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Virtual Reality for Public Speaking Rehearsals: Student and Faculty Perceptions

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ABSTRACT

Speeches and speech rehearsals are an important part of many basic communication courses. However, instructors are developing new ways for students to rehearse their speeches every day; one way may be for students to use virtual reality. Although virtual reality is somewhat of a new innovation, it is effective in various settings, including higher education, and more specifically, the speech classroom. However, this efficacy may not matter if students and instructors are unwilling to adopt it into the classroom. Diffusion of innovation theory, developed by Rogers (2003), focuses on how an innovation is diffused and adopted. Using two of the five attributes of an innovation (i.e., relative advantage and complexity), this thesis examines student and instructor perceptions of virtual reality. Results from the study showed that students and instructors perceived that complexity (i.e., ease of use) was significantly related to attitudes towards VR adoption. Results also showed that relative advantage was significantly related to VR adoption attitudes for students and instructors. Lastly, students and instructors had significantly different perceptions of ease of use but did not have significantly different perceptions of relative advantage.

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CHAPTER I

INTRODUCTION

Virtual reality (VR) is a new but rapidly growing tool for educational use in higher education. Research thus far has demonstrated that VR holds promise as a tool to enhance learning (Lee et al., 2017) and specifically to enhance efficacy within the Human Communication classroom (Frisby et al., 2020). If widely adopted, VR may one day be as ubiquitous in public speaking rehearsals as video recording devices are today (Frisby et al., 2020). However, the diffusion of innovation theory proposes if there are negative perceptions of an innovation, that innovation is not likely to be widely adopted, regardless of its utility (Rogers, 2003). Therefore, understanding student and instructor perceptions of VR for public speaking rehearsal provide valuable insight into its potential adoption for educational usage and what adaptations may be needed to advance adoption. Thus far, the perceptions of student use of VR for public speaking rehearsals are limited to only one study (Vallade et al., 2020), and no study on instructor perceptions on the use of VR for public speaking rehearsals appears to exist.

This introduction chapter includes a brief overview of the basic communication course as part of the Human Communication discipline, the past and present use of technology in the basic communication course, a description of VR as an emerging technology, potential uses of VR in higher education, and the basic communication course, the context of the COVID-19 pandemic on instructors use of technology in higher education and diffusion of innovation theory. While some elements of this introduction,

such as VR and diffusion of innovation theory, will be discussed in greater detail in the literature review, it is important to understand the context and relevance before reviewing past studies.

An introductory course on the fundamentals of public speaking and Human Communication, often referred to in the literature as the *basic communication course*, is a foundational course within higher education institutions (Morreale et al., 2016). Many basic Human Communication courses focus on public speaking alone; however, some basic courses consist of a blended curriculum which includes "interpersonal, small group, and/or public speaking contexts all in one course" (Morreale et al., 2016, p. 341). The basic communication course continues to hold its value partly due to the desire to have employees who can effectively communicate in the workplace (Morreale et al., 2016). The basic communication course's beginnings are traceable to Plato, Aristotle, and the Roman Empire (Valenzano et al., 2014). However, the basic communication course looks very different today than when it first started and may continue to change in the future (Valenzano et al., 2014).

Many of the topics covered in a contemporary basic communication course focus on the "communication process, ethical communication (includes plagiarism), public speaking, critical thinking, listening, communication confidence," and a wide variety of other topics (Morreale et al., 2016, p. 347). While the basic communication course may seem elementary, it can be an excellent building block for students, instructors, and researchers to serve "as a laboratory for new instructional practices, and as one of the primary locales for the study of instructional communication" (Valenzano et al., 2014). One feature of the basic communication course that makes it appropriate as a focus of

research for this study is the ability to integrate new changes and techniques, including technology.

The integration of technology use for public speaking rehearsal in the basic communication course has changed over time with the introduction of new technologies (Elmer, 2007). The basic communication course has often adopted new technology, and a high level of importance has been placed on technology, even historically (Muchmore & White, 1976). Previous examples of technology adoption in the basic communication course included audio recording technologies such as reel-to-reel tapes, cassette tapes, and now digital media; video recording technologies, such as film, video cassette recorders (VCRs) and digital video capture devices; and presentation technologies such as paper-based charts, slides, and now digital video projection and computer displays (Elmer, 2007).

These historical, technological interventions in the basic communication course have led to increased academic gains. For example, one technique that was innovative at its time of initial use was interactive video (Cronin & Kennan, 1994). Instructors could record lessons, and students could interact with the video and respond (Cronin & Kennan, 1994). Interactive videos have been used in public speaking courses to help reduce speaking anxiety, outline writing, create better introductions, and improve listening skills (Cronin & Kennan, 1994). Implementing audiotaped lectures became another technological communication used in the basic course (Mino & Butler, 1995). Additionally, instructors have often used new technologies such as computer-mediated communication for out-of-class assignments or group activities (Phillips & Santoro,

1989). While some of the technology used historically is still being used today, there are new ways to use it and new technologies to integrate.

More recently, instructional technology usage in a basic communication course often includes watching pre-recorded speeches via video for peer evaluation, as well as in-classroom filming of speeches for self-evaluations. Many instructors utilize video recordings for student self-evaluations to help students target areas to improve and recognize strengths (LeFebvre & LeFebvre, 2018; Opt, 2012). Instructors also often use video formats to present information and lectures to students (Morreale et al., 2016; Pecot-Hebert, 2012). Another form of technology use is video feedback. This feedback from instructors provides students a way to watch the video performance of their speech; this resulted in increased speech skills from the students (Russell, 1993). Other video techniques can include students using mobile phones for classroom activities (Frisby, 2017; Ober et al., 2020). Students can use mobile phones to record their speech rehearsals and work with other classmates to watch and evaluate personal speeches using their mobile phones (Frisby, 2017).

The basic communication course can also increase media literacy and use technology to enhance media literacy (Cramer, 2015). An educational objective of many basic communication courses is for students to develop their critical thinking skills, such as increased media literacy (Cramer, 2015). An understanding of digital media use is also becoming increasingly important with the increase in technology (Cramer, 2015). Technology and digital communication skills are an important part of the basic course and can help prepare students for their careers (Edwards, 2021). Instructors may also

create assignments for students to use social media and make posts on various social media platforms (Frisby, 2017).

Integrating instructional technology will continue to be critical to the advancement of the basic communication course (Elmer, 2007). As technology use has increased in higher education and in the basic communication course classroom, "the role of basic communication instructors in embracing and capitalizing on these changes to engage students and better position the basic communication course, becomes critical" (Frisby, 2017, p. 79). One emerging technology basic communication course instructors may find of value in engaging students is with VR, especially for use in student public speaking rehearsals.

VR is an immersive technology accessed through mediums such as head-mounted displays and simulators. VR is proliferating in popularity globally, with an estimated 26 million headsets owned worldwide (Osterland, 2020). The VR industry growth has the potential to reach 21.6% from 2020 to 2027 (Grand View Research, 2020). Current events such as the COVID-19 pandemic may further increase the use of VR for educational and entertainment purposes (Osterland, 2020).

Potentially, VR may be a valuable innovation for use in public speaking rehearsals. For example, previous studies have demonstrated efficacy for student public speaking rehearsals, such as using VR for speech rehearsals has been shown to improve student grades in public speaking (Lee et al., 2020). VR can also elicit a powerful emotional response, and students may react differently based on virtual audience reactions (Mabrook & Singer, 2019; Pertaub et al., 2002; Slater et al., 1999). VR also

demonstrated that it increased students' self-efficacy in public speaking (Frisby et al., 2020).

However, without comprehension of how instructors and students view VR and whether they wish to adopt it, this tool's effectiveness holds little value (Vallade et al., 2020). Understanding students' and instructors' perspectives may provide a more well-rounded assessment of VR's place for public speaking rehearsals. If one or both groups express negative perceptions of VR, this would likely hinder the adoption rate for public speaking rehearsals. If students or instructors are unwilling to use VR or view it unfavorably, it will be challenging to integrate it into the classroom.

Any current discussion of potential adoption of technology in education must consider the arrival of the COVID-19 pandemic. The interruption of "traditional" instruction has dramatically increased the amount of technology used across almost all disciplines at all institutions (Klein & Liang, 2020; O'Brien, 2020). Heavy use of technology is anticipated to continue even after the pandemic is over (How Technology Can Help Higher Education, 2021). The increase in technology usage during the pandemic, however, has not come without its challenges (Klein & Liang, 2020; O'Brien, 2020). Now more than ever, instructors are using technology in their daily lives (McDaniel et al., 2020), but their experiences may not have always been positive (Lederman, 2020). Despite these challenges, "many rose to the occasion and reported positive experiences" (McDaniel et al., 2020).

Diffusion of innovation theory is an appropriate lens for studying student and instructor perceptions of instructional technology (Stark, 2018; Warford, 2017). Diffusion of innovation theory focuses on the decision process of adopting an innovation, like VR,

among a population (Rogers, 2003). This theory also provides insight into what makes their potential adoption successful or unsuccessful (Rogers, 2003). Therefore, given that instructors and students are just now beginning to explore the adoption of VR for public speaking rehearsals, Rogers' theory provides an appropriate theoretical framework for identifying what perspectives might lead instructors or students to employ VR for this purpose.

