

**Randomized Control Pilot of Virtual Reality, Empathy, Knowledge,  
Emotions, and Self-Efficacy among Undergraduate Health Science Students**

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**Abstract**

Immersive, embodied virtual reality (VR) combines a head-mounted display with head and motion tracking systems, noise-cancelling headphones for sound, and a three-dimensional interaction scenario. VR can enable social work students to become fully immersed in a simulated realistic world to experience client scenarios. Scant research has been conducted on VR and undergraduate students; this study aimed to answer the research questions: 1) What is the feasibility and acceptability of virtual reality in a large, undergraduate class? and 2) Is virtual learning more effective than an active learning assignment on undergraduate students' knowledge, empathy, emotions, and self-efficacy? A randomized control pilot study was conducted with undergraduate students ( $N = 18$ ) in an introductory course. Students were randomized to receive VR (intervention group) or an active learning assignment (control group) to learn about people with Alzheimer's Disease, vision impairment, or in end-of-life. VR was feasible and acceptable among students who commonly reported it as "cool". The results found that students in the VR group reported more empathy for health conditions and poorer self-efficacy to support clients than the control groups. The reality that immersive VR enables has

profound potential for preparing future health professionals to support clients with health conditions.

## **Introduction**

Some undergraduate health and social work programs have begun including a new form of experiential learning beyond the classroom, virtual reality (Huttar & BrintzenhofeScoz, 2020). Immersive virtual reality (VR) combines a head-mounted display with head and motion tracking systems, noise-cancelling headphones for sound, and a three-dimensional (3D) video, audio, and motion-censored interaction scenario that enables students to become fully immersed in a simulated realistic world to experience potential client scenarios (Li et al., 2017). According to neuroscience philosophers, VR creates embodied simulations to process our surroundings and interactions with it, which is what neuroscientists suggest is what our brains do in the “real world” (Bostrom, 2003; Tegmark, 2017). Riva and colleagues (2019) explain that “the brain creates an embodied simulation of the body in the world used to represent and predict actions, concepts, and emotions.” In embodied VR, the physical body is replaced with a virtual one; the user feels presence in a virtual body and in the digital space surrounding it. Lane (2017) argues that, while people can read a book or description about a scenario, it will lack critical details and the “all important ingredient, the feeling of ‘being there’.” This explanation of VR provides a deeper understanding of the potential for VR in education and preparation of health professionals.

## **VR and Professional Education**

If the brain processes VR similar to how it does the “real world,” then the potential for VR use in preparing future health professionals is beyond merely knowledge, emotions, and

empathy, which are commonly measured outcomes in previous VR research with college students. In a review of 38 experiments using VR with college students, 35 out of 38 studies showed that students improved a skill, knowledge, and/or increased engagement (Concannon et al., 2019). Another review of six VR articles related to improving students' attitudes about mental illness found that there was a clear relationship between VR simulation and empathy, attitudes, and knowledge of mental illness (Wan et al., 2019). Buchman and Henderson (2019) conducted focus groups with students across eight healthcare educational programs who participated in Embodied Labs' (2021) immersive VR simulations, the same application used in this study. The focus groups suggested increased knowledge, empathy, and acknowledgement of the importance of effective interdisciplinary communication for improved patient outcomes. Using the Presence Questionnaire (PQ) this study indicated students felt present in the VR simulation. Similarly, Dyer and colleagues (2018) found that students across medical professions' use of immersive VR using Embodied Labs (2021) was associated with an increase in empathy and understanding of age-related health problems. New research on building soldier's emotional resiliency prior to going into combat using VR shows that VR can potentially prevent PTSD among veterans; this research has implications for social workers and other first responders who could benefit from resiliency to avoid burnout or secondary trauma (Rizzo & Shilling, 2017). However, many of these studies did not use control groups.

