

Running head: VR & AR IN IMMERSIVE THEATER

INTEGRATING VIRTUAL AND AUGMENTED REALITY WITH IMMERSIVE THEATER:

A QUANTITATIVE STUDY ON

ENHANCING HIGH SCHOOL MUSICAL PRODUCTIONS IN NEW JERSEY

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Chapter I. Introduction

Introduction

The integration of emerging technologies such as virtual and augmented reality (VR/AR) and immersive theater has the potential to transform traditional theatrical experiences, providing audiences with unique, interactive, and engaging performances. In recent years, these technologies have gained significant attention in the entertainment industry and have been utilized in various forms of performances, including music concerts, plays, and operas. However, the application of these technologies in high school musicals is relatively new, and there is a need to explore the feasibility and effectiveness of incorporating VR/AR and immersive theater in such productions.

Statement of the Problem

Despite the growing popularity and potential benefits of virtual and augmented reality (VR/AR) and immersive theater in the entertainment industry, little is known about their effectiveness in high school musical productions, particularly in the context of New Jersey. High school musicals provide a unique opportunity for students to develop their artistic skills and express themselves creatively. However, traditional productions often face challenges in engaging audiences and creating memorable experiences for students and viewers.

Purpose of the Study

The purpose of this dissertation is to explore and evaluate the potential benefits and challenges of incorporating Virtual/Augmented Reality (VR/AR) and immersive theater techniques in New Jersey high school musical productions. The study aims to investigate the ways in which these innovative technologies and theater practices can enhance the students'

learning experiences, engagement, and creativity in musical theater, as well as provide opportunities for more diverse and inclusive storytelling. Additionally, the dissertation seeks to examine the feasibility of integrating VR/AR and immersive theater in the high school curriculum, the costs and resources required, and the potential impact on the wider school community and audience. Ultimately, the study aims to contribute to the development of a framework for implementing VR/AR and immersive theater in high school musicals, which could serve as a model for other schools and theater programs.

Research Questions

This dissertation aims to address this gap by investigating the feasibility and effectiveness of incorporating VR/AR and immersive theater in high school musicals in New Jersey. The study will seek to answer the following research questions:

1. What are the potential benefits and challenges of incorporating VR/AR and immersive theater in high school musicals?
2. How do students, teachers, and audiences perceive the use of VR/AR and immersive theater in high school musical productions?
3. What is the impact of VR/AR and immersive theater on audience engagement, student learning, and artistic expression in high school musicals?
4. How can school districts obtain and utilize VR/AR and immersive theater

By answering these questions, the study aims to provide insights into the potential benefits and challenges of integrating VR/AR and immersive theater in high school musical productions, as well as identify opportunities for enhancing student learning and artistic expression.

Additionally, the study may provide recommendations for the effective implementation of these

technologies in high school musicals, which may contribute to the development of future productions in New Jersey and beyond.

Chapter II. Literature Review

Introduction

In recent years, virtual and augmented reality (VR/AR) technologies have gained increasing popularity and attention in various fields, including education and entertainment. With their ability to create immersive and engaging experiences, these technologies hold great potential for enhancing traditional forms of art and performance, such as musicals. In particular, high school musicals in New Jersey can benefit from incorporating VR/AR technologies to elevate their productions and engage younger audiences. This literature review will explore the ways in which VR/AR can be integrated into high school musicals in New Jersey, including the challenges and opportunities that come with this integration. By examining relevant studies, research, and examples of successful implementations of VR/AR in musical productions, this review aims to provide insights and recommendations for educators, directors, and performers interested in incorporating these technologies into their high school musicals.

Virtual Reality (VR), Augmented Reality (AR), and immersive theater are emerging technologies that are gaining popularity in the entertainment industry. For example, in 2019, the theater department at Olathe Northwest High School in Kansas used VR technology to create a virtual set for their production of "Big Fish." The VR set allowed the actors to interact with virtual elements in real-time, creating a unique and immersive experience for the audience. Similarly, the theater program at St. Mary's Episcopal School in Memphis, Tennessee, used AR

technology to enhance their production of "Beauty and the Beast" in 2018. The AR elements included virtual costumes and props, which allowed the actors to interact with them on stage.

According to Berate (2019), VR/AR can improve musical theatrical live performances by allowing the audience to explore particular components of the portrayal. Insights into the plot, subtitles for the lyrics, labels that indicate the name and role of characters on stage, and a function that tracks the score for a certain theatrical production are just a few examples. Remote involvement in these live theatrical performances is another more advanced use case. The concept is to provide online viewers who are listening to music in real time over the internet the option to walk around or even spin their heads. In this situation, user-customized multimedia streams must recreate the remote environment using 4K spherical video and high-quality spatialized audio.

