theater and evaluate their effectiveness.

Mason (2018) states that musicals demonstrate both originality and unconventional thinking, while also encouraging cross-disciplinary learning in areas beyond just STEAM due to the diverse array of themes and environments they depict. Musicals facilitate customized and project-based learning, and all five STEAM fields can be associated with musicals in educational settings. As a fundamental part of the arts, musicals are well-suited for concept-based curriculum within the STEAM framework. Mason's research provided several examples that can be adapted to a variety of musicals and can be especially effective when integrated with the production of a school musical. The concepts that he presented can permit instruction to be structured around show tunes and themes.

Holt (2022) researched Dallas Independent School District which announced a district-wide STEAM education program. The program was themed around the Broadway musical "Ain't Too Proud – The Life and Times of The Temptations". The educational program was designed to equip students with the necessary skills for both college and modern job opportunities. The program consists of a series of teaching modules that focus on essential video editing techniques, using the latest technology available to develop both creative and technical skills. Additionally, the program covers topics related to the Civil Rights Movement and other significant historical events that occurred during the time when The Temptations were gaining fame.

McCullough (2019) states that educators in any grade level face the task of creating a classroom environment that is interactive, collaborative and can cater to the diverse "learning intelligences" of their students. To achieve this objective, theater can be a highly efficient tool as

it has the ability to utilize and combine a wide range of skills and expressive forms.

The use of educational theater can contribute to STEAM programs by providing a flexible and comprehensive medium that allows students to begin with a solid framework, while also giving them the liberty to modify that framework into an entirely new learning encounter. Unlike traditional school plays that typically involve a limited number of students for a brief period, curriculum-based theater can be utilized on a daily basis in every class, with the participation of all students.

According to recent studies, our present educational system is designed to meet the demands of industrial requirements from the 20th century. The needs of 21st century learners will depend on their ability to be creative, to be resourceful and to innovate (O'Neill, 2014). In a survey conducted in 2010, more than 1,500 CEOs of major corporations were asked to identify the most critical attribute they sought in new recruits. Their response was summarized in a single word: creativity. Students who possess creativity (such as those in art or theater), collaborate well (e.g., band or choir), demonstrate ingenuity (e.g., in engineering or industrial technologies), or are imaginative (in any form of arts education) have the potential to become the future leaders of business and innovation (Grant, 2013). Hence, If STEAM educators were allowed to teach using more creative teaching methods and introduce musical theatrical artistic concepts in their instructional design, students may begin to find different interests and passions in this specific content area as well as creative ways to view the theatrical world.

Segarra et al. (2014) states that one way that STEAM classes can incorporate understanding theater firsthand is to apply a "Reader's Theater" class in their lesson planning. This method involves students trying to create a captivating story by reading a script given by their teachers. The script focuses on the subject matter that is of importance. Although typically

used to help students improve their reading fluency and expression, Reader's Theater can also

serve as a means to spark scientific storytelling by asking students to come up with the script

themselves, encouraging them to summarize, analyze, and imagine the content. In addition,

applied and improvisational theater have demonstrated their usefulness in the classroom by

helping students enhance their ability to think quickly on their feet and effectively convey and

connect scientific concepts. This concept also teaches students about theater and how one can

create scenery around them.

Chapter III. Methodology

Design of the Study

      The primary objective of this qualitative study is to investigate the integration of STEAM

education in the creative process and production of musical theater performances. To accomplish

this goal, the study will employ in-depth interviews with individuals who possess experience in

producing musical theater performances that integrate STEAM principles. In addition to

conducting in-depth interviews with individuals who have experience in producing musical

theater performances that incorporate STEAM principles, the study will also utilize observation

as a data collection method. Observations will take place during the rehearsals and performances

of school musical productions where STEAM principles have been incorporated. This will allow

for a deeper understanding of how STEAM principles are being implemented and the impact

they have on the creative problem-solving skills and the overall quality of the performance. The

observation data will be complemented by interviews to gain a more complete understanding of

the experiences and perspectives of those involved in the production of the musicals. The study

will involve a pre- and post-intervention design, where data will be collected before and after the

implementation of STEAM principles in the school musical productions. Additionally, a comparative analysis will be conducted between school musical productions that have incorporated STEAM principles and those that have not, in order to gain insights into the impact of STEAM on the quality of the production.

Participants

In order to select appropriate participants for the study, a purposive sampling method will be utilized. This sampling method will help identify individuals who have been directly involved in producing musical theater performances that involve STEAM education. The participants in this study will be selected based on their expertise and experience in producing musical theater performances with STEAM integration in the Hudson County school districts. The participants will include educators, theater directors, musicians, set designers, lighting designers, sound engineers, choreographers, and performers. The interviews and observations will be recorded and transcribed for analysis, and all identifying information will be removed to protect the anonymity of participants. The interviews and observations will be recorded and transcribed for analysis, and all identifying information will be removed to protect the anonymity of participants.