The use of VR in undergraduate education is becoming more common, yet little is known about its effectiveness in teaching. Summaries of teaching with VR using Second Life, a non-immersive virtual reality world, have been published but without quantitative data (Lee, 2014; Reinsmith-Jones et. al., 2015; Tandy et al., 2017). In Second Life students create an avatar which explores and engages in a virtual world. Neither noise cancelling head-phones or motion-sensors

are used nor needed. Only seven full-length articles and conference presentations in total were found in a systematic review of social work undergraduate education and virtual reality (Huttar & BrintzenhofeScoz, 2020). Reinsmith-Jones' study included an evaluation of social work students' participation in Second Life where their avatar was placed in one of five scenarios. One example scenario included a plane crash where nine avatars were plane crash survivors and asked to make difficult decisions as a group. The avatars and environment are presented in a cartoon-like drawing lacking real world detail. The results of the evaluation found that students reflected on developing empathy and emotions as well as grappled with professional values (Reinsmith-Jones). In Tandy's study they created an avatar to participate in an interview with student avatars as a mock client interview. Students reported enjoying the experience and developed skills from it but did report that it was not as serious as a real interview. Other social work instructors used avatars and virtual role playing with students. Levine and Adams (2013) found that students who participated in virtual case management role playing improved self-efficacy.

Randomized control studies on VR and professional education have begun more recently. Liaw and colleagues (2020) compared outcomes of VR and face-to-face simulations with student physicians and nurses on teamwork and team communication; they found no differences in skills learned between the groups. In another study, basic life support training for first year medical students was delivered in virtual and traditional face-to-face formats, finding that traditional methods led to better technical skills while virtual methods had increased knowledge, which led the authors to recommend a combination of virtual and face-to-face approaches (Issleib et al., 2021). Berg and Steinsbekk (2020) observed first year medical and nursing students in individual practice of the ABCDE (airway, breathing, circulation, disability, and environment) approach,

comparing traditional practice with equipment (i.e. blood pressure gauge, ear thermometer, and pulse oximeter) to virtual practice. Similar to the prior study, traditional practice and virtual practice had different benefits, where students were more satisfied with virtual practice and were engaged, however they found it gave a non-inferior learning outcome compared to traditional practice, as well as concerns in meeting potential advanced practice learning needs. Francis and colleagues (2020) found that student physician assistants who participated in a VR simulation of an operating room improved their self-efficacy more than those who did not. The self-efficacy and resiliency outcomes mentioned previously are of particular interest to social workers and are newer researched outcomes.

The VR research suggests the potential for VR to be effective in improving students' empathy, reflection, interpersonal skills, and competence to effectively engage with diverse clients and their families. This randomized control pilot study aimed to answer the following research questions: 1) What is the feasibility and acceptability of virtual reality in a large, undergraduate class? and 2) Is virtual learning more effective than an active learning assignment on undergraduate students' knowledge, empathy, emotions, and self-efficacy?

### **Methods**

A randomized control pilot study with delayed intervention was conducted. A convenience sample of undergraduate students from a Hispanic Serving Institution were randomly assigned to three groups. The university institutional review board approved this study.

#### **Virtual Reality Assignment**

An undergraduate class of 46 students from fall 2019 utilized Embodied Labs' (2021) immersive patient scenarios by donning headsets for VR in individual sessions. The course, titled HLTH 101 Overview of the Health Care Delivery System, was designed for interdisciplinary

health sciences majors, some of whom may become social workers. The course was taught by a trained social work professor. Students were assigned a VR session to improve learner knowledge, empathy, emotions, and self-efficacy to support clients with various health conditions or disabilities: Alzheimer's Disease, vision impairment, and/or in end-of-life. The VR method used was Embodied Labs (2021), which includes 3D video and audio using an Oculus headset in which students "embodied," experiencing life as a patient with a health condition. Students could turn their heads while wearing their headsets and look around to fully capture the realistic scene surroundings as the patient and interacted with other people portrayed by professional actors (Appendix A). They were also asked to complete tasks in the scenes while interacting with family members or health care providers; as students moved their real hands, they saw the patient's hands move in front of them (Appendix B). The patients' hands looked different than theirs; sometimes the hands they saw were slightly wrinkled to reflect an older adult patient and/or dark to represent a patient of a person of color's ethnic background. Students were randomized in semester week 1 to an intervention (VR) and control group (active learning assignment). In semester weeks seven (Study Week 1), eight (Study Week 2), and nine (Study Week 3) of the 15-week semester, students participated in VR or an active learning assignment at home. Those who did not get to complete Virtual Reality in Study Week 1 were scheduled to complete VR in Study Week 2 or 3 as a delayed intervention. Students were each assigned a patient scenario, which was associated with one of the following health conditions: Alzheimer's Disease (the Beatriz scenario), sensory impairment (the Alfred scenario), or end-of-life (the Clay scenario). The instructor was present to assist with students using VR to help the student to get the headset set up, move to the next scene (each scenario had 2-3 scenes), and reflect briefly after