Using the attributes of diffusion of innovation theory may also help predict what technological affordances may make VR successful or unsuccessful as a tool for public speaking rehearsals. For example, Vallade et al. (2020) analyzed student perceptions of VR for public speaking rehearsals. However, this researcher located no studies involving instructor perceptions during the review of literature. Thus, further research is necessary to better understand student perceptions and explore instructor perceptions of VR through the lens of diffusion of innovation theory.

This introduction provided an overview of the basic communication course as part of the Human Communication discipline, the past and present use of technology in the basic communication course, a description of VR as an emerging technology, potential uses of VR in the basic communication course, the context of the COVID-19 pandemic on instructors use of technology in higher education, and an introduction to the diffusion of innovation theory. This thesis continues with a discussion of the literature, the hypotheses and research question, methods used, results of the study, and a discussion of the findings conclude this thesis.

CHAPTER II

LITERATURE REVIEW

This review of literature explores the definition of virtual reality (VR), VR in the classroom, an exploration of the diffusion of innovation theory, the attributes of an innovation, as well as specifying the hypotheses and research question for this study. The following paragraphs overview current therapeutic uses of VR, uses in K-12, uses in higher education, and uses explicitly in public speaking. Most applicable to this study is the literature review regarding student perceptions of VR for public speaking rehearsals. However, during this review, no study was located which focused on instructors' perceptions of the uses of VR for public speaking rehearsals. The literature review continues by providing an overview of the theoretical framework used. This portion of the literature review also includes diffusion of innovation theory's elements, specifically focusing on the attributes of an innovation and existing research using diffusion of innovation theory. This review ends with the study hypotheses and a research question regarding student and instructor perceptions of VR.

Virtual Reality

This section of the literature review explores what VR is, the history of VR, the therapeutic uses of VR, the use of VR in the classroom, and the use of VR in the public speaking classroom. VR is an immersive, sensory technology accessed through head-mounted displays, simulators (e.g., flight or medical simulators), bodysuits, immersive screens, or some combination of the above (Lee et al., 2017; Makransky & Lilleholt,

2018; Merchant et al., 2014). VR provides an immersive environment in which a person can directly interact with an information technology system (Lee & Wong 2014; Makransky & Lilleholt, 2018). As an immersive technology within a simulated environment, VR offers great promise for education (Valenti et al., 2020). For example, students in a public speaking rehearsal setting could wear a VR headset displaying an animated audience that simulates a public speaking scenario while sensors within the VR equipment record biometric data from the user, such as eye contact or speaking rate (Farley et al., 2020).

History of VR

The earliest VR concepts began in the 1950s, with popularity increasing quickly during the 1990s as technology reached the ability to simulate VR more affordably (Merchant et al., 2014). One of the first VR-like creations was the Sensorama machine, created in 1957, which was described by authors as "an arcade-style theatre cabinet which featured stereo speakers, a stereoscopic 3D display, fans, smell generators, and a vibrating chair" (Correia Loureiro et al., 2020, p. 2). While this device was not interactive, it had features resembling modern VR environments (Mandal, 2013). After the development of the Sensorama, VR continued to push the boundaries of capabilities throughout the following decades, including creating the first head-mounted display in 1965 by Ivan Sutherland (Correia Loureiro et al., 2020; Mandal, 2013). Developments continued to progress and become more accurate and complex as technology developed. The term "virtual reality" was not coined until the late 1980s by Jaron Lanier (Correia Loureiro et al., 2020).

Once more advanced technological capacity became available in the 1990s, VR developments began expanding more rapidly (Merchant et al., 2014). One example of these developments was CAVE (CAVE Automatic Virtual Environment); researchers projected images onto the walls of a room, and users wore LCD shutter glasses, allowing them to explore in an entire room (Mandal, 2013). Later, VR continued developing with the introduction of virtual world applications, such as SecondLife, more advanced head-mounted displays, such as the Oculus, and rapid developments in gaming and immersion techniques, such as 360-degree VR treadmills (Correia Loureiro et al., 2020).

A review of the history of VR cannot ignore the increasing influence the gaming world has on advancing VR and other similar technology like augmented reality (AR). Many VR/AR advancements have been due to the gaming industry, with a projected $92.31 billion market size by 2027 (Grand View Research, 2020). While there have been many VR developments in hardware and software, there are still areas for improvement, such as motion sickness reduction and eye fatigue (Correia Loureiro et al., 2020; Mandal, 2013). With additional innovations and advances, VR is becoming more affordable and immersive over time (Farley et al., 2020).

Therapeutic Uses of VR

Understanding the therapeutic uses of VR can inform the use of VR in public speaking contexts and thus warrants review. Documented uses of therapeutic VR have included the fear of public speaking, which demonstrated reduced anxiety and phobia symptoms (Parsons & Rizzo, 2008). Reducing speech anxiety symptoms was evident in VR speech rehearsals (Menzel & Carrell, 1994). Speech rehearsals and the amount of time rehearsing speeches are related to speech delivery (Menzel & Carrell, 1994). While

it is important to practice speeches, differences in the location of the practice may affect outcomes (Menzel & Carrell, 1994). Speeches practiced in areas more similar to the presentation location are more likely to be successful (Delivering Your Speech, n. d.). While practicing the speeches where presented can be extremely helpful, it may not always be feasible. However, VR can allow students to practice their speech in a virtual environment similar to the setting where they will present (Frisby et al., 2020). Using VR as a therapeutic tool may be able to assist in speech rehearsals. There are two main types of VR therapy identified in the literature being used today: cognitive-behavioral therapy and virtual reality exposure therapy.

Cognitive-behavioral therapy, best conceptualized as "a common type of talk therapy . . . cognitive-behavioral therapy helps you become aware of inaccurate or negative thinking so you can view challenging situations more clearly and respond to them in a more effective way" (Mayo Clinic, n.d.). Early studies looked at the possibility of combining VR and cognitive-behavioral therapy (Lister et al., 2010). Once it was determined VR and cognitive-behavioral therapy worked well together, researchers like Safir et al. (2012) and Anderson et al. (2005) looked at their effectiveness. Their studies indicated VR effectively treated fear of public speaking. While VR may reduce public speaking fear, enrollment in a basic communication course may also have the same effect (Rubin et al., 1997). Therefore, using VR in a basic course may help reduce the fear of public speaking in multiple ways.

Virtual reality exposure therapy describes being "immersed in a VE [virtual environment], they can be systematically exposed to specific feared stimuli within a contextually relevant setting" (Parsons & Rizzo, 2008, p. 251). Virtual reality exposure

therapy has become more widely popularized as the technology required to operate a therapy session successfully is more affordable, easy to use, and readily available (Parsons & Rizzo, 2008). Virtual reality exposure therapy works on people with and without diagnosed anxiety disorders; it also can result in an increased reduction in those with higher levels of anxiety (Stupar-Rutenfrans et al., 2017). The majority of virtual reality exposure therapy was conducted on adult participants, with a notable subset of college-age participants (Cornwell et al., 2005; Harris et al., 2002; Scheveneels et al., 2019; Stupar-Rutenfrans et al., 2017). While the research conducted on children is limited, the results are consistent with adult findings (Kahlon et al., 2019). Researchers have found similar results using systematic desensitization, as another technique applicable in the basic course in tandem with VR (Hopf & Ayres, 1992).

VR in the Classroom

While the public perception of VR may be that of an entertainment device, its use and popularity as an educational tool are well recognized. Many examples of academic studies using VR utilize a head-mounted display. Head-mounted displays fit over the head with the viewing lenses centered over the eyes. These affordable VR headsets used in education can range in size, ease of use, and price ($10 – $500+). One example of a highly affordable head-mounted display is Google Cardboard which, as its name suggests, is a foldable piece of cardboard in which a smartphone can be inserted and is used casually in college classrooms (Lee et al., 2017). However, higher-end and more complex headsets have built-in 4K displays with stereo sound and embedded sensors to measure movement, often utilized in research laboratories (Radianti et al., 2020). When determining the correct type of VR hardware, it is essential to consider the application

and desired outcome (e.g., public speaking rehearsals). Other VR applications in education have uses within the classroom, such as vocational training, K-12, and higher education. A key theme of VR in education is helping students develop 21st-century skills (Maas & Hughes, 2020; Papanastasiou et al., 2019).

Studies on the use of VR in the K-12 classroom are limited and focus on critical thinking skills, student participation, and creativity (Maas & Hughes, 2020; Merchant et al., 2014; Papanastasiou et al., 2019). Despite limited research on VR in K-12, some have suggested it has the potential to be "an effective tool to enhance learning and memory as they provide immersed multimodal environments enriched by multiple sensory features" (Papanastasiou et al., 2019, p. 434). Therefore, if this advancement in K-12 does take place, these students have the potential to be more familiar with and have prior experience with VR when advancing to the higher education classroom, thus providing a more seamless transition.

