USE OF FIRST-PERSON PLAYER COMPUTER GAME TO IMPROVE GERONTOLOGY STUDENTS' EMPATHY TOWARDS PERSONS WITH DEMENTIA

Juniarto Hadiatmadja (First Author)* [a], Sam Sim[b] and Bavani Elanggovan [b]

[a] School of Design, Temasek Polytechnic, Singapore
[b] School of Humanities & Social Sciences, Temasek Polytechnic, Singapore

*Hadiatmadja_juniarto@tp.edu.sg

Conventionally, gerontology students studying to be future carers for persons with dementia develop empathy for the people they will be caring from an observer's perspective. This could either be through directly observing the difficulties faced by people with dementia or reviewing various media articles that highlight the problems related to the illness. As a result, the students current learning falls far short of enabling students to have an experience closer to being 'in the shoes of a person with dementia'.

This study explores the potential use of a first-person computer game format for facilitating and motivating the learning of gerontology students. A simulation format that enables students to have something closer to a first-person perspective of the common visual and auditory experiences of persons with dementia. This would open the potential for a more impactful, emotive experience that generates the students' deeper understanding and sense of empathy toward the people with dementia.

The proposed study piloted use of the game with students from a gerontology course in Singapore. A country where the dementia awareness is rising as the country rapidly evolves into a greying society. The study was jointly planned by lecturers with relevant expertise in dementia care as well as those with a built environment background with the ability to develop computer simulation environments. The proposed simulation that the students engaged with are made up of the digital built environment as well as presence of autonomous nonplaying character avatars that students can autonomously converse with. Both elements are planned to enable a combined experience that closely reproduces the common environmental conditions and interactions encountered by people with dementia.

The study plans to potentially capture the breadth and depth of the students' response. With this purpose in mind, the various input of students participating in this research were captured through an online anonymous survey with open ended questions. The responses were compiled and analysed to highlight the prominent benefits as well as limitations of the current computer simulations used. The current research provides foundation as well as possible directions of future research. This could expand beyond the initial topic to influence the direction of teaching and learning in topics related to other emerging concerns in society.

Keywords: *computer simulation, dementia care, motivating students teaching and learning, empathy*

Introduction

Based on data produced by the Singapore Department of Statistics, in 2024 the ratio between working age residents (aged 20 to 64) compared to residents aged 65 and above is 3.5. This is a decline from a ratio of 4.3 in 2020 and a ratio of 7.4 as recently as 2010 (Department of Statistics Singapore, 2025). The data shows a progressive decline of the ratio of the amount of working age residents that can support the elderly population. This is a clear indication of Singapore rapidly becoming a greying society.

The situation also comes with a realisation that Singapore will be required to continue to increase support for its rising elderly population. This also comes with an increased awareness of the specific problems faced by the elderly population. Within the context stated above, specific tertiary education courses related to gerontology in general and more specifically to cater for care of the elderly have been established in Singapore.

One specific problem highly related with the elderly population is the higher likelihood for a person to develop dementia as a person grows older (Subramaniam et al, 2025). Therefore, an important part of a gerontology student's education would be related to the care and understanding of dementia.

Continuous improvement of how the teaching and learning of the topic of dementia that leads to a student's deep understanding is of primary concern. An understanding that would hopefully lead to the student's deep empathy to care for the person with dementia (PWD).

This paper will take a closer look at one specific research conducted at a polytechnic level gerontology care related course in Singapore as part of continuous efforts to improve care for persons with dementia. The polytechnic is fortunate to have a wide range of courses ranging from social sciences, engineering as well as design from which a multi disciplined approach for

improvements could be realised. In this case, the research involved a collaboration between teaching staff from the school of Humanities and Social Science's gerontology related course and the School of Design's built environment related course.

Before the research was conducted, the topic of dementia has been taught in a series of subjects. This starts with subjects in year one on the theoretical understanding of dementia within the wider introduction of gerontological care. Year two students will delve deeper into the topic of dementia specifically. The course also collaborates with a dementia care centre to enable practical observation of the care of persons with dementia. In short, the students learn through a variety of ways to observe the persons with dementia.

The current research wishes to enable students to not just be an observer. The research wishes to enable students to be closer to a position of being 'in the shoes' of a person with dementia.

This is made possible through collaboration with teaching staff from the school of Design with a built environment studies background. The school of Design staff at the time was interested in developing digital built environment simulations that would be useful for the needs of other professions.

In this case, such a digital environment explored possible ways to replicate some experiences of what is uniquely seen and heard by a person with dementia. By engaging with this digital environment, the gerontology students would not be 'looking at' the person with dementia. On the contrary, the students would be closer to an experience of 'seeing, hearing and overall experiencing the world' of a person with dementia. It is a unique visual and auditory experience beyond that of an outside observer trying to 'imagine' what the person with dementia is experiencing.

