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*Research Article*

# Using Virtual Reality for Speech Rehearsals: An Innovative Instructor Approach to Enhance Student Public Speaking Efficacy

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## Abstract

*Basic communication courses (BCCs) are evolving, and technology is a driver of this change. Guided by self-efficacy theory, this study examined the use of virtual reality speaking rehearsals as one technology that instructors can adopt to enhance students' public speaking efficacy. Students (N = 32) in this study practiced their final informative speeches in virtual reality 360-degree videos. They perceived their efficacy was enhanced in five ways including preparedness, realism, self-awareness, feedback, and comfort level. Conversely, efficacy inhibitors included the lack of presentational aids, technology issues, and lack of audience realism. The results are used to provide practical advice to instructors who would like to implement their own virtual reality rehearsal sessions.*

*Keywords: speech rehearsal, public speaking efficacy, virtual reality*

## **Introduction**

Public speaking has long been a focal point for communication instructors. Both instructors and employers report that speech and presentational skills are essential for student success after graduating (e.g., Hart Research Associates, 2015). Indeed, the National Association of Colleges and Employers (NACE; 2018) consistently reports oral communication skills as one of the most desired for college graduates seeking employment across career fields. It is this important set of skills that provides the foundational curriculum for the basic communication course (BCC). Consequently, BCC instructors employ a wide arsenal of tactics to try to enhance students' speaking skills, including building classroom community, organizing peer reviews, teaching both theory and skills, and encouraging students to practice their presentations. Although each of the above strategies have merit, Menzel and Carrell (1994) reported speech practices as the single greatest predictor of student speaking success. Despite the importance of rehearsals, however, students may not practice at all or may be practicing in ineffective ways. This presents instructors with the challenge of finding a way to get students to rehearse their speeches; one way to solve this dilemma may include using cutting edge technology to improve both instructor and student experiences.

A primary method an instructor may encourage to help students further develop their speeches is through practice. However, this practice often does not mimic the real speech environment (i.e., audience and context). Emerging technology, such as virtual reality (VR), can change the ways students practice their speeches and provide a new method for replicating the final speech context for students' practice sessions. Those who do adopt cutting-edge technology like VR into their classes may benefit from its use; however, the instructors who are responsible for making decisions about technology use in the classroom may be hesitant to implement this change without sound evidence for its adoption. Further, even when sound evidence exists for using a tool or strategy in the classroom, it may fail if students decline to adopt the change or do not have positive experiences with it. Given the novelty of using VR technology as a speech rehearsal technique, it is important to examine the initial utility of VR technology in the BCC. The purpose of this study is to (a) examine virtual reality tools and simulated authentic speaking environments as a potential solution to students' poor rehearsal practices and (b) explore student perceptions regarding the effectiveness of VR rehearsals in enhancing their public speaking self-efficacy.

## Speech Rehearsals and Preparation

The BCC is a staple for most general education curriculum in higher education and “introduces students who may never experience another communication course to communication-based content” (Strawser et al., 2017, p. 90). One essential component to the BCC is public speaking (e.g., speech preparation and rehearsals). Rehearsals are critical to student success in speaking and may especially be so in the BCC, where students may perform more than 10 speeches (Morreale et al., 2016).

Bodie (2010) reviewed research on speech rehearsals and found mixed results regarding the occurrence and efficacy of student speech practices. As noted above, Menzel and Carrell (1994) reported that the single greatest predictor of speech quality was the number of rehearsals a student performed before an audience. Higher levels of preparation correlate with higher speech grades (Pearson et al., 2006). However, Pearson et al. (2006) also found that some students spend as little as five minutes preparing. This is problematic because rehearsal is a key strategy for reducing speaking anxiety (Menzel & Carrell, 1994). Thus, even if practice is a useful preparation technique, some speakers (especially those with high communication apprehension) do not effectively utilize their preparation time (Ayres, 1996). For example, Pearson et al. (2006) reported that students spend most of their time writing the formal outline rather than working on delivery. Other speakers may not start practicing early enough; Goberman et al. (2011) found that when students started practicing earlier, they had more fluent speeches.