While the potential of VR as a learning tool in K-12 may be promising, the focus of this thesis study and thus this literature review is within higher education. Existing research on VR in higher education settings spans multiple disciplines. An application-based experience allowed nursing students to work through potential problems without potentially injuring a patient (Rim & Shin, 2021). VR has also been used to train future teachers by creating a 3D learning environment, allowing them to work through problems and interact with their peers (Nissim & Weissblueth, 2017). Nissim and Weissblueth (2017) found future teachers developed creative and critical thinking skills, had a better grasp of technology, and developed creativity in teaching, among other outcomes. Overall, both Rim and Shin (2021) and Nissim and Weissblueth (2017) documented how

VR allows higher education students to explore and advance their skills in a low-risk setting. Further, Lee et al. (2017) propose that VR may also have "the potential to make learning more enjoyable by allowing students to translate their personal experiences, emotions, and memories to the virtual environment" (p. 157).

Going further, Lee et al. (2017) studied the novelty, interest, reliability, understandability, and usage enjoyment of content delivered via VR. According to Lee et al. (2017), participants in this study were placed in either an immersive VR environment or flat-screen control group and viewed the same informational video about mountain climbing in Nepal. Users in the VR groups reported significant increases in interest and enjoyment levels (Lee et al., 2017). This increase in interest and enjoyment indicates students found VR enjoyable, and Lee et al. (2017) propose the VR intervention may lead to more engaged learning.

VR in the Public Speaking Classroom

Researchers have studied the use of VR within the discipline of Human Communication and public speaking courses. One of the earliest studies on using VR in public speaking focused on positive or negative audience reactions (Slater et al., 1999). The results from this study inspired other researchers to study the use of VR in public speaking rehearsals. Pertaub et al. (2002) also looked at positive and negative audience reactions; however, these reactions are not only limited to the virtual audience but can impact the user as well. Mabrook and Singer (2019) discuss how immersion with 360-degree video can elicit a powerful emotional response within the user. Some of the elements in public speaking rehearsals that can impact this type of emotional response have to deal with the virtual environment's realism (Felnhofer et al., 2014). Additionally,

using VR to practice public speaking has been shown to lead to higher grades (Lee et al., 2020). Teaching real-world life skills and application is often an objective of public speaking courses, and two studies suggest skills acquired while using VR appear to transfer to the real world (Frisby et al., 2020; Palmas et al., 2019).

Furthermore, using VR as a practice tool may increase students' self-efficacy (Frisby et al., 2020). Most applicable to this study, Vallade et al. (2020) analyzed students perceived usefulness of VR for public speaking rehearsals. Vallade et al. revealed students did have positive experiences and viewed VR as helpful for speech rehearsals. However, this study only researched students' perspectives and did not include instructors in the study. Because instructors are most likely to implement VR-based public speaking rehearsals, it is critical to consider their perspectives as well. However, this review of literature did not discover existing research focusing on instructor perspectives of VR.

Diffusion of Innovation Theory

This portion of this literature review will detail how diffusion of innovation theory started, current applications, similar models, its elements, and the hypotheses and research question. Diffusion of innovation theory was first created in 1903 by Gabriel Tarde, but it became popularized and further developed in 1971 by Everett Rogers (Sartipi, 2020). Although Rogers passed in the early 2000s (Obituary Everett Rogers, 2005), his work still holds essential value in communication and innovation studies today. Diffusion of innovation theory focuses on how innovations are dispersed and adopted into society (Rogers, 2003). Diffusion is defined as "the process in which an innovation is communicated through certain channels over time among the members of a

social system" (Rogers, 2003, p. 5). Rogers defined the activity of deciding to adopt or reject an innovation as the innovation-decision process. This process may seem like it is void of interaction, but at its core, diffusion of innovation is a communication process (Singhal, 2009).

Throughout the years, the examples of and application of diffusion of innovation theory have changed. In earlier versions of Rogers' (1962) *Diffusion of Innovations*, he uses examples of farmers in Iowa. However, in his book's later editions, he includes more current references, such as various technologies developed in the late 1990s (Rogers, 2003). The fifth and most recent edition included many examples of the internet and how it changed the diffusion process (McGrath & Zell, 2001).

Diffusion of innovation theory applies to various industries such as government and economics, technology, and education (Perilla Jimenez, 2020; Reddick et al., 2019; Vollink et al., 2002). In an analysis of blockchain distribution in the public sector, Reddick et al. (2019) used diffusion of innovation theory to analyze multiple nations' use and distribution. Blockchain technologies are being adopted and are proven to be beneficial for governments (Reddick et al., 2019). Another example of diffusion of innovation theory is to predict the intention to engage in energy conservation interventions (Vollink et al., 2002). Perilla Jiménez's (2020) research focuses on the rate of economic growth and development through the lens of diffusion of innovation theory. Frequently used to study technology and technological advancements; one example is the adoption of banking apps in Saudi Arabia (Al-Jabri & Sohail, 2012). These examples of government and economic analyses of diffusion of innovation theory show positive results and positive progress towards adopting these innovations (Perilla Jimenez, 2020;

Reddick et al., 2019; Vollink et al., 2002). However, this adoption is most likely slow and will take longer than more commercial and profitable innovations (McGrath & Zell, 2001).

Technological contexts are another area where diffusion of innovation theory is observable. One application of the diffusion of innovation theory can be visible in smartphone applications such as Twitter and Uber. Twitter users can hashtag messages with the # symbol; hashtags group similar tweets, and users can view other tweets tagged with the same messages and engage with other users (Chang, 2010). Chang's (2010) article follows the lifecycle of a hashtag and how specific hashtags become trending. Min et al. (2019) used diffusion of innovation theory to focus on the perceived usefulness and ease of use of the popular ride-share app, Uber. This study's findings indicate that when both perceived usefulness and perceived ease of use are high, consumers are more willing to adopt an innovation, in this case, Uber (Min et al., 2019). While these results are focusing on a ride-share app, these positive results indicate these two factors are critical to the adoption of an innovation. Both of these applications are popular and can be good examples of how non-physical technological applications spread.

There are other examples of more conceptual technologies like green information technology or technology companies that place a high level of importance on corporate social responsibility (Thomas et al., 2016). Green information technology companies can focus on clean energy, carbon offset, sustainable material acquisition, social and environmental integrity (Thomas et al., 2016). If companies understand users are switching to companies offering these initiatives and who adopt these green practices, they stand to gain more users in the long run (Thomas et al., 2016). In examples such as

green information technology, it is easy to see how consumer power and desire can inform company behavior. Diffusion of innovation theory applies to many different concepts and industries, not limited to the research detailed above.

Information and communication technologies are recent technological advances that are changing education. E-learning or web-based education are two examples of information and communication technologies examined using the diffusion of innovation theory (Goh & Sigala, 2020; Ntemma & Olatokun, 2012). The use of diffusion of innovation theory can also be visible in the implications of universally designed college instruction (Scott & McGuire, 2017) and the adoption of geospatial technologies for classroom use (Curtis, 2020). Diffusion of innovation theory in education applies to various courses and areas of study (Curtis, 2020; Scott & McGuire, 2017).

While diffusion of innovation is the primary theory presented in this study, it is critical to acknowledge similar models and concepts, specifically the Bass model, technology acceptance model, and the Gartner Hype Cycle. One similar model to the diffusion of innovation theory is the Bass (1969) model, which explains the number of adopters is almost identical to sales numbers (Chang, 2010). However, unlike the Bass model, diffusion of innovation theory "serves as a comprehensive framework for understanding diffusion process of an innovation and its underlying factors driving the diffusion" (Chang, 2010, p. 2). The technology acceptance model is also widely used when discussing an individual's acceptance of information technology (Min et al., 2019; Moore & Benbasat, 1991). Despite the technology acceptance model including similar features to diffusion of innovation theory, "it has been criticized for not fully reflecting the nature of consumer adoption" (Min et al., 2019). The Gartner Hype Cycle is another

similar model that follows how technological innovations are adopted in a bell curve-like shape characterized by the trough of disillusionment (Lajoie & Bridges, 2014). However, diffusion of innovation is more specific regarding an innovation's characteristics (Min et al., 2019). The author of this thesis selected diffusion of innovation theory due to its specificity over the technology acceptance model over the Gartner Hype Cycle.

Understanding the value that an innovation perceived by users can help explain why it is being adopted or rejected. One quote that gives weight to the value of innovations is "with each further adopter it becomes more valuable, not just to all future adopters, but to all past adopters as well (McGrath & Zell, 2001, p. 389). If students and instructors begin adopting VR, it should become more valuable to past, present, and future users as adoption increases. This increase in adoption may encourage VR companies to create more advanced versions, which further assist in pushing VR through the innovation adoption process.

Rogers (2003) suggests with the introduction of an innovation, the innovation goes through a multifaceted process as it is adopted called the innovation-decision process. The innovation-decision process consists of five stages: knowledge, persuasion, decision, implementation, and conformation (Rogers, 2003). A description of each of the five follows.