The teaching staff from both schools have the common objective that the experience given to the students would enable them to not just gain increased understanding. More importantly, they would also obtain a deeper empathy towards the difficulties faced by persons with dementia. An empathy that is critically needed for students to be motivated to care for the persons with dementia in their future profession.

The following sections of this paper will focus on how the research was set up, results that were achieved and the conclusions that could be drawn. At its heart, the following sections of this paper will attempt to answer the main question of: To what extent does this initiative, to enable the students to have an experience closer to what is seen and heard by a person with dementia, can affect their learning?

The research will endeavour to highlight the possible improvements that could be accomplished as well as the limitations currently faced. In addition, the research also discusses the current state of digital environments that could be created to enable the students to have the intended learning experience. The paper will also discuss the students' feedback on the drawbacks of the set up and technologies. At the same time recommendations for future improvements will also be noted.

Materials and Methods

This research is still at a preliminary stage. For this research, 31 students participated. The students were in their second year of a three-year polytechnic level diploma related to gerontology care in Singapore. The students were introduced to the digital simulation by the school of design lecturer that made the simulation. This was done during the students' in-class consultation activity.

Within the time limit of the class activity, five students had the experience to try out the digital simulation. The other 26 students could see what the five students are experiencing through a shared projected screen.

The chosen format for the digital environment simulation was a first-person computer game. This format was chosen because the view shown on the computer screen would be the view that emulates what is seen through the eyes of the person playing the game. Therefore, this format would be a format that gives a closer experience for the student player to feel to be 'in the shoes' of a person with dementia. This is distinct from a third person computer game format that shows the entire body of the avatar that represents the student playing the game. This format was not chosen because it only resembles observing the person with dementia from a distance. The difference between the different formats are presented in Figure 1 and Figure 2.

Figure 1. First Person Format emulates the view from the eyes of person playing the game. In this case player is conversing with the character in front of the player. The shadow of the player's head can be seen on the other character's torso.

Figure 2. Third Person Format emulates an observer that is looking at the entire body of the player's avatar (visual representation of the player) from the back. Iin this case the male figure with the beige sweater is the player avatar.

The first-person format game was developed using Unreal Engine software. This software was chosen due to the different visual as well as auditory experiences that could be developed for different parts of the digital environment. The different visual and auditory experiences were used to give a contrast between parts that show the world of a person with dementia and parts that show the real world (experienced by people who do not suffer from dementia).

For this specific simulation the staff from School of Design was given useful input by the staff teaching gerontology. The effects shown in the simulation closely replicated the visual and auditory experiences of a person that has a specific type of dementia which is known as Lewy body dementia (Lewy Body Society, 2019).

The Unreal Engine software also provided an important feature that rapidly simulates the surrounding environment. The feature is called procedural content generation (PCG). Using this feature a multitude of buildings, trees and streets of different sizes could be spawned randomly to rapidly fill the landscape using parametric input. Thus, digitally creating an urban conurbation instantaneously. The PCG environment was further enhanced by using additional code to enable changing arrangements of buildings to appear over time. Overall, this will result in an ever changing overall built environment. This simulates the disorientating built environment that people with dementia navigate through in their daily lives. The changing built environment created can be seen Figure 3 and Figure 4 below.

Figure 3. Prior arrangement of simulated buildings

Figure 4. Subsequent arrangement of simulated buildings

The PCG environment also provides a feature that could enable variations of the colour tone and camera lens sharpness in different parts of a digital environment. This feature was useful to incorporate the input of the gerontology staff about difference of colour and vision between the real world (as perceived by people that do not have dementia) and the world of a person with dementia. Figure 5 shows a comparison of the two world views that could be experienced.

Figure 5. Left: Colour and lens sharpness in the real world; Right: Colour and lens sharpness experienced in the world of a person with dementia.

At a detailed level, the digital simulation also incorporated the use of technology developed for utilising non-playing character (NPC) human avatars that the person playing the game could interact with (Moltenbrey, 2023). These NPC avatars represent different people that the person with dementia may often encounter in their daily experiences. These can range from health care professionals to family members that the person with dementia commonly engage with.

The appearance of the avatar is also adapted to what a person with dementia would see the character to be in different parts of the digital environment. The appearance of the avatar may change as a person exits or enters the part of the simulation environment that shows the world of a person with dementia.