they completed the scenario. Due to the large class size of 46 students, it took three weeks of class (3 hours per week) for each student to have a chance to complete one VR scenario.

### **The Patient Scenarios**

The first scenario embodied was Alfred, a 74-year old African American male with macular degeneration and hearing loss. In the scenario, he spends time with family, visits a doctor, and receives a diagnosis. Participants of the Alfred scenario can: 1. understand hearing and vision loss, 2. identify effective modes of communication between patients and healthcare providers, 3. identify assistive technologies for people with vision and hearing loss, and 4. describe what happens inside the eyeball of a person with macular degeneration according to Embodied Labs (2021). The second was Beatriz, a middle-late aged Latina woman who transitions from early to middle to late stages of Alzheimer's disease; she interacts with family members and healthcare workers. Beatriz scenario participants can: 1. identify ways in which Alzheimer's Disease affects brain communication, 2. recognize visual and auditory changes in the progression of Alzheimer's Disease, 3. identify ways to redirect, calm, and engage a person with Alzheimer's Disease, and 4. find ways to work as a team to improve quality of life of the patient (Embodied Labs). The third was Clay, a 66-year old male, with a terminal diagnosis whose experiences include receiving a terminal diagnosis, hospice care at home, and the active dying process at the end-of-life. Clay scenario participants can: 1. learn sensitive communication skills about end-of-life, 2. practice communication and transitioning in care, 3. experience physical body changes in the end-of-life, and 4. remember end-of-life symptoms (Embodied Labs). The Alfred scenario was 15 minutes, Beatriz scenario was 20 minutes, and Clay scenario was 22 minutes. Each scenario has 2-3 different scenes offering the students a brief break between scenes.

### **Alternative, Active Learning Assignments**

Two alternative assignments were given for students during the weeks they did not complete VR. The assignments included readings on the patients' health condition as well as an active learning assignment. The Week 1 active learning assignments for each scenario were compared to the VR group outcomes. Alfred scenario students' week 1 alternative active learning assignment was: "For 15 minutes, wear a sleep mask or bandana covering your full eyesight while in your home. Try to have a conversation in person or on the phone, listen to the TV or radio." Beatriz scenario students' alternative assignment was: "Tie shoelaces with a blindfold, scarf, or bandana covering your eyes." Clay scenario students' alternative assignment was: "Create a funeral playlist- which five songs do you want played at your funeral."

### **Data Collection**

To address research question 1 on the feasibility and acceptability of VR in a large, undergraduate class, debriefing discussions with students were used. To address research question 2, if VR is more effective than an active learning assignment on undergraduate students' knowledge, empathy, emotions, and self-efficacy, surveys were administered to students before and after the assignment they conducted in Week 1. Surveys asked students about empathy, knowledge, emotions, and self-efficacy related to the patient scenario. Questions were designed by the second and third authors from a previous non-experimental study on the impact of VR on nursing students (Hannans and Nevins, 2021). Survey questions are in Tables 2-4.



## Analysis

Due to the longitudinal nature of the study, missing data was an issue. A total of 18 students had complete pre and post surveys used for analysis. A description of the study sample is in Table 1.