Although rehearsals before an audience are beneficial to speech quality, they are arguably the most difficult form of preparation to arrange and utilize. Speaking to this challenge, Smith and Frymier (2006) said the “practice itself should accurately reflect the skill or activity one wishes to improve upon” (p. 111). Similarly, Menzel and Carrell (1994) argued that speech practices should be as realistic as possible. Smith and Frymier detailed common practice methods for public speaking students, which included reading speeches to a small audience, reading speeches to a larger audience, reading speeches privately, practicing in front of a mirror, and recording a practice presentation. Other instructors require in class practices that allow for individualized feedback but are time consuming (Levasseur et al., 2004). Additionally, students may choose to attend a communication center (if one exists at their university) as a delivery practice method and resource for improvement (LeFebvre & LeFebvre, 2014). However, these rehearsal methods may not accurately reflect the classroom experience in size, audience composition, or environment. Virtual reality

may provide an opportunity to enhance student practices through its ability to closely replicate the classroom environment. For example, this may allow for classroom appearance, audience size, and even audience receptivity to information to be altered to match the student experience. The actual performance of the skill in a more authentic environment, replicating that of any classroom, has the potential to address student self-efficacy for public speaking.

### **Public Speaking Self-Efficacy**

Self-efficacy is a belief about personal agency, control, and ability to succeed (Bandura, 1977, 1989; Bandura et al., 1996). Efficacy beliefs are situational and include behavioral and cognitive assessments and the ability to accomplish a given task (Bandura, 1982). Self-efficacy can be negatively influenced when placed in a threatening situation, such as public speaking, especially for those who are anxious about public speaking (Lucchetti et al., 2003). To address these potentially threatening situations, Bandura (1977, 1989) outlined four ways in which self-efficacy can be built: performance experiences, vicarious experiences, verbal persuasion, and physiological states. Performance experiences are actual past experiences, either successful or not, that lead to changes in an individual's self-efficacy. Vicarious experiences occur when an individual witnesses others enacting behaviors to reach a desired outcome. The individual then determines if he or she can enact the same behaviors to achieve the same outcomes. Verbal persuasion refers to the individual hearing advice and encouragement from another. Finally, positive and negative physiological states affect efficacy beliefs. It is important to note that previous performance experiences have the strongest influence on self-efficacy beliefs (Bandura, 1977, 1982; Maddux, 1995).

Relevant to this research, both performance experiences and physiological states can be replicated and addressed using virtual reality. Specifically, first, when students practice speeches in virtual reality, they are able to view the same or a similar classroom in which their speeches will be performed with the same, or a similar, audience to whom they will be speaking. Practicing in this virtual environment, then, simulates a performance experience. Second, students may not experience anxiety when practicing in front of a small audience, friends or family, reading aloud to themselves, or when practicing in a mirror. The more realistic environment produced in virtual reality may prompt them to experience a more realistic physiological state and practice anxiety management techniques in that authentic state (rather than

planning to engage in a management technique hypothetically). Thus, virtual reality speaking rehearsals may be influential to students' public speaking self-efficacy and is explored as a unique pedagogical tool in this study. As previously mentioned, VR rehearsals can enhance efficacy and performance by mitigating experiences of performance anxiety.

### **Virtual Reality as a BCC Tool to Encourage Rehearsals**

Virtual reality (VR) has been examined as one strategy to alleviate public speaking anxiety (Anderson et al., 2005). For example, framed as a cognitive behavioral therapy, Anderson et al. (2005) exposed participants high in speaking anxiety to virtual audiences through VR as part of a treatment plan. Those who were exposed to virtual audiences self-reported decreases in speaking anxiety immediately following the treatment and again in a third month follow-up survey. Further, clinical studies have examined the effectiveness of VR exposure therapy (VRET) with reducing certain phobias and anxieties. For example, Klinger et al. (2005) explained in their preliminary VR trials that people with performance anxieties (i.e., social phobias), such as public speaking anxiety, benefited greatly. They reported that individuals who used the VRET had higher efficacy and reductions with “the full spectrum of social phobia symptoms” (p. 85). Powers and Emmelkamp (2007) concluded that VRETs are effective for individuals who suffer from anxieties and phobias and suggest using VR exposure. They highlight that VR allows for more control over the space in which the experience is conducted and allows for gradual building of exposure to specific situations which may be anxiety- or phobia-inducing. Parsons and Rizzo (2007) concurred that VRET is effective and called for more research to explore the affective and cognitive effects of those treatments. This study's focus on the student perceptions of VR for speaking rehearsals will garner more information about the affective and cognitive states of students who experience a VR rehearsal.