These changing forms of the avatars are meant to simulate the symptom of misidentification that a person with Lewy body dementia may experience. The person with this particular form of dementia may even misidentify their own family members (Lewy Body Society, 2023). An example used in the simulation can be seen in Figure 6. In this example, the middle-aged female character in the real world is seen as a younger version of herself in the world of a person with dementia. This could lead the person with dementia to misidentify the avatar as a different person.

Figure 6. Left: character in the real world; Right: Same character with a younger appearance in the world of the person with dementia.

The students who played the game were also able to verbally interact with the character's avatar (visual representation of the character). In order to support this, the avatars utilised conversational artificial intelligence technology. This was provided by Convai.com website. This technology enables each avatar to be programmed with a specific personal character data bank. This data bank can be updated and modified whenever needed. The NPC avatars were also given a specific voice type that is relevant to the intended character. This enables the

avatars to be conversational non-playing character AI (NPC AI) avatars. The use of the technology provided by Convai.com also enabled students to verbally ask the avatars to walk by either leading or following the players to different parts of the digital built environment simulation (Convai, 2024). The interface used to enter the knowledge bank, voice and personality of the avatar in convai.com can be seen in Figure 7.

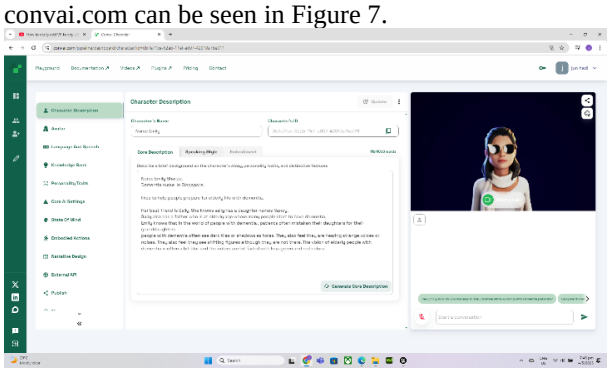

Figure 7. Convai.com interface

An additional information to note is that the body, facial features and clothes of the avatars were developed from various sources. Some were taken from the Metahuman website which is developed by Epic Games, the parent company of Unreal Engine. The Metahuman avatars had a high compatibility with Unreal Engine, but the possible appearance and clothing are rather limited (Gorka Games, 2023). More customisable avatars were developed using a software called Character Creator 4 and imported into Unreal Engine (Jobutsu Tutorials, 2023). A comparison of the quality of the conversational NPC AI avatars can be seen in Figure 8. Additionally, some background figures with movement but without speech ability were made using Adobe Mixamo (Unreal University, 2024). These can be seen in Figure 12.

Figure 8. Left: Metahuman avatar Right: Character Creator 4 avatar.

After the simulations have been conducted, the students were given an opportunity to provide their feedback. This was mostly obtained through open ended questions in an online anonymous survey. The mostly open-ended nature of the survey questions were meant to enable students to extensively express their feedback.

Results and Discussion

The students gave a range of responses toward what they experienced. The paragraphs below will highlight the main findings and offer some further discussion on the findings. Figure 9 and Figure 10 show situation of the room and facilities used at the time of the student's interaction with the first-person format computer game simulation.

Figure 9. View of a student playing the game viewing through a laptop computer screen while the non-playing students are at the back of the class.

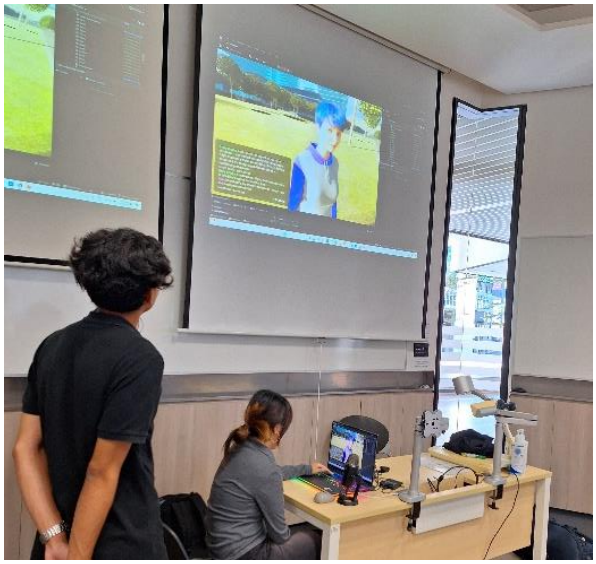

Figure 10. View of class projector screen used by non-playing students.

The vast majority of students (30 out of 31 students) were able to list specific experiences that were common to built environments experienced by persons with dementia. These range from viewing water puddles as holes to changing building arrangements. The students were also able to observe changing imaginary characters and sounds that the player representing the person with dementia can see or hear. Figure 11 and Figure 12 show some of the scenes from the part of the simulation showing the world of the person with dementia.

