



## Benefits of Mixed Reality Simulations in Online Courses

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### Abstract

*Online learning has become an important component of higher education. Incorporating technology necessitates the consideration of additional factors related to choosing appropriate teaching pedagogy and experiences for knowledge construction. Despite these challenges, it is “often taken for granted that technologies can ‘enhance learning’” (Kirkwood & Price, 2014) based on increased student engagement in online instruction. It is important that faculty learn how to employ enhanced instructional strategies and gain an understanding of why it is so important. This study focuses on gaining an understanding of the perceptions held by students and instructors after the use of a mixed reality simulation. Qualitative data were collected through the use of semi-structure interviews with the instructors and journal reflections from the students. The interview responses and journal entries were analyzed for emerging themes and then axial coding methodology was used to identify the relationships among the themes and frequency. Findings indicate that mixed reality simulations do have a positive impact on students.*

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## 1. Introduction

Online learning has become an important component in higher education as evidenced by the fact that the majority of American college courses include some digital components. In the fall of 2017, more than 6,000,000 students were enrolled in distance education coursework in the United States (National Center for Education Statistics, 2018). The online course delivery platform is particularly attractive to adult learners who often face the challenge of balancing work and family obligations while attempting to complete graduate coursework. In the light of current changes related to COVID-19 and the transition of most or all face-to-face programs to an online format, the need for understanding and employing enhanced instructional strategies is even more critical.

The flexibility offered by online courses is appealing to adult learners, but its structure also presents challenges. Orlando and Attard (2015) explained that “teaching with technology is not a one-size-fits-all approach as it depends on the types of technology in use at the time and also the curriculum content being taught” (p. 119). Incorporating technology necessitates the consideration of additional factors related to choosing appropriate teaching pedagogy and experiences for knowledge construction. Despite these challenges, it is “often taken for granted that technologies can ‘enhance learning’” (Kirkwood & Price, 2014) based on increased student engagement in online instruction (Gillett-Swan, 2017). Other studies comparing online learning and face-to-face instruction identified that studies since 1998 have recorded better student learning outcomes from online courses than from face-to-face courses (Zhao, Lei, Yan, Lai, & Tan, 2005). Zhao et al. (2005) findings posited that technological advances that enhanced two-way interaction might be

promoting this online advantage. Means, Toyanna, Murphy, Bakia, and Jones (2009) in their analysis of 56 rigorous studies of online education found that learners in online settings significantly outperformed their peers in face-to-face settings in the use of metacognitive strategies, including self-reflection, self-explanation, and self-monitoring. These are particularly important skills that impact candidates' ability to apply concepts learned in classes to the real-world setting.

With these findings in mind, it is important to note that beginning teachers, or those transitioning to new roles with the educational system, whether trained in traditional face to face settings or online, are reporting that they do not feel adequately prepared to face challenges in their new position (Dieker, Hynes, Hughes, & Smith, 2008). This feeling of a lack of preparation to meet the demands is a concern. One method that research has shown to be effective in increasing educators' confidence and improving their practice is coaching. Coaching has been found to increase teachers' use and fidelity to evidence-based practices (Lerman, Vorndran, Addison, & Kuhn, 2004). Typically, in the face to face setting, a coach will meet with an educator outside of student contact time to discuss the teacher's instructional practices. Research further suggested that coaching is an effective mode of professional development (Scheeler, Ruhl, & McAfee, 2004).

When students are taking online courses, it can be difficult to recreate this coaching environment. Consequently, for those constructing online courses, there is increasing interest in using technology as a tool to support online learners as they are practicing newly acquired skills. Simulations using technology provide learners the opportunity to engage in guided practice that would not typically be available to online learners, while at the same time avoiding exposing real individuals to educators' sometimes unsuccessful attempts to apply new skills (Dieker, Rodriguez, Lignugaris/Kraft, Hynes, & Hughes, 2014). The goal for using the virtual environment is to positively impact teacher recruitment, preparation, and retention in education by enabling teachers to hone their skills in the virtual environment, providing a more ethical approach to learning the art of teaching (Dieker et al., 2014).

If educators have more specific preparation, they may feel better equipped and may be more willing to remain in the classroom longer (Whitworth, 2000). This is especially true if the selected teachers are provided strong preservice training. Blair (2003) reported that quality teachers with more preparation had a greater chance of survival in education.