Given the support for VR to provide efficacy-building opportunities and therapeutic approaches to anxiety, including public speaking anxiety, one way to enhance student self-efficacy for oral communication is to innovate technologically by including VR practices as part of the BCC experience. However, we argue that changes to strategies to provide students with rehearsal opportunities should not be instituted in the basic course without sound evidence regarding effectiveness in achieving BCC goals. Although instructors know the value of student practices and

recommend this to students during class and in public speaking textbooks (Smith & Frymier, 2006), students seem less inclined to adopt this advice (Pearson et al., 2006). Thus, finding a practice technique that is both effective and likely to be adopted by students is a necessity for improving student public speaking self-efficacy. In other words, understanding students' perspectives and experiences with VR rehearsals will provide insight into the likelihood of students adopting these rehearsal techniques if instituted by basic course instructors or programs. This exploratory study examines students' perceptions of VR as an avenue of speech preparation guided by the following research question:

RQ: How does virtual reality speech rehearsal affect students' perceptions of their public speaking self-efficacy?

## Method

### Participants

Participants ( $N = 32$ ) were recruited from two sections of the BCC; two of these participants did not provide demographic information. Participants included male ( $n = 14$ ) and female ( $n = 16$ ) students who were primarily in the first semester of their first year in college (93.3%), ranging in age from 18 to 22 ( $M = 18.30$ ,  $SD = 0.84$ ). They included primarily Caucasian (80.0%) students, with 13.3% Black/African American students, 3.3% Asian/Asian American, and 3.3% identifying as 'other.' Of these participants, 12 reported having previous experience with virtual reality technology.

### Procedures

**Recruitment.** Students were recruited during the first two weeks of class. The first author visited each classroom to explain the study to students and to obtain informed consent. The virtual reality speech practice was worth 2.5% of their final grade. The designated classes were taught by members of the research team, but student consent status was kept confidential from the instructors. Although all students were required to practice, not all students consented to have their data included in the research study.

**Stimulus materials and training.** The virtual reality stimulus video was recorded using a 360-degree camera in a live classroom with actual students. This video was uploaded to YouTube and shared so that the students attending each lab session could be immersed in the 360



*Figure 1. Student view in virtual reality headset.*

classroom during their virtual reality practice (see Figure 1 for a screenshot from the virtual reality classroom video). Specifically, students viewed a previously recorded video of college students in a classroom. In the video, students were moving and acting as normal audience members would behave. To ensure consistency across the study, members of the research team used a standardized research protocol and feedback form in all lab sessions. Further, all research team members completed 3 one-hour practice lab sessions with students who were not included in the final sample.

**Virtual reality practice.** First, students entered the lab, and the practice process was explained to them by the lab assistant. Students then watched a brief tutorial video on using the virtual reality headset. Students were given a few moments to ask questions and to look over any speaking notes, since the virtual reality headset prevented students from using notes during their speech practice. Then, the student practiced their 4-5 minute final informative speech from beginning to end while the practice was recorded using a webcam. The 360-degree video of the audience was 6 minutes long, set to loop on repeat if the student exceeded 6 minutes of speaking time. While the student practiced, the lab assistant took notes using the standardized feedback form. After completing the speech, students were provided feedback by the lab assistant, using the feedback form, which students were able to take home with them. Following the brief feedback session, the student was asked to complete a short online survey with several open-ended questions about their VR practice experience. Finally, the student was thanked for their participation and excused.