Descriptive statistics were used to describe the full sample with complete pre- and post-data ( $N = 18$ ; Table 2). To test the effectiveness of the Virtual Reality assignment, between-group (VR versus Week 1 Active Learning Activity) comparisons of changes in knowledge, empathy, emotions, and self-efficacy were conducted between the VR and control group for each scenario. Qualitative responses to open-ended questions were also analyzed.

## Results

### Feasibility and Acceptability

VR was feasible because of grants received by the second and third authors to bring the equipment and scenarios to campus. Oculus headsets are approximately \$300 each, and Embodied Labs requires a subscription to access scenarios, which is approximately \$10,000 annually for universities. The second author who had used VR prior with nursing students met with and introduced the first author to the equipment and scenarios. Staff from the university Teaching and Learning Innovations team also provided technical support on the days that the VR was used. Additionally, the first author and instructor for the course using VR scheduled and planned each VR day over the span of three weeks of the course. This required adapting the length of other topics covered in the course.

Debriefing reflections immediately following students' participation in VR and group discussion as a class yielded rich descriptions of students' acceptability of VR. Overall, students were engaged, excited, and described the experience as "cool" very often. One student said it

was her most memorable experience of any course offering she took at the university. Some students who had experienced VR gaming previously appeared immediately comfortable with using the headset, and when prompted to physically move in the scenario, they did so with grace and comfort. Other students appeared to need a moment to get used to wearing the headset and appeared uncomfortable at first; when prompted to physically move in a scenario, these students would make small movements. The first author would sometimes assist them by helping them to make a bigger movement with their hands for example. Students who completed the Clay, end-of-life scenario, responded strongly to it. Two students cried a bit and reported that it was “intense”. Emotional support was provided by the instructor, a trained social worker. Students were asked to remain in the office with the instructor until they felt prepared to leave the room. They were also offered university counseling services if needed. One of these students reported that even though she had worked in hospice, she was never able to put herself in her clients’ shoes and was able to do so in the VR simulation. A third student reported that he was “not phased by death” and described seeing his uncle being shot in front of him the previous week. The student told the first author, his instructor, this one-on-one as he reflected immediately after completing the VR simulation. Many of the students in the Health Science program come from low-income backgrounds, still live locally in low-income communities, and may experience trauma from gang or other violence. The instructor believes that the one-on-one reflection after the VR simulation provided space for students to feel safe to be vulnerable with the instructor. The instructor requested emotional students to sit with her in the room where they did the VR, take time to debrief more, and the instructor assessed students’ emotional stability prior to letting them leave. The instructor was prepared to refer students to the counseling center on campus if needed, but that was not needed.

## Effectiveness

All analyzed survey response data is reported in Tables 1-3.

**Emotions.** In the Clay End of Life Scenario students were asked, “How would you feel if you had a disease that was incurable?” The response options were ranked by negative (i.e., angry) to positive emotions (i.e., peaceful). The VR group students reported fewer negative emotions towards end-of-life in the post-survey than the control group. Students in the VR group reported four less negative emotion words in the post-survey compared to the pre-survey regarding how they would feel if they had a disease that was incurable. Students in the control group reported two less negative emotion words in the post-survey compared to the pre-survey in the same prompt (Table 2).

**Knowledge.** Knowledge was measured for the Clay End of Life and Beatriz Alzheimer’s Disease scenarios. While there were slight changes in students’ ability to recognize symptoms of end-of-life and Alzheimer’s Disease, no significant differences between the VR and control groups were observed (Tables 2 & 4).

**Empathy.** Empathy was measured for the Alfred sensory loss and Beatriz Alzheimer’s Disease scenarios. Students in the VR group were more likely to report that they understood older adults in the post-survey among the VR group compared to the control group. When responding to “People with vision impairment, like macular degeneration, can live life to the fullest” for those who did the Alfred scenario and “Once a person cannot recognize their family and friends, they no longer are able to feel emotions like love, friendship, hope, or connection” for those who did the Beatriz scenario, VR group students were more likely to disagree with the first statement and agree with the second statement than control group students, suggesting that VR students empathized with the severity of symptoms of the two health conditions.