In the *knowledge stage*, potential adopters learn an innovation exists, how it works, and why it works (Scott & McGuire, 2017). During the knowledge stage, an innovation's proponents must get the message to potential adopters to provide awareness. Companies frequently advance through the knowledge stage by repeating a standard message (Sartipi, 2020). Therefore, it follows that repeating a standard message of VR's

usefulness as an academic tool will likewise drive VR adoption in higher education. For example, students or instructors who may be familiar with VR in video games but not for speech rehearsals will thus need to see and experience VR public speaking settings. During the *persuasion stage*, the potential adopter forms a favorable or unfavorable opinion about the innovation, which ultimately leads to adopting or rejecting the innovation (Rogers, 2003). As an emerging technology, instructors and students are forming their opinions of VR more broadly, and these opinions will be critical to the implementation and future adoption of VR as an academic tool. In this stage, positive perceptions of VR can be helpful as students and instructors may be more willing to try something they have seen positively in the past. The *decision stage* happens when the user decides to adopt the innovation. Early in this stage, users may conduct a cost/benefit analysis to further research and determine its potential value (Sartipi, 2020). In education, the cost/benefit analysis would likely be performed by potential adopters using the metrics of time to implement versus the potential for positive academic outcomes. Again, positive perceptions and positive research results of VR for public speaking rehearsals are likely to boost the potential for positive outcomes.

The *implementation stage* starts when the user begins using the innovation for the first time. Good user support is critical in this phase, as difficulty during first-time use can lead to discontinuance (Sartipi, 2020). In the context of public speaking rehearsals, a departmental chair or dean would likely decide on adoption, and faculty would follow through with implementation. Support could come from the institution's information technology department or specially trained students or faculty within the department. Lastly, the *confirmation stage* occurs, defined as when an individual decides to keep

using the innovation or abandon it (Scott & McGuire, 2017). Positive results from a high percentage of individuals and institutions will likely lead to the continuance of VR for public speaking rehearsals and may expand to other applications in other disciplines.

The time this five-stage process takes can vary from individual and innovation (Rogers, 2003). Some innovations move through more quickly than others. In an interview with McGrath and Zell (2001), Rogers noted that commercial innovations are more likely to be rapidly adopted, whereas medical or nonprofit innovations tend to diffuse more slowly. Higher education, being more similar to medical and nonprofit, will likely take longer to reach the confirmation stage than gaming or other more commercial VR uses.

Adoption is visualized on a bell curve where potential users are stratified into five different categories (Rogers, 2003). According to Rogers, the first group, *innovators*, are risk-takers and the first to adopt an innovation. These risk-takers will try an innovation even though no one else has; they are willing to accept uncertainty and setbacks while adopting an innovation (Goh & Sigala, 2020). Rogers defined the second group, *early adopters*, as those who wait for significant problems to be resolved by the innovators but are still willing to accept some uncertainty. Early adopters are also seen by peers as opinion leaders (Rogers, 2003). Having opinion leaders give positive feedback to potential VR adopters is vital for reaching subsequent phases of adoption. The third and fourth groups are the *early and late majority*, who adopt as innovations hit the "mainstream" or "critical mass" (Rogers, 2003; Sartipi, 2020). Typically, these two groups wait for the resolution of most, if not all, significant issues and uncertainty. Lastly are the *laggards* who resist innovations or postpone until adoption is absolutely necessary

(Rogers, 2003). Laggards often believe "personal resources are scarce, and they want to be absolute certain the adopted innovation will definitely work" (Goh & Sigala, 2020, p. 162).

As the innovations move through the adoption cycle, various groups are in different parts of the innovation-decision process (Rogers, 2003). Innovators and early adopters who have already advanced to the usage stage become opinion leaders for the early majority and late majority (Goh & Sigala, 2020; Rogers, 2003). Having these opinion leaders as advocates of an innovation is critical to the continued adoption of innovation. Given that VR for public speaking rehearsals is not yet a widely adopted innovation, it most likely exists on the early half of the adoption curve, where advocacy from innovators and early adopters becomes important for sustained adoption. While it can be hard to predict precisely where VR for public speaking rehearsals is on the adoption curve, the appearance of examples of early adoption in academic research provides evidence that innovators and early adopters have begun the experimentation process, and their published results will begin to offer insight into the progress toward large-scale adoption or indifference (Frisby et al., 2020; Vallade et al., 2020).

While VR as a technology has been around for decades, it has not yet reached mainstream use; therefore, some authors argue that the COVID-19 pandemic may jump-start VR adoption due to many people staying home and experimenting with technology (Osterland, 2020). Still, with the potential of increased experimentation, adoption is not guaranteed. VR has historically faced barriers in adoption, such as high costs, poor marketing, motion sickness, and ergonomic challenges (Mandal, 2013; Osterland, 2020). While these barriers have not hindered early innovators, it must be noted that VR has not

yet reached the early majority adoption group. However, if the market continues to grow as barriers are reduced, the adoption of the early majority would be on the near horizon (Grand View Research, 2020). As the COVID-19 pandemic has demonstrated, mainstream technology adoption within higher education has become a key topic for discussion (Prentiss, 2021).

Attributes of an Innovation

As innovations are being adopted, an innovation's attributes become indicators of an innovation's success or failure. These five attributes are defined as *compatibility, trialability, observability, complexity,* and *relative advantage* (Rogers, 2003). Rogers (2003) suggests there is a "49 to 87 percent variance in the adoption rate" from these attributes, meaning they contribute to a large portion of determining if an innovation will be adopted (p. 221). The following paragraphs discuss each of these attributes and how they relate to VR adoption in public speaking.

Compatibility is defined as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 240). The attribute of compatibility within VR in education could be how it fits into the plans and style of potential student or faculty adopters. For example, if an institution has a communication center, allowing VR use for rehearsals may be compatible with their current processes. Compatibility explains how users' past experiences will inform their future adoptions, and it must include their lifestyle choices (Min et al., 2019). Part of successful compatibility requires significant thought behind whether the user believes it would be compatible with their lifestyle, which creates some complexity. This attribute was not included because students and instructors may not

know how VR would be compatible in their classrooms, and students and instructors would likely think about compatibility very differently. Instructors would likely be considering how to implement VR whereas students would just think about how to use VR. It can also be hard to determine if an innovation is compatible without the following attribute.

Next is *trialability*, or "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 258). Trialability allows potential adopters to find ways to give meaning to innovations on their terms. Participating in VR trials before a sizeable financial commitment may help students and instructors be convinced of its value and compatibility. Studies in the past have included VR trials for public speaking rehearsals (Frisby et al., 2020; Vallade et al., 2020). Goh and Sigala (2020) suggest giving more opportunities to use new technology will help instructors be more comfortable with adoption. However, due to time, budgetary, and social distancing limitations, trialability could not be tested within the present study.

Observability is "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 258). Some innovations are more observable than others; however, the theme of more easily observable innovations being adopted more easily remains consistent (Rogers, 2003). In the context of VR, if students observe positive results such as an increase in grades, satisfaction, or enjoyment in others, they may be more likely to use VR in their studies (Goh & Sigala, 2020). Similarly, if instructors see success using VR in other instructors' classrooms, they may be more inclined to prescribe its use in their courses. Similar to trialability, the logistics of testing observability were not possible due to time and budget restraints. Additionally, student participants may feel

self-conscious or embarrassed to have other students watch them use VR. This may create a negative experience and lead to future resistance to using VR or new technology. While the first three attributes are important to adopt an innovation, the remaining two appear more critical to the success of adopting VR in public speaking rehearsals: complexity and relative advantage.

Complexity (also known as "ease of use") is "the degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 2003, p. 257). Similar to the other attributes, if innovations are perceived as too complex, their adoption rate will be negatively affected. Rogers (2003) used the example of home computers to explain this attribute. When first created, computers required a complex set-up process, and salespeople used large amounts of jargon while trying to sell the devices, which negatively affected their adoption. VR could be seen as complex because of the setup required and because it is a relatively new technology with unfamiliar attributes. If it is easy to use, it will more likely be adopted, but if it is difficult to use, it is less likely to be adopted (Ntemma & Olatokun, 2012). Therefore, if students and instructors have little difficulty while setting up and using VR for public speaking rehearsals, they may be more likely to adopt it. If VR is viewed as too complex to use for public speaking rehearsals, students and instructors may completely reject the innovation leaving the previous attributes with little influence to bring users back. It is also believed to have a significant impact on innovation adoption rates.

Relative advantage is defined as "the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 2003, p. 229). Rogers (2003) states that relative advantage is the greatest predictor of innovation adoption and success. There

are several different sub-categories of relative advantage that provide more context to the innovation and why it may be successful or not: economic factors (e.g., cost), status aspects (e.g., whether it is a well-recognized brand), over adoption (e.g., an expert thinking an innovation should not be adopted), rate of adoption (e.g., how quickly it is being adopted), preventive innovations (e.g., seat belts to limit injuries), effects of incentives (e.g., subsidies or rebates for adopting), and mandates for adoption (e.g., vehicles with low pollution levels) (Rogers, 2003). Rogers emphasizes how diffusion of innovation is an uncertainty reduction process, and potential adopters want to know how an innovation is better than the current innovation (Rogers, 2003). Having relative advantage will be extremely important for VR to be adopted. Consumers determine the value and relative advantage of innovations by comparing them to a previous innovation or technology (Min et al., 2019). Within education, a similar determination is performed. If VR is not determined as better than existing interventions, instructors and students will not see the value in adopting it. Relative advantage was selected as the final attribute in this study because of its significance in the innovation adoption process. If innovations are not perceived as having relative advantage, they will be less likely to be adopted than innovations that do.