## Data Analysis

Students' perceptions of their experience using virtual reality to practice for their final informative speeches were examined by three members of the research team who reviewed the qualitative responses and used open coding for emergent themes (Strauss & Corbin, 1990). The emergent themes were examined in the context in which the student discussed them and categorized as either efficacy enhancers or efficacy inhibitors. Further, the participants' responses were repetitive and consistent with the emergence of no new themes, thus suggesting theoretical saturation of the data (Glaser & Strauss, 1967; Saunders et al., 2018). Next, using the codebook developed from the open coding, two members of the research team independently coded each student response. There were several instances where a participant's response contained more than one theme, thus a total of 77 codes were assigned. The coders independently coded the responses, reviewed their codes, and discussed any discrepancies until consensus was reached about which themes were represented in the student responses. The coders achieved high intercoder reliability (Cohen's Kappa = .95).

## Results

Students' responses to the open-ended questions were coded into two themes which were comprised of eight subthemes: efficacy enhancers (5 subthemes) and efficacy inhibitors (3 subthemes). Within each theme, the subthemes are presented in descending order of frequency.

### Efficacy Enhancers

The first theme, *preparedness* ( $n = 26$ ), encompasses perceptions of feeling more prepared or confident regarding participants' speech skills. In some cases, the preparedness theme captured students' perceptions that they had a better developed action plan for continued improvement as a result of the VR rehearsal. Students remarked that engaging in this VR practice was useful and allowed them to think about what to do to prepare for their actual speech. One student explained, "it was useful because I had to fully memorize my speech before coming in, which has better prepared me for my actual presentation... I definitely feel more prepared and confident about my upcoming speech." Other students commented, "I believe the practice session was helpful. I'm a nervous public speaker, but I feel this has helped with that. I feel I'll be ready for the final speech after I make some improvements." Lastly, one student explained that she felt "more confident about giving my final

speech because before my speech was just an outline on paper but now that I've heard it and gone through it out loud in front of an audience I feel better about it.”

The second theme, *realism* ( $n = 19$ ), refers to perceptions of the authenticity of the audience and classroom experience within the VR practice session. Students explained that the VR technology allowed for the ability “to see yourself in the actual classroom setting which you are giving the speech, allowing for you to actually picture yourself there before the speech is given” and “I like how there was an audience. The virtual reality made it feel very real and I was able to practice on controlling my nerves as a result.” One student in particular reported:

It was amazing how realistic it was. I was able to give my speech just like I was in class and then get a chance to redo it. That is awesome! I am able to go into my real speech knowing what it feels like and having key points to have an effective delivery.

Overall, students noted that the VR technology afforded a realistic experience, stating, “it was a great way to get a real-world application for what it would be like to give the speech in a classroom setting.” Part of the realism was reflected in another student’s comment: “I also got to experience the distractions that could occur during my speech and how to deal with those distractions.”

The third theme of *self-awareness* ( $n = 7$ ) involves participants’ increased awareness of their existing preparation, skill level, or anxiety levels related to the speech assignment. One student pointed out that she “learned how much the audience made me tense up. I was frozen instead of moving around the class like I planned too.” Another student echoed this reaction, “the practice session was useful, I got to see how I felt in front of others.” Additionally, another student commented that the experience “was useful to me because it really made me realize what parts of my speech need the most practice.”

The fourth efficacy enhancer was named *feedback utility* ( $n = 6$ ), encompassing perceptions that the feedback participants received from members of the research team would help them improve their public speaking performance for the final speech assignment. For example, one student explained that, “this practice was very helpful in making practice in front of people and getting feedback from an instructor who knows the grading rubric.” Similarly, other students found the feedback helpful, stating, “I feel 100% more confident now that I've given it and got good feedback,” “I was provided with great feedback that I will actually use for my final speech,” and

“this practice session was useful because I got real time feedback and learned what I could improve from an actual instructor.”

Fifth, *comfort* ( $n = 4$ ), relates to student perceptions of the low-risk nature of the VR speaking practice. For example, one student explained that, to her, “it was a way for me to get more comfortable with the environment I am going to be in during my real speech in class.” Additionally, one student remarked, “it was helpful to be able to stand in front of what the classroom looks like and practice with a degree of separation and comfort.” The low-risk nature is exemplified in this student’s response, “if I messed up, or needed to stop and take a moment to collect my thoughts there wasn't a reaction from the audience.” Related to self-awareness, one also perceived that the self-awareness raised in the VR practice may decrease anxiety and enhance comfort levels, “I think for kids who might struggle to some degree with anxiety when it comes to speaking in front of a class it provides a great deal of helpful practice.”