## **2. Problem**

The concern facing the researchers in this study was understanding candidates' and instructors' perceptions related to the use of a mixed reality program to enhance learning and knowledge application while increasing student collaboration. A small, private university in the southeastern United States employed mixed-reality simulations in an attempt to increase student-to-student collaboration and to encourage the transfer of skills between the online classroom and the real-world setting. To that end, the question being addressed is: How does the use of mixed reality simulations impact student learning, knowledge application and collaboration?

## **3. Methodology**

The researchers decided to implement Mursion software using a synchronous online setting. Graduate students would meet in a Zoom room at a specific pre-identified time. This would allow all students access to the Mursion virtual, immersive training simulator program no matter where they were physically located. The program uses a combination of artificial intelligence avatars and live actors to deliver the synchronous scenarios. The live actor, or simulation specialist, is trained in acting, improvisation, and human psychology. Simulation specialists develop a character and then play out that character's behaviors based on family history, ethnic and political identity, living environment, personal motivations, friendships, and other specific characteristics (Dieker et al., 2014). The simulation specialist playing the roles of the avatars was able to interact with the candidates during the Mursion session in addition to being able to hear the between-session conversations among the graduate student participants and their instructors. This knowledge enabled the simulation specialist to adapt the session to the needs of the students and their instructors.

Two different scenarios were specifically designed to support the education students as they attempted to apply the course content in a field setting; consequently, different courses used different scenarios. One scenario involved coaching a single adult avatar who demonstrated difficulty in his classroom instruction, while the other involved conducting a focus group composed of a diverse group of middle school students. Course participants attended hour-long sessions as a class and were able to observe each other working with the avatars. One candidate worked individually with the avatar for 10 min using their computer microphone and speakers while the instructor and class observed and analyzed the process. If a candidate wanted additional support during the 10-minute session, the session could be stopped so the candidate could ask for help from his colleagues or the instructor. After the 10-minute session, that candidate received immediate feedback and recommendations for further refinement from the instructor and colleagues. The candidate then watched other candidates practice and receives feedback. This process allowed each participant to apply their newly acquired skills while interacting with the avatar or avatars in a safe environment. As candidates became

comfortable applying the newly acquired skills, the level of resistance from the avatar was increased to present a more real life-like challenge.

This program was chosen because studies have shown that “simulations are more effective than other instructional methods because they simultaneously engage trainees’ emotional and cognitive process” (Mursion, 2018). Mursion offered the researchers the added benefit of being a synchronous simulation that could be used in an online environment.

#### **4. Data Collection and Analysis**

Qualitative data was collected from 2 instructors and 54 graduate education students over a period of three semesters. Semi-structured interviews were conducted with the instructors. Their answers were recorded, transcribed, and analyzed. The 54 graduate students completed anonymous journal reflections about their perceptions of the use of Mursion within the course. The majority of the data were collected through online open-ended questions. Students shared their reflections with both colleagues and instructors.

A qualitative research method of narrative inquiry was chosen as the strategy for data collection and analysis because theories developed using qualitative approaches are more representative of the real world. The chosen format generated 'rich' data collected from the words chosen by the participants (Creswell, 1998). Rich or qualitative data are the results of the meaning and significance of the Mursion event to the participants (Manen, 1990). According to Leedy and Ormrod (2019) “narrative researchers search for common themes, threads and tensions” (p.235). In the qualitative paradigm, data analysis could be either based on a positivist or interpretivist approach (Yin, 1984). Burrell and Morgan (1979) argue that the interpretivist approach is used to understand the “subjective experience of individuals”, consequently this study adopted an interpretivist approach.

The interview responses and journal entries were analyzed for emerging themes. The data was classified and interpreted using open and axial coding. Using the open coding methodology, the researchers read through the qualitative, narrative data several times to create “chunks” of data. The interpretive, inductive method was used to generate themes and ideas and then axial coding methodology was used to identify the relationships among the themes. The themes were then further analyzed to determine their frequency. The frequency was used to identify the importance as determined by the group of participants.