Relative advantage and complexity were both selected for this thesis because they are highly critical to the success of an innovation being adopted. Although Rogers (2003) defines the term as *complexity*, Moore and Benbasat (1991) define the term as *ease of use*, which is adopted for this study. These two attributes also appear to be the most likely to be directly related to adoption. Rogers (2003) even discusses how relative advantage is the greatest predictor for success. While trialability, observability, and compatibility are

important to an innovation being adopted, relative advantage and ease of use have continually been predictors of an innovation's success (Ntemma & Olatokun, 2012). Because trialability, observability, and compatibility are reliant on having to touch and use the innovation itself, it could be potentially costly to test these, and if initial perceptions of VR are negative, testing these could waste valuable resources. This is another reason why relative advantage and complexity were selected for the present study. Early success with these two attributes can lead to success for later studies measuring the other three attributes. If relative advantage and complexity are tested first and have positive perceptions, this could lead to the purchase of VR to later study the other attributes; however, if there are negative initial perceptions, significant time and money could be saved.

Hypotheses and Research Question

Taken together, little is known about the perceptions of VR, especially among instructors. By continuing the research of Vallade et al. (2020) and studying both student and instructor attitudes, a greater understanding of VR and its adoption is gained. Perceived relative advantage and ease of use of VR equipment appear to be likely predictors in the context of public speaking rehearsals. Thus, the following hypotheses are posed:

> **H1**: For students, attitudes toward VR adoption for student public speaking rehearsals will be associated with perceptions of (a) ease of use and (b) relative advantage.

H2: For instructors, attitudes toward VR adoption for student public speaking rehearsals will be associated with perceptions of (a) ease of use and (b) relative advantage.

While the attributes of an innovation can help predict an innovation's potential success or failure, other external factors may also play a role. One of these factors is age. Because instructors are typically older than students, they will likely have different perspectives on adopting technology. While older Americans are adopting more technology and using technology more rapidly, there is still a gap between older and younger Americans (Anderson & Perrin, 2017). Additionally, younger adults are more willing to adopt technology than older adults (Morris & Venkatesh, 2000). Due to the likely age difference between instructors and students, it may affect the adoption of VR. This typical age difference can create differences in perspectives, but instructors are open to technology in the classroom (Ober et al., 2020).

Studies such as Berkowsky et al. (2018) and Czaja et al. (2006) looked at different factors which impacted if participants adopted new technologies. Some of the factors in these articles include self-assessment of computer/internet skills, prior experiences, and willingness to adopt (Berkowsky et al., 2018; Czaja et al., 2006). Other factors may be "technology self-efficacy, attitudes toward technology, and perceived ease of use of technology" (Li et al., 2016). Long et al. (2019) found similar results to Li et al. (2016), proving these factors are consistent across multiple studies. The choice to adopt or not does not rely solely on age, but also "sociodemographic factors, attitudinal variables, and cognitive abilities . . . indicating that people's choices about using a particular technology

cannot be explained solely by their age or education; they also require considerations of other psychological factors" (Czaja et al., 2006, p. 349).

Taken together, looking at perceptions of ease of use and relative advantage through students' and instructors' perspectives can give helpful insight into their thoughts and potential barriers to adopting VR as a public speaking rehearsal tool. However, it remains unclear what the similarities and differences in perceptions will be for both groups. As such, the following research question is posed:

> **RQ1**: Will students and instructors report significantly different perceptions of (a) ease of use and (b) relative advantage of using VR for student public speaking rehearsals?

Chapter Summary

This chapter reviewed the existing literature surrounding VR and diffusion of innovation theory. From this review, two hypotheses and one research question were developed to explore student and instructor perceptions of VR to investigate VR adoption for public speaking rehearsals. The next chapter will discuss the methods being used in this study to evaluate these perceptions.

CHAPTER III

METHOD

This chapter will discuss the research methods being used, including the procedure for gaining responses, the participants' demographic information, and the instrumentation used.

Procedures

Upon receiving IRB approval (Appendix A), an email was distributed to potential participants, which included both students and instructors, using a convenience sampling method. The email was distributed to students enrolled at a small private Southern university, and instructors were contacted through the researcher's professional network (Appendix B). Participants were informed they would be asked questions about virtual reality (VR) for public speaking rehearsals and attitudes towards VR adoption in the public speaking classroom. Before beginning the survey, both groups were informed of possible risks and were prompted to provide or decline their consent to participate (Appendix C). Upon consent, participants then completed a series of survey questions contained within a student survey instrument or an instructor survey instrument as appropriate (Appendix D). The survey took approximately 15 minutes for the participants to complete.

Participants

Participants (N = 129) included both students and instructors. Students (n = 106, 81.5%) identified as female (n = 77, 72.6%) and male (n = 29, 27.4%). Students classified themselves as first years (n = 28, 26.4%), sophomores (n = 30, 28.3%), juniors (n = 23, 21.7%), seniors (n = 23, 21.7%), and graduate students (n = 2, 1.9%), with ages ranging from 18 to 24 years of age (M = 19.92, SD = 1.34). One participant did not report their age. Ethnicity information was not collected, which will be discussed as a limitation.

Instructors (n = 23, 17.7%) identified as female (n = 16, 69.6%), male (n = 6, 26.1%), and gender fluid (n = 1, 4.3%). Ages ranged from 22 to 73 years (M = 44.57, SD = 13.51). Instructors' statuses included Adjunct Professor (n = 2, 8.7%), Teaching/Graduate Assistant (n = 4, 17.4%), Instructor/Lecturer (n = 4, 17.4%), Assistant Professor (n = 1, 4.3%), Associate Professor (n = 3, 13%), Full Professor (n = 8, 34.8%), and Administrator (n = 1, 4.3%). The types of institutions that instructors taught at included two-year institutions (n = 8, 34.8%) and four-year institutions (n = 15, 65.2%). Instructors were also asked if they taught at a public institution (n = 13, 56.5%) or a private institution (n = 10, 43.5%). Years taught ranged from 0.5 to 47 (M = 16.93, SD = 11.51). Similarly, ethnicity information and discipline taught was not collected which will be discussed as a limitation.

Instrumentation

In this portion of the methods the instrumentation used, and the reliability in the present study will be discussed.

Ease of Use

Perceptions of complexity (i.e., ease of use) were operationalized using a modified dimension of a scale developed by Moore and Benbasat (1991). This seven-item instrument asked students and instructors to evaluate the perceived ease of use of VR in the classroom (e.g., "Learning to operate VR equipment to practice public speaking would be easy for students"). One item was deleted from this scale because the researcher perceived the wording to lack content validity for the current study: "Using VR equipment to practice public speaking would be clear and understandable for students." Participants' responses were measured with a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The measure had reliability in the current sample ($\alpha = .79$, $M = 4.37$, $SD = 1.02$).

Relative Advantage

Perceptions of relative advantage were operationalized using another modified dimension of the same scale (Moore & Benbasat, 1991). This modified, seven-item instrument asks students and instructors to evaluate the perceived relative advantage VR has in public speaking rehearsals (e.g., "Using VR equipment would enhance the effectiveness of students' public speaking rehearsals"). Two items were deleted from this scale because the researcher perceived the wording to lack content validity for the current study: "Using VR equipment enables me to accomplish tasks more quickly" and "Using VR equipment would give students greater control over their rehearsal." Responses were measured with a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The measure had reliability in the current study ($\alpha = .91$, $M = 5.28$, $SD = 1.17$).

Attitudes Toward Adoption

Attitudes toward the adoption were operationalized using three items developed for this study. The developed items ask students and instructors about their attitudes toward adopting VR (e.g., "VR equipment should be adopted for students to use when rehearsing public speaking"). Responses for this scale were measured with a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). The measure was demonstrated to be reliable in this study ($\alpha = .84$, $M = 4.59$, $SD = 1.48$).

Chapter Summary

This chapter discussed the methodology being used in this study, participant demographic information, and the instrumentation used. The reliability of the scales was also presented. Chapter four will discuss the results.

CHAPTER IV

RESULTS

This chapter contains the results of the hypotheses and research question presented in this study. Correlations among all study variables can be found in Tables 1 and 2.

H1 Results

H1 predicted student's attitudes toward virtual reality (VR) adoption for student public speaking rehearsals would be associated with perceptions of (a) ease of use and (b) relative advantage. The researcher calculated two Pearson correlations. Results indicated perceived ease of use was significantly related to attitudes towards VR adoption ($r = .66$, $p < .001$). Further, relative advantage was significantly related to attitudes towards VR adoption ($r = .84$, $p < .001$). H1 was supported.