### **Efficacy Inhibitors**

Three themes of efficacy inhibitors emerged from participant responses. The first theme, *lack of presentation aids* ( $n = 9$ ), encompasses the inability to utilize speaking notes or PowerPoint presentations with the VR headset. One student noted:

Did not like how I could not see my notes or see my presentation because it caused me to become a bit jumbled at points, also I could not see my hands or my body in general so I did not want to make any motions because I did not know what they would look like.

Others added, “the only thing not useful was not being able to use a visual aid or notes” in regards to the VR session, and “what was not useful to me was not being able to have any sort of visual guide with me and having to memorize the speech completely, it made it rather difficult.” Another noted the increased difficulty with the reflection that “this would have been easier if I had note cards.”

Although this was the most reported theme for this section, it is important to note that many students did not see a lack of visuals as a negative, and some even believed the benefits outweighed the drawbacks. After commenting about the difficulty, a student continued “overall though, I liked this way of training.” In other

examples, students stated, “it forced me to prepare my speech in advance to the point where I had to give it without note cards” and:

Before starting the speech, I was a little apprehensive about not having my visual aid behind me because I thought it would make me forget a lot of my content but it actually did the opposite. I was able to focus more on my content and my delivery because I wasn't distracted by the PowerPoint behind me.

Second, the theme of *technical issues* ( $n = 3$ ) refers to perceived problems with the use or quality of the VR technology used during the practice session. For example, one student explained, “the glasses started fogging up a little bit making it a little bit difficult to see everyone, but I could still see everyone.” Another student noted that “it was distracting that the audience was blurry.”

Finally, *limited audience realism* ( $n = 3$ ) encompasses participant perceptions of a lack of feedback, engagement, and external noise with the virtual audience. For example, “the one thing I would add is to make some type of realistic audience noise. Whether that is chairs moving or occasional whispers, it would add to the environment settings,” and:

One thing that was not useful was that there was no reaction from the audience, so in the beginning I thought I was doing great, in a real classroom, I might be able to see some non-verbals that would help me gain more attention from the audience.

## Discussion

The purpose of this study was to examine VR rehearsals as an innovative way to practice for required final informative speeches in the basic communication course. Generally, students responded positively to the rehearsal technique and highlighted several aspects of the experience that helped them to more effectively prepare for their final speech performance and to feel more efficacious. Conversely, there were some inhibitors to developing the speaking efficacy they desired when using VR. Both the positive and negative aspects of the students' experiences lend themselves to practical implications to assist instructors in deciding whether and how to incorporate this pedagogical approach into their own BCC.

Theoretically, VR provides multiple opportunities for students to build confidence and public speaking self-efficacy when compared to more traditional rehearsal strategies. As anticipated, both performance experiences and physiological states emerged in the data. First, the most frequently reported response was one of increased preparedness, which is, of course, the purpose of any form of speech rehearsal. For some students who might be otherwise inclined to practice silently to themselves due to factors such as communication apprehension (Ayres, 1996; Smith & Frymier, 2006), practicing in a comfortable VR environment provided an opportunity for them to rehearse out loud. As Menzel and Carroll (1994) noted, verbalization can help clarify thought, and thus, oral speech rehearsals help students gain more success in actual speech delivery. The students felt more prepared for the actual experience as a result of the VR. Additionally, VR provided students with a more authentic performance experience, which is of particular importance to the potential for adoption of VR for speech rehearsals. Students commented on the realism of the practice; the classroom environment and even student audience are simulated so that students may feel like they have a previous successful experience. Indeed, speech rehearsals that more closely mirror the actual speaking environment and audience are more likely to enhance actual speaking performance (Smith & Frymier, 2006).