**Self-Efficacy.** The VR students' report of confidence to support individuals at the end of life or with Alzheimers' was typically less than the control groups' reported self-efficacy in the post-survey.

## **Discussion**

This randomized control pilot study found that VR was feasible, acceptable, and had stronger empathy effects on students' outcomes as an alternative assignment. Future research is needed to assess the efficacy of VR. There have been a fair amount of virtual reality studies conducted in the nursing and medicine (Araujo, Duarte, & Magro, 2018; Dyer, Swartzlander, & Gugliucci, 2018; Elzie & Shaia, 2021; Foronda et al., 2017; Kavanagh et al., 2017; Shin et al., 2019). However, randomized, multisite, sufficiently powered studies are needed to establish efficacy of virtual reality for the health and helping professions. In future research a larger sample size will be used, which will enable multivariate analyses since a limitation of this study was the use of bivariate analyses.

The results found that students in the VR group reported more empathy for patient conditions or disabilities and poorer self-efficacy to support clients with these health conditions or disabilities than the control groups. Previous research on immersive VR shows that students felt "present" in the VR scenario (Buchman & Henderson, 2019). The undergraduates in this study were in a 100 level, introductory undergraduate course, suggesting that they had minimal knowledge on how to support patients. While the VR and control groups experienced similarities in knowledge gained, they both improved knowledge on the health conditions they embodied in the simulations. With their improved knowledge about the needs of people with the health condition they embodied and the "realness" of the scenarios, students may have felt that they lacked skills to support the patients given their very little undergraduate education at that time.

As a novice user of VR as a teaching methodology, the first author did not fully consider the depth and difference in learning that occurs in VR. While the assessments in this study were commonly used in other studies to assess VR (Dyer et al. 2018; Francis et al., 2020), the first author believes that the students' responses to the end-of-life question "How would you feel if you had a disease that was incurable?" may best represent the potential effects of VR out of all of the data collected. If students are truly embodying a person with a specific health condition such that they did in this study, they are going to come out of the experience with a newfound appreciation, understanding, and emotional response to the health condition. While this is like empathy, the student is still interpreting the embodied experience through their own perspective. Different measures should be used to grasp the effect of VR on student learning. The research on the concept referred to as "emotional resiliency" among veterans, demonstrating its potential to prevent PTSD, is of particular importance to explore in social work education. Future research should assess the impact of VR on emotional resilience and self-efficacy of VR in an upper-division or graduate social work course. It should also explore how VR experiences, immediate brief reflections, and/or in-class debriefing discussions after VR experiences may improve the memory of skills or knowledge gained.

One previous social work study used virtual scenarios to improve cultural competence; this should be explored more in future research (Lee, 2014). The first author was impressed by Embodied Lab's (2021) use of patients from diverse backgrounds and the depth of cultural influence portrayed in each scenario. For example, Latina students who participated in the Beatrice scenario reported that they saw their own families in the scenario. Beatrice held traditional roles within the family such as preparing meals, grocery shopping, and watching her grandchildren in the simulation. She is also almost always surrounded by a large family with

Spanish accents though English language was used. In scenarios such as this that embrace a specific culture, future research should assess the impact of VR on cultural competence.

### **Conclusion**

Although the use of VR in social work education appears limited at this time, there is potential for enhancing knowledge, empathy, self-efficacy, cultural competence, and potentially emotional resilience. The profession of social work in healthcare calls for both cognitive and personal attributes that includes a good basis of knowledge of health conditions along with the ability to be empathetic and interpersonal (Seipel, Johnson & Walton, 2011). The methodology of immersing the student into a patient case scenario allows an opportunity to develop key attributes for those choosing social work education that translates into practice - a practice that empathizes with the patient/client, uses good judgement, and relates well to clients and interprofessional teams. In our study, VR is found to be feasible, acceptable, and effective in the academic setting as a methodology to enhance knowledge, empathy, emotions, and self-efficacy, aligning to current research findings. Therefore, there is benefit in pursuing greater exploration in use of VR for both academia and professional practice to substantiate both short term and long term effects.