Table 1

Correlation of student attitudes toward VR adoption

		Relative Advantage	Ease of Use	Attitude
Relative Advantage	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	106		
Ease of Use	Pearson Correlation	.661**	1	
	Sig. (2-tailed)	.000		
	N	106	106	
Attitude	Pearson Correlation	.844**	.663**	1
	Sig. (2-tailed)	.000	.000	
	N	106	106	106

**. Correlation is significant at the 0.01 level (2-tailed).

H2 Results

H2 predicted instructors' attitudes toward VR adoption for student public speaking rehearsals would be associated with perceptions of (a) ease of use and (b) relative advantage. The researcher calculated two Pearson correlations. Results indicated that perceived ease of use was significantly related to VR adoption attitudes ($r = .48$, $p < .05$). Further, relative advantage was significantly related to attitudes towards VR adoption ($r = .79$, $p < .001$). H2 was supported.

Table 2

Correlation of instructor attitudes toward VR adoption

		Relative Advantage	Ease of Use	Attitude
Relative Advantage	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	23		
Ease of Use	Pearson Correlation	.437*	1	
	Sig. (2-tailed)	.037		
	N	23	23	
Attitude	Pearson Correlation	.791**	.479*	1
	Sig. (2-tailed)	.000	.021	
	N	23	23	23

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

RQ1 Results

RQ1 explored whether students and instructors reported significantly different perceptions of (a) ease of use and (b) relative advantage of using VR for student public speaking rehearsals. To explore this, two independent samples t-tests were conducted. Results indicated there was a significant difference in perceptions of ease of use between students ($M = 4.46$, $SD = 1.04$) and instructors ($M = 3.98$, $SD = .83$) [$t(127) = -2.09$, $p < .05$]. In addition, results indicated there was not a significant difference in perceptions of

relative advantage between students (M = 5.29, SD = 1.18) and instructors (M = 5.22, SD = 1.16) [$t(127)$ = -.26, p = .80]. Full model results can be found in Table 3.

Table 3

Independent samples t-test

		Levene's Test for Equality of Variances		*t*-test for Equality of Means		Sig. (2-tailed)	Mean Difference	Std. Error Difference
		F	Sig	*t*	df			
Relative Advantage	Equal variances assumed	.018	.893	-.257	127	.798	-.06940	.27012
	Equal variances not assumed			-.260	32.632	.797	-.06940	.26723
Ease of Use	Equal variances assumed	.949	.332	-2.086	127	.039	-.48149	.23080
	Equal variances not assumed			-2.400	38.343	.021	-.48149	.20064

Chapter Summary

This chapter discussed the results that were found. Both hypotheses used a Pearson correlation, and the research question used an independent samples *t*-test. The review of results, discussion, limitations, and future directions will be discussed in chapter five.

CHAPTER V

DISCUSSION

Presented in this chapter is the review of results, discussion, limitations, and future directions. Within this discussion, a summary of the results, the implications for diffusion of innovation theory are assessed, the steps for virtual reality (VR) implementation, limitations, and future directions are discussed.

Summary of Results

The purpose of this study was to determine student and instructor perceptions of VR for public speaking rehearsals. Hypothesis one (H1) looked at student attitudes toward VR and their perceptions of ease of use and relative advantage. The results of this hypothesis found that perceptions of ease of use and relative advantage were associated. Hypothesis two (H2) looked at instructor attitudes toward VR and their perceptions of ease of use and relative advantage. Like the first hypothesis, this hypothesis's results found that ease of use and relative advantage were associated. Research question one (RQ1) explored the differences between student and instructor perceptions of ease of use and relative advantage. This research question found no significant differences between students and instructors concerning relative advantage, but there were differences between students' and instructors' perceptions of ease of use. Instructors believe that using VR would be more complex than students.

Diffusion of Innovation Theory Implications

The use of diffusion of innovation theory in this study is unique. Many of the studies located in the literature review did not look at the attributes of diffusion of innovation theory individually. However, it is possible that by looking at the attributes individually, more depth is reached, and different conclusions can be drawn than if all attributes were looked at collectively (Min et al., 2019). Using the individual attributes of diffusion of innovation theory helped clarify the similarities and differences of students' and instructors' perceptions. The use of diffusion of innovation to study technological advancements has seen positive results in prior studies (Albirini, 2006). These positive correlations between the attributes and technology give promise that diffusion of innovation theory is still a relevant theory and can be used to study technology adoption. Thus, future VR usage to provide students additional ways to practice public speaking appears promising (Frisby et al., 20202; Vallade et al., 2020). As mentioned, this study looked at ease of use and relative advantage separately; this helps draw more specific conclusions about how perceptions about these attributes will affect adoption.

First, results indicated that ease of use is related to students' and instructors' attitudes towards adoption. Both groups indicated they would not adopt VR if it was highly complex. Using diffusion of innovation theory can create clarity for limitations to adoption, such as an innovation being too complex. Ease of use can play a significant role in adoption because if an innovation is too hard to use, people will not adopt it or continue use in their life (Min et al., 2019; Rogers, 2003). Integrating a technology, especially a complex technology, is more than just providing the technology and expecting instructors to implement it into their classroom (Afshari et al., 2009). There

will need to be a well-developed process to implement VR for both students and instructors successfully. Ease of use will be important to focus on because there were significant differences between students and instructors. While this study shows that instructors viewed VR as more complex, this does not mean that they are unwilling to adopt it. Ease of use is highly important for technology adoption in adults (Li et al., 2016; Long et al., 2019). While there will be some complexity reduction steps that will need to be implemented for students, such as having training sessions and available troubleshooting technicians, the main focus should be on instructors. It will be important to find ways to show instructors that using VR for public speaking rehearsals is not complex. One way to do this is by having a well-developed support system which will be discussed later. However, ease of use was not the only attribute discussed in this study.

Students and instructors also indicated that relative advantage is related to their attitudes toward adoption. Because relative advantage is the greatest indicator of success for an innovation (Rogers, 2003), having positive results shows promise for the future of VR. Both students and instructors found VR to be relatively advantageous; this means that institutions and VR companies will not have to work as hard to show students and instructors that they should adopt VR. Having positive results for the most likely indicator of success is promising for the future of VR. Additionally, both of these groups can see the promise of VR, but it will still be important to show them why they should adopt it. Further research can continue to emphasize the relative advantage of using VR for public speaking rehearsals (Felnhofer et al., 2014; Frisby et al., 2020; Lee et al., 2020; Mabrook & Singer, 2019; Palmas et al., 2019; Vallade et al., 2020). Continuing future

research and increasing the studies done with VR can help increase its visibility and help contribute to the other attributes such as trialability, observability, and compatibility.

Because there were significant differences between students and instructors, it is important to address those, why they may have happened, and how to resolve those concerns. In the present study, instructors viewed VR as being more complex than students did. There could be several reasons for this, such as the ones discussed before RQ1. Instructors are typically older than students, and they may be less confident or more hesitant to adopt new technologies (Morris & Venkatesh, 2000). An instructor's steps to adopt a piece of technology would likely take much longer than a student would. Instructors may have also previously had bad experiences with new technology. Additionally, instructors would likely consider other factors such as ease of use, self-assessment, and attitudes when deciding if they would adopt new technology (Berkowsky et al., 2018; Czaja et al., 2006; Li et al., 2016; Long et al., 2019).

Instructors may also consider other factors like set-up and how they will integrate VR into their lesson plans. Students may not consider the thought process behind integrating VR; therefore, they may not have considered its ease of use. However, instructors are still willing to integrate technology into their classrooms despite complexity (Ober et al., 2020). Although instructors viewed VR as being more complex, this does not mean that they are unwilling to adopt VR. If institutions or VR companies want successful implementation, the steps below can give helpful information and factors to consider. Ways to increase ease of use are also mentioned in the following sections.

Steps for VR Implementation

For the successful implementation of VR for public speaking rehearsals, several steps can be taken. Many different groups can play a role in successfully implementing VR. Throughout the following sections of this discussion, these groups and the steps that they can take will be discussed. These steps will be important, as to the author's knowledge no universities have implemented VR for public speaking rehearsals.

There are several steps that students can take that will be helpful in VR adoption for public speaking rehearsals. Previous studies indicate VR can give students a more authentic experience and may also provide desensitization to public speaking (Frisby et al., 2020). Using VR can also help students by giving them more control, increased comfort, and reduced risk while practicing public speaking (Frisby et al., 2020). If students are going to use VR, several steps are suggested to ensure that it benefits students and gives them positive results. Vallade et al. (2020) stressed the importance of having the VR headset be available to students and knowing that it is available. However, just having the VR headset available may not be enough. Students should be willing to use VR and have an open mind when presented with an opportunity to use VR. Training the students and giving them adequate resources will be necessary. If they do not have the knowledge to use VR, they will not use it. While students' role in VR adoption's success is somewhat limited, students are still important, and VR could not be implemented for public speaking rehearsals. The role that other entities play will inevitably have a more significant impact on VR adoption.

For instructors, considerations are similar to those of students, but they will differ slightly. Like student use, instructors will also need to understand how to operate VR.