While some research supports the efficacy of visualizing success to become desensitized to public speaking anxiety and to modify cognitions about speaking (Bodie, 2010), these students have performed successfully in a realistic environment rather than simply visualizing it. VR may provide a desensitization and cognitive modification experience that is closest to the actual speaking experience when compared to other practice methods. If VR indeed addresses both desensitization and cognitive modification needs of speakers, then they may experience the short- and long-term outcomes highlighted by Bodie (2010). However, students commented on the lack of notes and visual aids in the VR practice session. It is possible that they gained efficacy in speaking, but did not gain efficacy in competently using presentational aids because they were unable to obtain a performance experience with their visuals.

Second, efficacy is built through physiological states. In VR, the anxiousness and apprehension associated with speaking is replicated so that students are forced to cope with that physiological state. Although students perceived the practice as realistic, they did perceive that it was lower risk and reported feeling higher levels of comfort practicing in this situation. Perhaps this level of comfort begins to shift

student physiological states away from anxiousness and apprehension. Further, students may experience a positive physiological state when that practice session is successful or when they receive positive and affirming feedback. Scholars have noted that “highly anxious people view the public speaking experience as one provoking uncertainty and a relatively high degree of concern about what might occur” (Daly et al., 1989, p. 45). Overall, students’ responses suggest that VR is a promising way of allowing students, whether highly anxious or not, to reap the benefits of practicing their speeches out loud in front of a realistic classroom setting and audience, in a low-risk and comfortable setting.

A third method of building efficacy also emerged. Students identified verbal persuasion, which may be conceptualized as personalized instructor feedback, immediately following the VR as an efficacy enhancer. Revelo et al. (2017) found that instructors and teaching assistants are key sources of verbal persuasion to increase efficacy. The students discussed the one-on-one feedback they received from the research team in the lab as integral to feeling confident about moving forward on their final speeches. Not only is this type of feedback consistent with self-efficacy theory, it is also consistent with feedback intervention theory (FIT; Kluger & DeNisi, 1996). According to feedback intervention theorists, focusing feedback on a specific task helps with motivation and performance to achieve the desired standards of the task. Thus, when the feedback is solely focused on learning of the task, it is more likely to render positive results such as confidence and efficacy (Kluger & DeNisi, 1996; Schunk, 1987). Teacher feedback has been associated with higher self-efficacy in other contexts as well (e.g., Brown et al., 2016; Ruegg, 2018).

### **Practical Implications**

When instructors decide to implement technology like VR into their classrooms, it is vital that they (a) research the technology, (b) practice with the technology before introducing it to their students, (c) plan how to strategically implement it into the course, and (d) reflect on the integration of the technology (Afshari et al., 2009; Chen, 2006; Nissim & Weissblueth, 2017). Given that implementing novel or new technology like VR into the classroom has shown potential “to increase engagement in learning activities through this innovative way of delivering content, benefitting student’s learning experience” (Lee et al., 2017, p. 158), instructors and students should have a shared understanding for the technology’s use and purpose (Granger et al., 2002). Thus, considering the responses from the student participants in this

study, along with the experiences from the instructors conducting the research, several practical suggestions for use of VR technology in the basic course classroom are provided below, specifically related to video creation, classroom adoption, and advice for student use.

**Video creation.** Participants' comments regarding the realism of the VR experience were likely enhanced by the fact that the 360-degree video used for rehearsals was recorded in a classroom on campus with fellow university students. In order to ensure that the rehearsal mirrors their final speech experience as closely as possible, we suggest that instructors record videos in a manner that most closely recreates the final speech environment. To further enhance the realism of the VR experience, participants referenced that the inclusion of external noise (e.g., classroom or hallway noises) and audience reactions would be beneficial for making the experience more authentic and would provide opportunities for practicing desensitization effects. Finally, participants noted that it would have been helpful to have a speech timer incorporated within the video.

**Instructor adoption.** First, planning and testing the technology is a vital step in its integration. For example, in our initial practice session as a research team, we took turns putting on the headsets and practicing the delivery of a speech. In doing so, we were able to troubleshoot potential issues and develop a plan of action and a troubleshooting guide with steps to address any foreseeable problems during the actual student practice sessions. Becoming comfortable with the technology allowed us, during student practice sessions, to focus on the students' experiences and our feedback for bolstering their speaking skills and confidence. In this way, the use of VR technology as an additional resource for skills practice became a realistic endeavor. Additionally, we ensured the space for the practice session was safe. Given that students would be wearing a headset that may cause disorientation, we used tape to create a square on the floor with a 'X' in the middle, upon which students were directed to stand. We also told students that, for their safety, we would verbally notify them if they were close to stepping out of the marked zone.