#### **5. Discussion**

Journaling responses occurred based on three open-ended questions: (1) What surprised you about this activity? (2) What did you (or your students) learn from this experience? (3) How did the activity help to hone your (or your students’) skills? After analyzing the responses to these questions, it was determined that the knowledge growth most frequently discussed related to interpersonal relationships. Approximately 80% of the respondents commented on principles related to group dynamics and interpersonal interactions. 80% of the participants commented on the role of preparation for interpersonal interactions and 80% also commented on learning about ways to better handle the interactions as they were occurring.

The most frequently identified theme about preparation for the Mursion interactions was nervousness or feeling intimidated (20%). It became obvious that the participants viewed the conversation with the avatar as a legitimate conversation. One participant stated, “Interviewing avatars is not something I would have ever thought that I would do. However, when the students asked me about the pictures on my wall- I realized it was very life-like.” Another stated, “One of my biggest takeaways from this coaching session was the need to build a positive relationship with the people I am working with.” About 10% of the participants expressed concerns about how to prepare for the interview with the avatars. A student observed, “I learned that how you ask questions was just as important as the questions. Although the questions were similar, the presentation of the questions seems to impact the responses given.”

Students also commented on what they learned from the experience about effective ways to conduct interviews. About 20% of the respondents discussed the importance of using open-ended questions. One student stated, “Variations occurred in the ways in which we expanded on the responses. As interviewers we need to be aware of what messages we are sending to our interviewees because this can impact how they respond.”

15% of the participants discussed the importance of paying attention to body language when conducting interviews. A participant indicated, “Mr. Miller’s (the avatar’s) responses were sort of resistant towards some of the feedback he was receiving, he would sit back and crossed his arms. Pretty much telling us, “I am already doing that in my classroom, do you have anything else”. Mr. Miller was more open to ideas that expanded on what he was already doing, he would lean in gesture and nod. If a coach led with a positive, he was more open and reflective.”

Knowledge growth was not limited to the actual time the individual interacted with the avatars. About 10% of the participants commented on what they learned by observing others interact with the avatars. A participant observed, “I enjoyed watching everyone take a turn and seeing how we all interpreted the information in different ways and would take the coaching to different points all while following the same guideline charts.”

## 6. Conclusion

Although students found the experience initially intimidating, many of the participants indicated that they found the experience to be positive and they gained important knowledge from it. Even the one student who experienced some technical issues, indicated that the experience was positive. The three following responses summed up the experience well. One student stated, "It is a learning experience that I will always cherish." Another added, "This was probably the most fun I have had in this program since it started. I got so tickled by the students. This was so close to a real-life experience." One indicated the desire for additional sessions with the comment, "I would want to practice other scenarios as well. I liked having practical "lines" prepared in advance so that I knew what I wanted to say and had planned an articulate way of providing feedback beforehand. It is also important to be prepared to listen, and not simply present my "spiel" and move on." Based upon the results of the data analysis, the researchers have determined that the mixed reality simulations do positively impact students in the areas of learning, knowledge application and collaboration.

## 7. Limitations

A variety of factors limit the generalization of the findings from this study to other groups of students, locations, and programs. The frequency, time, and method of implementation of the mixed reality scenarios was chosen based upon the learning objectives of the program. This approach gave us flexibility in meeting the specific needs of students through the experience; however, the characteristics of the instructors or the students might have impacted the effectiveness of the mixed reality experience.

Second, the number of participants in our study was limited to 54 graduate students and 2 instructors. To determine the extent to which these results can be generalized to other populations and settings, additional studies that incorporate an expanded population, are needed. In this study, data about participants' perceptions were also only collected through journaling and interviews. No attempt to made to quantify learning gained through the experience. Additionally, only graduate students from two education programs were included in the study. These findings might be able to be generally to students at other levels or in other programs.

Finally, because not all students participated synchronously in the Mursion session, perceptions of students who only viewed the recording might be different from the perceptions of those who participated in the session. Responses were not disaggregated by synchronous interaction as compared to asynchronous viewing of the session.

## 8. Future Research

As course designers continue to incorporate mixed reality simulations into their online courses, it will be important to extend this research and determine if there are different results based upon the participants' age, the program in which students are enrolled, and the type of activity within the mixed reality simulation. It would also be beneficial to investigate the impact of mixed relativity sessions on student engagement and student achievement since these variables were not investigated in this study.

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