Gonzalez (2020) conducted a study and discovered that the four motivational factors for students taking visual theatrical courses were very satisfied. Attention, relevance, trust, and satisfaction were recognized as these four motivational variables. Regardless of the level of studies being performed, using an augmented reality module increased student attention compared to a traditional one, helped them understand concepts that were difficult to describe or picture, allowed them to create and manipulate objects, and revealed environmental processes and elements. Gonzalez's study comes to the conclusion that the usage of VR in arts education is appropriate given its enormous potential to introduce students to the idea of using virtual 3D objects and models. This is based on cutting-edge techniques for representing reality via computer software.

Georges (2022) research gave two theater experiences to test subjects. To replicate seeing a stage from a typical audience seat, one subject was shot in 2D. The same topic matter was also

delivered in virtual reality. The study indicated that when compared to a 2D encounter, virtual reality (VR) produced a better sensation of presence, higher engagement, and higher emotional response from an audience and the cast (both self-reported and physiologically tested). Georges's research also explained that the audience can empathize with other people's perspectives, but VR does not make it easier for the audience to fully imagine other people's points of view, which would raise the experience to cognitive empathy. According to the research, active participation, such as conversing with others while participating in an immersive experience, can help people use their imagination to more actively construct and understand another person's experience.

Gale (2018) has researched emerging technology that has been receiving popular interest for theatrical designers. Mixed Reality (MR), a term that was founded by Microsoft, makes it possible for augmented graphics to appear to interact with real objects. In 2017, Cirque du Soleil and Microsoft started working together to create a brand-new program that is rapidly growing the AR design methodology. Using simple geometric forms and Microsoft's HoloLens, a theatrical production team can work together to create a virtual set in actual physical space. A stand-in (a performer in representation) can even enter the scene for scale because of this application's AR capabilities. Gale concludes that before spending too much time and money on a real model, directors and design teams can experiment with virtual models to find the ideal solution. This is ideal for high school musicals that are given a budget. At the early concept stages, set designers may solve complex problems in three dimensions, giving them a more well-informed direction for their design. This concept can be taught to students in a high school setting. And by imparting this technology to today's students, the opportunities will only expand. This will be new knowledge students will learn and take with them after graduation! Although emerging technology is never entirely reliable, it always provides a roadmap for where we might be in the

future. The potential applications of XR technology for theatrical design are only getting started!

These articles tie into the benefits of AR/VR and immersive theater in New Jersey high school musical productions. This concludes that the shows can be more engaging and interactive. Students can also use AR/VR technology to create virtual sets, costumes, and props, which can be interacted with by the actors and the audience. The accessibility will also be a benefit to the school. AR/VR technology can help students with disabilities participate in the production by creating virtual environments that are accessible and inclusive.

Even though the cost will be high when purchasing these products, immersive theater techniques require minimal sets and props, reducing the cost of production. AR/VR technology can also be cost-effective as virtual sets and props can be reused in multiple productions. The students can learn about different technologies and techniques used in theater production, which can prepare them for future careers in the arts.

Chapter III. Methodology

Introduction

High school musicals are a popular and important part of the high school experience. Participating in school theater can have positive effects on academic performance, social skills, and self-esteem (Kokx, 2017). However, there are challenges associated with staging high school musicals, such as limited budgets, small venues, and technical difficulties. Virtual reality (VR) and augmented reality (AR) technologies offer potential solutions to some of these challenges by providing new ways of designing and presenting musical productions.

The use of VR/AR and immersive technology can provide a unique and immersive

experience for the audience. By creating a virtual environment that complements the storyline and theme of the musical, the audience can be transported to a different world, thereby enhancing their overall experience. For example, a production of "The Lion King" could use AR technology to project images of African wildlife onto the stage, creating a more immersive experience for the audience.

The use of VR/AR and immersive technology can also provide students with opportunities to develop a range of skills. For example, students involved in the production of the musical can gain experience in using technology, design, and production. This can be particularly beneficial for those interested in pursuing a career in the performing arts or the technology industry. Additionally, the use of these technologies can encourage creativity and innovation, allowing students to explore new and unique ways of presenting a musical.

The use of VR/AR and immersive technology can also help students to better understand the storyline and themes of the musical. By creating a virtual environment that is in line with the theme and storyline, students can gain a deeper appreciation and understanding of the art form. This can also help students to develop critical thinking and problem-solving skills as they work to integrate the technology into the production.

Research Design

The research problem is to investigate the potential effects of virtual and augmented reality in high school musicals. Specifically, the study aims to explore how virtual and augmented reality technologies can enhance the learning experience of students in high school musicals. This research problem requires the identification of appropriate research questions that can guide the research design.

Hypothesis

H₁: The use of VR and AR design will improve the quality of high school musicals by enhancing the audience experience, increasing engagement, and reducing technical difficulties.