Second, Lévasseur et al. (2004) explained that instructors often report tension between teaching content and allowing skills practice in class. We see the availability of VR rehearsals outside of the classroom as one way to help address this tension for instructors. It may be necessary to implement time in the schedule to introduce and teach students how to use the hardware and software involved, yet, this should not add to the tension instructors already experience. We addressed this issue by creating a tutorial video that students watched in the beginning of the practice session. This

time-saving technique can be made and reused with all students. This saves valuable class time, which can then be used for other instruction. VR rehearsals may also be a viable option for distance learning students as the number of basic courses being offered online and in geographically dispersed locations increases.

Third, instructors need to be prepared to provide personalized feedback. For our practice sessions, we used a standardized rubric that would allow us to provide points of strength and points of improvement, which helped us give concrete examples to the students of areas where they needed to focus and improve for their final speeches. This is likely no different from the constructive feedback instructors give during in-class rehearsals or final speeches, but does add an element of instruction to the VR practice that might not exist when practicing alone or with friends and family who do not have training in public speaking or feedback provision.

**Student use.** For the practice session, students need to be aware of the technological constraints around using VR technology. Of importance to speech practice is the inherent lack of visual access to presentational aids and speaking notes (i.e., notecards). For this study, our instructors reminded students that this was a constraint. Upon arriving at the practice session, participants were allowed time to review notes prior to delivering their speech. Additionally, within the video, we incorporated a blank PowerPoint presentation into the recording, so that, if students looked behind them within the VR classroom, they would see where their visual aid would be located.

### Limitations and Future Directions

There are a few limitations regarding this study. First, for logistical reasons, the sample size for this investigation was intentionally small (i.e., lab scheduling, time intensive practice sessions involving one-on-one feedback). Second, the students who agreed to allow their practice data to be used may differ from those students who did not agree. For example, perhaps the highly apprehensive students (about speaking or about new technology) chose not to have their data included. Third, the participants in this study may suffer from the Hawthorne Effect. Specifically, knowing that their rehearsal would be in VR, recorded and with a member of the research team present, and part of a study may have facilitated better preparation (although we cannot confirm this with our data or anecdotal observations). Fourth, students may have been experiencing greater stress at the end of the semester and

those stress levels may have impacted their perceptions of the VR experience. A final limitation is related to the affordances on the technology (e.g., sound, pixelation).

Future research should examine VR rehearsals in the BCC on a much larger scale. For example, this could be tested with multiple practices, a greater variety of speeches, and in VR environments where the audience is altered. For example, the audience can be altered to address students' specific majors (e.g., giving a pitch to a client for engineering students, explaining a diagnosis for nursing students) to increase relevance, as well as to practice audience analysis and adaptation. While this research revealed that students perceived the VR to be helpful for their anxiety and efficacy, future research should examine potential changes in these outcomes to provide additional evidence for the effectiveness of this rehearsal technique. Because students do have so many rehearsal options, it is also essential to test how VR practices compare to the more traditional practice techniques. Finally, future research should examine the factors that go into instructors' decisions to adopt VR technology in the classroom and to understand how instructor perceptions of this pedagogical technique may compare to student perceptions.

### **Conclusion**

This study uncovered students' initial impressions of using VR to practice speeches. As participants in this study noted, the overall experience not only prepared them for their final speeches, but was a new and innovative way to think about speech preparation and to apply the theory they learned during class in an out-of-class experience. This application both enhanced and hindered students' abilities to learn and practice newly acquired communication skills. As Green et al. (2017) said, "as technology changes, so will the opportunity to incorporate the changes into the classroom and measure the outcomes" (p. 27). Thus, this study makes an important initial contribution to understanding how students feel about using virtual reality technology as well as whether and how that technology can be effectively incorporated into the classroom and curriculum by BCC instructors.

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