Data Collection

The data collection techniques for this study will include surveys, in-depth interviews, and observations. These are appropriate methods for collecting qualitative data, as they allow for a deep exploration of the research questions and the subjective experiences of the participants. The surveys will be given to STEAM educators and theater directors at given schools. The in-depth interviews will be conducted with educator directors who have experience in producing

musical theater performances that incorporate STEAM principles. This technique will allow the researcher to obtain rich and detailed data about the integration of STEAM education in musical theater productions. Interviews are particularly useful for exploring complex and multifaceted topics, as they allow participants to speak in their own words and share their perspectives on the subject matter.

Observations will be used to gather data during rehearsals and performances of school musical productions where STEAM principles have been incorporated. This method will provide insights into how STEAM principles are being implemented and the impact they have on the creative problem-solving skills and overall quality of the performance. Observations can be particularly useful for gathering data about behaviors, interactions, and contextual factors that may be difficult to capture through other methods.

By using both in-depth interviews and observations, the researcher can triangulate the data, which can help to increase the reliability and validity of the findings. Triangulation is the process of using multiple methods or data sources to confirm or refute emerging themes, which can help to ensure the credibility and trustworthiness of the study's results.

Data Analysis

The data collected from the interviews and observations will be analyzed using thematic analysis to identify recurring themes and patterns. The analysis will be an iterative process, where new themes may emerge from the data that were not initially identified. Triangulation will be used to ensure the credibility and trustworthiness of the findings, where multiple sources of data will be used to confirm or refute the emerging themes. Finally, the results of the study will

be presented in a comprehensive report that will include quotes from the interviews and

observations to support the findings.

Validity and Reliability

To ensure the validity and reliability of this qualitative study, several measures will be

adopted. Firstly, the study design will be based on established qualitative research principles,

including purposive sampling, which will enable the selection of participants with direct

experience in producing musical theater performances with STEAM integration in the Hudson

County school districts. In-depth interviews will be conducted with participants to gather rich

data on their experiences, perspectives, and practices related to STEAM education in musical

theater.

Secondly, the interview questions will be first pilot-tested with a small group of

participants to ensure clarity and consistency in the questions. Any necessary revisions will be

made before the main data collection phase. The interview questions will be open-ended and

designed to explore participants' thoughts and experiences in depth.

Thirdly, the analysis process will be conducted by two independent researchers to

increase the reliability of the findings. The researchers will engage in a collaborative process of

coding and analysis to ensure that the findings accurately reflect the data. Any discrepancies will

be resolved through discussion and consensus.

Finally, member checking will be used to validate the findings. This involves sharing the

study's preliminary findings with the participants and giving them the opportunity to review and

verify the accuracy of the data. Member checking will help ensure the credibility and

confirmability of the findings by providing an opportunity for participants to clarify any

misunderstandings or provide additional insights. These measures will help ensure the validity

and reliability of the study and strengthen the trustworthiness of the findings.

Ethical Considerations

To ensure the ethical treatment of human subjects, this study will adhere to the guidelines

set forth by the Institutional Review Board (IRB) of New Jersey City University. The IRB will

review the study design, procedures, and informed consent documents to ensure that the study

meets ethical standards. All participants will be informed of their rights and provided with a

consent form that outlines the study's purpose, procedures, risks, and benefits. Informed consent

will be obtained from all participants before their involvement in the study. Any identifying

information will be removed from the data to protect the anonymity of the participants. The

researcher will also take measures to ensure the confidentiality of the data collected throughout

the study.

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Appendix A:
Survey Questions for STEAM Teachers

1. Have you ever incorporated music or theater into your STEAM lessons? If so, could you provide an example of how you did so?

2. Have you ever been involved with a school musical production? If so, in what capacity?

3. Do you have any experience with sound or lighting design? If so, could you describe your experience?

4. Are there any specific STEAM concepts or principles that you think could be particularly relevant to a school musical production?

5. What kind of resources or materials would you need to effectively incorporate STEAM into a school musical production?

6. How do you think STEAM could enhance the overall learning experience for students involved in a school musical production?

7. Have you ever collaborated with music or theater educators in the past? If so, could you describe the nature of your collaboration?

8. Are there any challenges you anticipate facing when trying to incorporate STEAM into a school musical production? If so, what are they?

9. Are there any particular musical productions that you think would be especially well-suited to incorporating STEAM concepts? If so, which ones?

10. Would you be interested in working with a music or theater educator to develop STEAM-based lesson plans or activities that could be used in conjunction with a school musical production?

Appendix B:
Survey for Theater Director of School Musical/Play

1. How do you typically approach set design for a production?

2. How can STEAM students contribute to the set design process?

3. What are some ways that technology can be used to enhance the set design and storytelling?

4. Are there any specific themes or messages that you want the set design to convey?

5. Can you describe any challenges or limitations you face in the set design process, and how can STEAM students help overcome them?

6. How do you incorporate storytelling into the set design?

7. Can you give examples of productions where STEAM students have made significant contributions to the set design or storytelling?

8. How can STEAM students collaborate with the actors and production team to bring the set design to life?

9. Are there any specific skills or tools that STEAM students should have in order to be successful in helping with set design and storytelling?

10. What advice would you give to STEAM students who are interested in pursuing a career in theater design or production?