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**Table 1*****Sample demographics***

| Variable            | Frequency(%) |
|---------------------|--------------|
|                     |              |
| Gender              |              |
| Female              | 16(88.88)    |
| Male                | 2 (11.11)    |
| Ethnicity           |              |
| White, Hispanic     | 11(61.11)    |
| White, non-Hispanic | 5(27.77)     |
| Asian               | 2(11.11)     |

**Table 2**

***Clay Scenario (n = 6), End-of-life Patient Week 1***

|  | Pre           | Week 1 Post | Change |
|--|---------------|-------------|--------|
| <b>Emotional Response to End-of-Life:</b> How would you feel if you had a disease that was incurable?  |               |             |        |
|  | Frequency (%) |             |        |
| VR Group   |               |             |        |
| Angry  | 2(66.7)       | 1(33.3)     | -1     |
| Helpless   | 3(100)        | 2(66.7)     | -1     |
| Sad  | 3(100)        | 2(66.7)     | -1     |
| Scared   | 2(66.7)       | 1(33.3)     | -1     |
| Resigned   | 2(66.7)       | 2(66.7)     | 0      |
| Curious  | 2(66.7)       | 1(33.3)     | -1     |
| Determined   | 0(100)        | 0(100)      | 0      |
| Empowered  | 1(33.3)       | 1(33.3)     | 0      |
| Peaceful   | 0(100)        | 1(33.3)     | 1      |
| Control Group  |               |             |        |
| Angry  | 0             | 0           | 0      |
| Helpless   | 0             | 0           | 0      |
| Sad  | 3(100)        | 3(100)      | 0      |
| Scared   | 3(100)        | 1(33.3)     | -2     |
| Resigned   | 2(66.7)       | 1(33.3)     | -1     |
| Curious  | 0             | 1(33.3)     | 1      |
| Determined   | 0             | 1(33.3)     | 1      |
| Empowered  | 0             | 0           | 0      |
| Peaceful   | 0             | 0           | 0      |
| <b>Knowledge:</b> Identified number of end-of-life symptoms out of 6 end-of-life symptoms.   |               |             |        |
|  | M(SD)         | M(SD)       |        |
| VR Group   | 4.67(1.15)    | 4.67(0.57)  | 0      |
| Control Group  | 4 (2)         | 3.67(1.15)  | -0.5   |
| <b>Perceived Self-Efficacy:</b> I feel confident to provide care for someone in the last weeks of their life. Options ranged from 1 = not at all confident to 10 = very confident. |               |             |        |
| VR Group   | 4.67 (3.78)   | 4.67 (4.61) | -0.25  |
| Control Group  | 4.67 (4.00)   | 6.33 (3.05) | 1.66   |

**Table 3*****Alfred Scenario (n = 6), Older Adult with Macular Degeneration***

|   | Pre        | Post       | Change |
|---|------------|------------|--------|
| <b>Empathy:</b> I understand the perspective of an older adult. Options ranged from 1 = strongly agree to 7 = strongly disagree   |            |            |        |
|   | M(SD)      | M(SD)      |        |
| VR Group  | 2(0.0)     | 1.33(0.57) | -0.66  |
| Control Group   | 2.67(0.57) | 2.67(1.15) | 0      |
| <b>Empathy:</b> People with vision impairment, like macular degeneration, can live life to the fullest. Options ranged from 1 = strongly agree to 7 = strongly disagree |            |            |        |
| VR Group  | 2.6 (0.57) | 1.67(1.15) | -0.93  |
| Control Group   | 3.33(1.58) | 3.00(1.00) | -0.33  |