Figure 11. Example of water puddles perceived as holes in the world of the person with dementia.

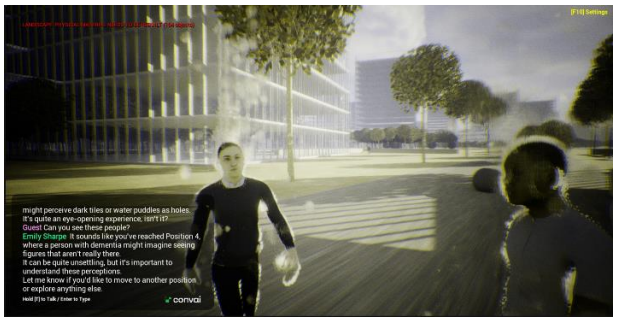

Figure 12. Example of avatars from Adobe Mixamo used in the simulation to depict examples of illusion of imaginary figures seen by the person with dementia.

Most students (29 out of 31) gave feedback that through experiencing the first-person game, they felt a higher sense of empathy towards the person with dementia. When asked about it in more detail, the students gave a variety of reasons of what encouraged a higher sense of empathy. Some students feedback centred on the ability to see not from their own point of view but from a person with dementia. Other students highlighted the sense of annoyance, fear and confusion that they themselves were feeling from what they experienced in the simulation.

In terms of specific positive experiences of the simulation, the students gave a variety of replies. This ranged from enjoying the interaction that the simulation provides as well as some increased insights and understanding of the topic of dementia.

Similarly, when asked to give feedback of negative experiences of the simulation, the students also gave a variety of feedback. These range from some glitches and slow processing that occurred while the simulation was played as well as some feeling that the scenario of the game was not realistic enough.

The students gave suggestion for future improvement of the game. The most basic suggestion focused on improving the game playing mechanism such as possible use of WASD buttons on a keyboard. A feature that is used for common input in computer games. Other students stated the need for utilising better graphic displays and a faster pace of the game.

There were also some more advanced suggestions to enable the game to be more realistic. For instance, there was a suggestion that the simulation could also be made to be more contextual for Singaporean students by using digital environments that are familiar local scenes. There was also a suggestion that the interaction of the player with NPC avatars could be more varied, realistic and emotional. For example, this could be done through scenarios where the plea for help by player as a person with dementia was misunderstood, rejected or shun by the NPC avatar.

Some analysis could also be done in terms of teaching efficiency and future for development. The simulation was conducted within a limited class consultation timing. With only 5 students directly playing the game, the projected view only enabled most other students to have lesser form of interaction. Most students can see the interaction that happens but cannot actively participate. Efforts should be explored to enable more students to have the opportunity to play the simulation.

One possibility of how wider participation could be realised is by further developing the simulation into a stand-alone game. This could be downloaded by each student into their personal computer. This could also enable access even outside of the classroom hours, at any time and any location that the student prefers.

By enabling each student to download a stand-alone format of the simulation, the students could play the simulation repeatedly on their own computer. Repeated use could enable the students to notice details and nuances of the simulation that may have been previously missed. The repeated use of the simulation could potentially also offer an interactive way in which students could revise on specific learning points related to the study of dementia care.

The students feedback also highlighted that improvements could still be considered to further improve the immersive view that students could experience. It is important to consider the limitation of a 2D computer or projector screen as the medium to show the view of a person with dementia. It raises questions that if the digital simulation can be viewed in a 3D format it could enable an even higher state of immersion that enables the students to be even closer to be ‘in the shoes’ of a person with dementia.

Conclusions

Overall, the simulation seems to enable something closer to a ‘first hand’ experience that the students would not have been able to obtain in the current conventional observations that they are commonly taught with. Overwhelmingly, most students have expressed that the simulation had a positive impact towards their understanding and empathy for persons with dementia.

It should be reminded that currently the research is at a preliminary stage with feedback from a limited number of respondents. Further research involving a larger number of respondents would be useful to further confirm the current findings.

Discussion on the possible future development such as the idea to make the simulation into a downloadable stand-alone game as well as the search for even more immersive formats are also important to note. Such suggestions could broaden access to the simulation and improve the immersive quality of the simulation as well.

The research also raises wider questions beyond the scope of dementia care alone. Could other first person

computer games be developed to help students understanding and empathy towards the plight of people with other ailments? Would this possibly have wider impact that could benefit health care related education in general?

All these efforts are in line with an overarching pursuit to continually improve the education of students. Nurturing them to be passionate individuals who will be the future generation of care giving professionals. In the end, the hope is that these efforts will contribute to the emergence of a more empathetic and caring society in the future.

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