Sampling

A random sample of high schools in NJ that have performed a musical in the past two years will be selected. The sample size will be determined based on the available resources and statistical power calculations.

This study will be based on Bandura (1977) postulate, since we want to demonstrate creating virtual environments that emulate theater in a high school musical setting that can improve students' and audiences' theatrical emotional motivation.

Quantitative Research methods for gathering information are listed below.

- Observations: Observations will include recording the frequency and duration of VR and AR use, as well as the reactions of the performers and audience members in the theatrical high school settings.
- Pre- and Post-Performance Assessments: Pre- and post-performance assessments will be used to collect quantitative data on the impact of VR and AR on the performance quality and audience engagement. Pre-performance assessments can include measures of the performers' skill level and the audience's level of interest in the performance, while post-performance assessments can measure the audience's satisfaction with the performance.
- Quantitative Questionnaire will be given to multiple high school theater teachers in the beginning of this study. Here are the given questions:

1. Have you directed a high school musical that incorporated VR/AR or immersive theater techniques?
 - a. Yes, I have successfully incorporated VR/AR and immersive theater techniques in a high school musical
 - b. No, I have not incorporated VR/AR or immersive theater techniques in a high school musical
 - c. I have attempted to incorporate VR/AR or immersive theater techniques but was unsuccessful

2. How do you feel about using VR/AR and immersive theater techniques in high school musicals?
 - a. I strongly support the use of VR/AR and immersive theater techniques in high school musicals
 - b. I am open to using VR/AR and immersive theater techniques in high school musicals but have concerns
 - c. I am not in favor of using VR/AR and immersive theater techniques in high school musicals

3. What are some concerns you have about incorporating VR/AR and immersive theater techniques in high school musicals? (Select all that apply)
 - a. Cost of equipment and technology

- b. Complexity of incorporating technology into the production
 - c. Fear of detracting from traditional theater experiences
 - d. Risk of technical difficulties during performances
 - e. Lack of training or expertise in using VR/AR or immersive theater techniques
 - f. Difficulty in finding appropriate content or material to incorporate into the production
4. How do you think the use of VR/AR and immersive theater techniques can enhance a high school musical production?
- a. It can provide a unique and immersive experience for the audience
 - b. It can enhance the visual and audio aspects of the production
 - c. It can engage a younger generation of theater-goers
 - d. It can allow for more creative and imaginative storytelling
 - e. It can provide a platform for experimentation and innovation in theater
5. Would you consider incorporating VR/AR and immersive theater techniques in future high school musical productions?
- a. Yes, I am open to exploring the use of VR/AR and immersive theater techniques in future productions

- b. No, I am not interested in incorporating VR/AR or immersive theater techniques in future productions
- c. It depends on the availability of resources and support from the school and community.

Proposed timeline for conducting quantitative research on the use of AR/VR in high school musical settings.

- Month 1-2: Literature Review
- Conduct a thorough review of the existing literature on the use of AR/VR in theater productions, including high school musicals. Identify the gaps in the research and formulate research questions.
 - Month 3-4: Sample Selection
- Identify a representative sample of high schools that have recently staged musical productions. Develop criteria for sample selection and recruit schools from different regions and demographics.
 - Month 5-6: Data Collection Tool Development
- Develop a survey questionnaire that collects data on technical difficulties, budget, audience engagement, cast and crew engagement, and the use of AR/VR technology in high school musical productions.
 - Month 7-8: Pilot Study
- Conduct a pilot study to test the effectiveness of the survey questionnaire, refine the data collection tool, and identify potential issues with data collection or analysis.
 - Month 9-12: Data Collection

- Administer the survey questionnaire to the selected high schools, collect the data, and perform quality checks to ensure the accuracy of the data.
 - Month 13-14: Data Analysis
- Analyze the collected data using descriptive statistics and inferential statistics to test the hypothesis that the use of AR/VR technology will improve the quality of high school musical productions.
 - Month 15-16: Intervention
- Provide AR/VR design support to the high school theater programs that participated in the study, and measure the impact of this intervention on the quality of their subsequent musical productions.
 - Month 17-18: Data Analysis and Interpretation
- Analyze the data collected after the intervention, compare the pre- and post-intervention results, and interpret the findings in light of the research questions and hypotheses.
 - Month 19-20: Report Writing and Dissemination
- Prepare a final report of the research findings and disseminate the results to stakeholders, including educators, school administrators, theater professionals, and researchers. Present the results at relevant conferences or symposia to engage with the broader community of scholars and practitioners.

Note: The timeline is flexible and subject to adjustment based on the availability of resources, personnel, and unforeseen challenges. It is important to plan for contingencies and allocate adequate time for each phase of the research process to ensure the validity and reliability of the results.

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