More importantly, they will need to set up the VR for student use inside or outside the classroom. Having training sessions such as a "lunch and learn" or other professional development sessions will help increase ease of use and help instructors understand how to operate the VR headset (Li et al., 2016; Long et al., 2019). Instructors can also offer incentives to students and offer them the chance to use VR. Having an instructor who wants VR to be used can encourage the students to use or continue using it. Instructors will also need to ensure equitable access to the VR headset and that all students will have the same opportunities to use it (Vallade et al., 2020). Having equal access will be essential to ensure that some students are not having an unfair use or lack of use of the VR headset. This will also depend on whether the VR is being provided through the instructor or a communication center.

Communication centers, also called speaking centers, are an institutional resource that can be offered to students to help offer support during the speech writing and rehearsal process. The services offered at these centers vary greatly between institutions. When visits are voluntary, many students do not seek help from a communication center. In Nelson et al. (2012), 78% of their sample did not attend when it was voluntary; while this study's results may be limited, there still may be some truth across all institutions. While there may not be initial success for communication centers, there are steps that the staff can take to make it and the support for VR more successful. Working with instructors to develop a visitation schedule or a plan for when students will visit can be helpful. Having this open line of communication and collaboration can help create more opportunities for cutting-edge technologies, like VR (LeFebvre et al., 2017). For students, making visits to a communication center required may help increase and incentivize

using its resources, including VR (Nelson et al., 2012). As mentioned earlier, there are no known communication centers using VR for public speaking rehearsals, and there is virtually no research exploring how effective VR is for speech rehearsals in a communication center setting. Another resource that will likely be critical in the success of adopting VR for public speaking rehearsals is the information technology department.

The information technology (IT) department is an often critical but overlooked department at an institution. The role that this department can play will be a primarily background and support role. IT can often purchase devices at a reduced rate or with a group discount price, which can help cut down on the VR headsets' cost. They can also offer training sessions as mentioned in the instructor's role, as this training will be important to developing understanding and self-efficacy from the instructors (Li et al., 2016). Additionally, the IT department can be responsible for the set-up and maintenance of the VR headsets, which can be complex. Having the IT department handle more of the technical role will help increase the instructors' ease of use. Overall, the role of the IT department is to offer set-up and support. However, not all institutions have a well-developed IT department, or they may wish to handle new technologies like this at the institutional level.

Lastly, institutions will likely play an essential role in adopting VR use for public speaking rehearsals. Having institutional level support can help ensure equitable access to VR, and they can ensure a smooth rollout and maintenance of the VR headsets (Vallade et al., 2020). In many cases, institutions have greater access to funding or are more easily able to secure grants than individual instructors or departments. This greater access to funding can ensure that the proper headsets are being purchased and better provide

support. Successful implementation will require support from students, instructors, and the institution (Afshari et al., 2009). While it is possible for instructors to operate the VR rehearsals in coordination with the students, having institutional support will likely increase the effectiveness and success. It is crucial to find ways to increase ease of use, such as having trained information technology or communication center employees, ensuring that instructors are adequately trained, and if students have difficulty, they know how to find the solution.

Limitations

Within the present study, several limitations could have impacted the results. Both student and instructor sample sizes were relatively small and were convenience samples. Small sample sizes can potentially lead to problems because they may not be fully representative of the population. Having such a small sample size can potential create false positive or negative results (Hackshaw, 2008). A small study can still be effective, but the results must be interpreted carefully as the results may not fully represent the population. During the present study, there was some difficulty getting respondents, especially from the instructors; one way to increase responses could have been to distribute the survey through various listservs such as COMMNotes, the National Communication Association's daily email server. Increasing the number of places that the survey was published and not relying on snowball sampling could have helped get more respondents. For students, more respondents could have been reached by canvassing campus and handing out slips of paper with the survey link or a QR code. The email distribution could have also been sent to more instructors or students directly. However, the COVID-19 pandemic may have also affected students not wanting to take

the survey. Had students been approached in the library or on other parts of campus, they may have been hesitant to be approached by a stranger during a pandemic.

Additional limitations with the sample were that it was a convenience sample. Convenience samples can be problematic because they may not represent the population (Andrade, 2020). Also, the people that chose to take the survey could have self-selected and already be interested in VR, which may also have skewed results, as they may not fully represent the population. Distribution to more potential participants could have alleviated this. Using a more random sample method could increase the number of participants and reduce convenience sample effects. Using a stratified sampling method within the university and giving each student at the university a chance to take the survey could have reduced these convenience factors.

Other potential limitations within the survey were within the questions asked. Ethnicity was unintentionally omitted from the survey that was distributed to participants. This omission can potentially be problematic because while ethnicity is a social construct, it profoundly affects what people feel (Williams & Husk, 2013). Also, the experiences of different ethnic groups may have had an impact on their perceptions of VR. The inclusion of ethnicity can be best used as "a complex interacting variable rather than either a casual or explanatory factor" (Williams & Husk, 2013). Without ethnicity, the full scope of the diversity of the sample is unknown. Not knowing the ethnicity and diversity of this sample can affect its generalizability.

Another potential limitation was that instructors were not asked what discipline they taught, meaning that non-communication faculty could have taken the survey. While this may have been helpful for descriptive statistic purposes, it could also play a role if

instructors understood how speech rehearsals work. Additionally, it could be helpful in understanding if those in charge of funding would view VR as being helpful for public speaking rehearsals.

Other limitations within the survey questions were that students and instructors might not fully understand how the VR software would work. In the survey, only images were included, meaning that the participants may not have understood the process of how VR works. A video showing how the software would work was considered, but it was not included to reduce survey complexity and ensure participants did not skip the video. Additionally, questions about participant's past experiences with VR were not included. Had a student or instructor used VR in the past, this could have changed their perspectives, mainly if they had a poor experience.

Lastly, the student participants were only students at a private university. This may have impacted results, as students from public and private universities may have different experiences (Martin, 2011). The wealth distribution between public and private universities and the students who attend them may impact prior VR experiences (Martin, 2011). Overall, there were several limitations that this study faced. While these limitations may not have directly impacted the study, it is crucial to address them as they may have played a role in the results.

Future Directions

Several future research studies could be conducted. Due to the COVID-19 pandemic, this study's original concept was modified to meet current social distancing and capacity guidelines. However, in a post-pandemic world, the original concept could be studied once it is safe to be within six feet and share a VR headset. Students would be

able to practice using VR to rehearse their speech in a communication center setting, classroom setting, or home. A survey could then be sent out to evaluate students' perceptions of VR after using it and getting to see how it works. Another similar option would be similar to Vallade et al. (2020), but with instructors' inclusion. By including instructors, both the student and instructor perceptions would be recorded, increasing survey results' accuracy. By including both pre and post-surveys, it would be possible to see student and instructor perceptions before and after using VR to see how they changed.

Second, a similar study could be conducted and focus on the other attributes of diffusion of innovation theory that were not included in this study. This study would likely need to be an in-person study as the students would need access to trial and observe the VR headsets before determining if they are compatible. A study could be conducted that analyzes where participants are within the adoption curve and look at the innovation-decision process. Seeing where participants are at within the innovation-decision process can help universities and VR companies see what they can do to increase VR adoption further and move through the process. These studies could be done through surveys similar to the present survey or through more active and involved methods (Frisby et al., 2020; Vallade et al., 2020). Including these other attributes may help bring in a more well-rounded view of student and instructor perceptions.

A third potential study could take place over a semester and study the more long-term effects of using VR in the public speaking classroom. Including VR studies over time can also help look at overall improvement and change. Many of the more current VR studies, especially for the public speaking classroom, look at shorter-term results.

Including a semester-long study would give more opportunity to analyze the effectiveness and more opportunity for perception development. Student and instructor perceptions may be different depending on repeated use. While some studies such as Scheveneels et al. (2019), Safir et al. (2012) included multiple sessions, these studies were mainly focused on reducing public speaking anxiety. It would be interesting to study how perceptions have changed over a semester and including both students and instructors would also help create a more well-rounded view of this.

Conclusion

The study of successful adoption of technology into classrooms is a continuing and essential topic. Technology has strong evidence for use in the classroom to create "a powerful learning environment . . . involve new forms of learning and teaching . . . contribute to creating learning environments in which students can actively work on solving real problems encountered in daily life" (Volman & van Eck, 2001, p. 614). Thus, including technology, such as VR in the classroom, is also likely to help advance student learning and prepare them for life events (Drent & Meelissen, 2008). The adoption of VR for public speaking rehearsals may help expand the use of VR as an educational tool within the discipline of communication.

Since VR is still in its infancy for use in the classroom setting, studies such as this give insight to the future of VR as an emerging academic tool. As this study has demonstrated, VR is perceived as relatively advantageous by instructors and students, and this may help its adoption. Also documented within this study, innovators will likely need to find additional ways to increase ease of use as complexity may hinder the adoption process, specifically among instructors. This study's findings further support

earlier research that demonstrated that VR was seen as effective (Frisby et al., 2020; Lee et al., 2020; Vallade et al., 2020). Therefore, combining the known efficacy of VR with the positive perceptions of relative advantage and ease of use among instructors and students gives VR a strong foothold into its integration into public speaking rehearsals. It now appears using VR for public speaking rehearsals has promise to be a new, innovative, and groundbreaking way to practice public speaking. Finally, future developers and institutions should be encouraged to increase ease of use and emphasizing the relative advantage of VR for public speaking rehearsals to increase adoption by students and instructors.