**Table 4**

***Beatriz Scenario (n = 6), Older Adult with Alzheimer's***

|   | Pre          | Post    | Change |
|---|--------------|---------|--------|
| <b>Knowledge:</b> Imagine if a person with early stage Alzheimer's disease had her family coming over to eat during a holiday. Which of the following might be affected?                |              |         |        |
|   | Frequency(%) |         |        |
| Memory  |              |         |        |
| VR Group  | 3(100)       | 3(100)  | 0      |
| Control Group   | 3(100)       | 2(66.7) | -1     |
| Attention   |              |         |        |
| VR Group  | 3(100)       | 2(66.7) | -1     |
| Control Group   | 3(100)       | 3(100)  | 0      |
| Spatial Awareness   |              |         |        |
| VR Group  | 1(33.3)      | 2(66.7) | -1     |
| Control Group   | 2(66.7)      | 3(100)  | 1      |
| Speaking Ability  |              |         |        |
| VR Group  | 2(66.7)      | 2(66.7) | 0      |
| Control Group   | 2(66.7)      | 2(66.7) | 0      |
| Auditory Processing   |              |         |        |
| VR Group  | 2(66.7)      | 2(66.7) | 0      |
| Control Group   | 1(33.3)      | 2(66.7) | 1      |
| Emotions  |              |         |        |
| VR Group  | 2(66.7)      | 3(100)  | 1      |
| Control Group   | 3(100)       | 3(100)  | 0      |
| Balance/gait  |              |         |        |
| VR Group  | 1(33.3)      | 1(33.3) | 0      |
| Control Group   | 1(33.3)      | 1(33.3) | 0      |
| Facial Recognition  |              |         |        |
| VR Group  | 2(66.7)      | 3(100)  | 1      |
| Control Group   | 3(100)       | 2(66.7) | -1     |
| Ability to Understand Words   |              |         |        |
| VR Group  | 1(33.3)      | 2(66.7) | 1      |
| Control Group   | 3(100)       | 2(66.7) | -1     |
| Planning  |              |         |        |
| VR Group  | 3(100)       | 3(100)  | 0      |
| Control Group   | 3(100)       | 3(100)  | 0      |
| Task Completion   |              |         |        |
| VR Group  | 3(100)       | 3(100)  | 0      |
| Control Group   | 3(100)       | 3(100)  | 0      |
| <b>Empathy:</b> To what extent do you agree with the following statement? "Once a person cannot recognize their family and friends, they no longer are able to feel emotions like love, |              |         |        |

|  |            |            |       |
|--|------------|------------|-------|
| friendship, hope, or connection." Response options: 1 = strongly agree to 7 = strongly disagree  |            |            |       |
| VR Group   | 4.67(1.52) | 3.33(0.57) | -1.34 |
| Control Group  | 6.33(0.57) | 6.33(0.57) | 0     |
| <b>Perceived Self-Efficacy:</b> What is your level of confidence in providing care for people in the early stage of Alzheimer's? Options ranged from 1 = no confidence to 5 = very confident.  |            |            |       |
| VR Group   | 3.67(0.57) | 3.00(0.0)  | -0.67 |
| Control Group  | 4.00(1.00) | 1.67(1.15) | 2.33  |
| <b>Perceived Self-Efficacy:</b> What is your level of confidence in providing care for people in the middle stage of Alzheimer's? Options ranged from 1 = no confidence to 5 = very confident.   |            |            |       |
| VR Group   | 3.67(0.57) | 3.33(0.57) | -.34  |
| Control Group  | 3.33(0.57) | 3.00(.00)  | -.33  |
| <b>Perceived Self-Efficacy:</b> What is your level of confidence in providing care for people in the late stage of Alzheimer's? Options ranged from 1 = no confidence to 5 = very confident.   |            |            |       |
| VR Group   | 3.67(1.15) | 2.33(1.15) | -.34  |
| Control Group  | 3.33(1.15) | 3.33(0.57) | 0     |
| <b>Perceived Self-Efficacy:</b> Rate your confidence level to handle an experience where a patient's family members are angry, negative, defensive, or critical of your skills. Options ranged from 1 = no confidence to 5 = very confident. |            |            |       |
| VR Group   | 2.66(1.52) | 2.33(1.15) | -.33  |
| Control Group  | 2.33(1.52) | 2.33(0.57) | 0     |

## **Appendix A**

### **Photo of Student Participating in VR**





## Appendix B

**Photo of Student Moving Physically as Prompted in the VR Scenario**