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APPENDIX A

Institutional Review Board Approval Letter

ABILENE CHRISTIAN UNIVERSITY
Educating Students for Christian Service and Leadership Throughout the World

Office of Research and Sponsored Programs
320 Hardin Administration Building, ACU Box 29103, Abilene, Texas 79699-9103
325-674-2885

October 28, 2020

Carrie Saltsman
Department of Communication and Sociology
Abilene Christian University

Dear Carrie,

On behalf of the Institutional Review Board, I am pleased to inform you that your project titled "Virtual Reality for Public Speaking Rehearsals: Student and Faculty Perceptions",

(IRB# 20-173)is exempt from review under Federal Policy for the Protection of Human Subjects.

If at any time the details of this project change, please resubmit to the IRB so the committee can determine whether or not the exempt status is still applicable.

I wish you well with your work.

Sincerely,

Megan Roth

Megan Roth, Ph.D.
Director of Research and Sponsored Programs

APPENDIX B

Solicitation Materials

(Sent Via E-mail to Students)

Virtual Reality (VR) is a new and upcoming technology, and it may be useful in the public speaking classroom. However, if instructors and students are not willing to use VR its efficacy may not matter. You are invited to participate in a study that explores attitudes towards the adoption of VR in the public speaking classroom. The participation time will be approximately 15 minutes.

If you meet the following criteria, you are eligible to participate in this study.

- At least 18 years old
- Currently a college student

<Insert Link Here>

Questions? Contact Carrie Saltsman at cas20a@acu.edu or the advisor Dr. Nick Tatum at nick.tatum@acu.edu

(Sent Via E-mail to Instructors)

Virtual Reality (VR) is a new and upcoming technology, and it may be useful in the public speaking classroom. However, if instructors and students are not willing to use VR its efficacy may not matter. You are invited to participate in a study that explores attitudes towards the adoption of VR in the public speaking classroom. The participation time will be approximately 15 minutes.

If you meet the following criteria, you are eligible to participate in this study.

- At least 18 years old
- Currently a college instructor or have been an instructor within the past 10 years

<Insert Link Here>

Questions? Contact Carrie Saltsman at cas20a@acu.edu or the advisor Dr. Nick Tatum at nick.tatum@acu.edu

APPENDIX C

IRB Participant Consent

Introduction:

You may be eligible to take part in a research study. This form provides important information about that study, including the risks and benefits to you, the potential participant. Please read this form carefully and ask any questions that you may have regarding the procedures, your involvement, and any risks or benefits you may experience. You may also wish to discuss your participation with other people, such as your family doctor or a family member.

PURPOSE AND DESCRIPTION:

Virtual Reality (VR) is a new and upcoming technology and it may be useful in the public speaking classroom. However, if instructors and students are not willing to use VR its efficacy may not matter.

If you agree to participate, you will be asked to complete a questionnaire through a secure link. You will also be asked to provide basic demographic information in order to document the diversity of the sample as well as ask a series of questions about your perceptions on using VR in the classroom.

RISKS & BENEFITS:
There are risks to taking part in this research study. You may experience mild psychological discomfort when reflecting on a previous experience. However, to the best of our knowledge, the things you will be asked have no more risk of harm than you would experience in everyday life. In addition to risks described in this consent, you may experience a previously unknown risk or side effect.
The primary risk with this study is breach of confidentiality. However, we will make every effort to safeguard your data, but as with anything online, we cannot guarantee the security of data obtained via the Internet. However, we have taken steps to minimize this risk. We will not be collecting any personal identification data during the survey. Third-party applications used in this study (i.e., Google Forms) may have Terms of Service and Privacy policies outside of the control of Abilene Christian University.
Although you may not directly benefit from your participation, your responses may help university instructors better serve their future students.

PRIVACY & CONFIDENTIALITY:

Information collected about you will be handled in a confidential manner in accordance with the law. Some identifiable data may have to be shared with individuals outside of the study team, such as members of the ACU Institutional Review Board. Aside from these required disclosures, your confidentiality will be protected.
This study is confidential. That means that no one outside of the research team, will know that the information you give came from you. Data will be stored on a personally-owned, password-protected laptop computer, but there will be no direct or identifying information relative to each participant.
CONTACTS:

If you have questions about the research study, the Principal Investigator is Carrie and may be contacted at 325-513-6772 or cas20a@acu.edu. You may also contact the thesis chair of this study, Nick Tatum, at 325-674-2292 or nick.tatum@acu.edu. If you have concerns about this study, believe you may have been injured because of this study, or have general questions about your rights as a research participant, you may contact ACU's Chair of the Institutional Review Board and Executive Director of Research, Megan Roth, Ph.D. Dr. Roth may be reached at
(325) 674-2885
megan.roth@acu.edu
320 Hardin Administration Bldg, ACU Box 29103
Abilene, TX 79699
Your participation in this research is entirely voluntary. You may decline to participate or withdraw from the study at any time and for any reason without any penalty or loss of benefits to which you are otherwise entitled.

Additional Information:
If you volunteer to take part in this study, you will be one of about 400 people to do so. The research procedures will be conducted via Google Forms, an online survey system. To participate in this study, you will provide basic demographic information and reflect campus experience during your time as a student. Your participation in this research will last about 15 minutes.
If you do not want to be in the study, you are not required in any way to take part in the study.
There are no costs associated with taking part in this study.
You may choose to leave the study at any time. You will not be treated differently if you decide to stop taking part in the study.
If you choose to leave the study early, data collected until that point will remain in the study database and may not be removed.
The investigators conducting the study may need to remove you from the study. This may occur for a number of reasons. You may be removed from the study if you are not able to follow the directions.
Generally, surveys done for research purposes are not meant to provide results that apply to you alone. Thus, you will not be provided with your individual results for this survey.

Your information collected for this study will NOT be used or shared for future research studies, even if we remove the identifiable information like your name, clinical record number, or date of birth.
Consent:
Please click the button below if you voluntarily agree to participate in this study. Click only after you have read all of the information provided and your questions have been answered to your satisfaction. If you wish to have a copy of this consent form, you may print it now. You do not waive any legal rights by consenting to this study.

I voluntarily agree to participate in this study
I DO NOT voluntarily agree to participate in this study

APPENDIX D

IRB Survey Items

DEMOGRAPHICS

1. What is your age? _____
2. With what gender do you identify?
    1. Male
    2. Female
    3. Other _____
3. Are you a student or instructor?
    a. Student
    b. Instructor

STUDENTS ONLY

5. What is your classification?
    a. First year
    b. Sophomore
    c. Junior
    d. Senior
    e. Graduate
6. What is your major? _____

INSTRUCTOR ONLY

7. What is your instructor status?
    a. Adjunct Professor
    b. Teaching/Graduate Assistant
    c. Instructor/Lecturer
    d. Assistant Professor
    e. Associate Professor
    f. Full Professor
    g. Other _____
8. How many years have you been teaching? _____
9. What kind of institution do you teach at?
    a. Four year Institution
    b. Two year Institution (e.g. Community College)
    c. Other _____

RELATIVE ADVANTAGE

On a scale of (1) Strongly Disagree to (7) Strongly Agree, to what extent do you agree with the following statements regarding **the relative advantage of virtual reality equipment in university classrooms**:

1. Using virtual reality equipment would improve the quality of students' public speaking rehearsals.
2. Using virtual reality equipment would make it easier for students to rehearse public speaking.
3. The disadvantages of a student using virtual reality equipment for public speaking rehearsals far outweigh the advantages.
4. Using virtual reality equipment would improve students' public speaking rehearsals.
5. Overall, students would find using virtual reality equipment to be advantageous for rehearsing public speaking.
6. Using virtual reality equipment would enhance the effectiveness of students' public speaking rehearsals.
7. Using virtual reality equipment would increase students' productivity when rehearsing public speaking.

EASE OF USE

On a scale of (1) Strongly Disagree to (7) Strongly Agree, to what extent do you agree with the following statements regarding **the ease of use of virtual reality equipment in university classrooms**:

1. I believe that virtual reality equipment would be cumbersome for students to use when practicing public speaking.
2. It would be easy for students to remember how to use virtual reality equipment when practicing public speaking.
3. Using virtual reality equipment to practice public speaking would require a lot of mental effort for students.
4. Using virtual reality equipment could be frustrating for students when practicing public speaking.
5. I believe that it would be easy to get virtual reality equipment to do what students want it to do when practicing public speaking.
6. Overall, virtual reality equipment would be easy for students to use when practicing public speaking.
7. Learning to operate virtual reality equipment to practice public speaking would be easy for students.

ATTITUDES TOWARDS VR ADOPTION

On a scale of (1) Strongly Disagree to (7) Strongly Agree, to what extent do you agree with the following statements regarding **the use of virtual reality equipment in university classrooms**:

1. Virtual reality equipment should be adopted for students to use when rehearsing public speaking.
2. I do **NOT** think virtual reality equipment should be adopted for students to practice public speaking.
3. Future public speaking classrooms should use virtual reality equipment to help students practice public speaking.