The reality of virtual reality at a South African university during the COVID-19 pandemic

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Intervention

A desktop-based virtual environment (VE) was developed to address the COVID-19-related limitations of the 'Nursing students' virtual environment'. The original strategy, based on the head-mounted display (HMD), was used to develop the desktop-based virtual reality platform aimed at improving student access to the virtual reality learning experience. Students were expected to access this platform either through their personal computers or via mobile phones at remote locations. The authors report on the feasibility of this desktop-based virtual reality platform in the form of the lessons learnt, based on information from a sample of volunteer undergraduate nursing students and the developers of the platform. The student group, comprising 34 undergraduate nursing students in their third or fourth year, were asked to install the platform on their personal computers (or phones), navigate through the platform and provide the developers with feedback based on their experience. Adam *et al.*[1] argue that virtual educational interventions need to be tested for feasibility, especially in low- and middle-income countries, before they can be adapted to mainstream education. Information gathered through feasibility testing may be used to enhance the usability of interventions, such as this desktop-based virtual reality platform, further enhancing its utility within the undergraduate nursing programme at the University of the Free State.

The lessons learnt

The COVID-19 pandemic re-emphasised the need for innovative teaching strategies for all health professions students, including nursing students, because of the limited opportunities for work-integrated learning. It was thought that a desktop-based virtual reality platform might enhance students' access to simulation activities from remote locations. Based on our modified feasibility test of the desktop-based virtual reality platform on volunteer undergraduate nursing students and the developers of the platform, we learned several lessons from this experience, namely:

1. *All students, regardless of their COVID-19 status, must be able to access the virtual reality sessions.* Students exposed to or diagnosed with COVID-19 were expected to quarantine or isolate from other students, and risked missing planned simulation activities and work-integrated learning when at home. The desktop-based virtual reality platform afforded students in quarantine or isolation an opportunity to continue learning. In addition, the students continued learning with limited physical contact, thus reducing the chances of spreading COVID-19. The current requirements are a personal computer or laptop capable of running low-end gaming applications (4 GB of RAM, 1.8 GHz dual core processor with 1 GB storage and an Intel HD on-board graphics processor). The long-term goal is to provide an even more accessible platform via a web-based, mobile and desktop application.
2. *The virtual clinical learning platform can be re-used.* Nursing students engaged in an institution-based virtual reality simulation do not have an opportunity to re-engage or re-enact the simulation, owing to logistical limitations and student numbers. The desktop-based virtual reality platform can be re-used and re-engaged at the student's convenience.
3. *A student may develop clinical reasoning skills.* Inasmuch as the desktop-based virtual reality simulation relates to clinical learning, students may only develop clinical reasoning skills as their decisions on the care of the virtual patient may directly result in a simulated physiological response. However, students will not develop any nursing-related psychomotor skills from this platform, as they use only a conventional mouse and keyboard or a touch screen interface when interacting with the scenario. The nursing students will still need to learn nursing-related psychomotor skills.
4. *The rapid development of the platform may result in errors.* The abrupt disruption of learning in health science education institutions (HSEIs) owing to the COVID-19 pandemic catalysed the rapid development of teaching and learning resources, including this desktop-based virtual reality platform. The development of such a platform needs meticulous checking and re-checking to avoid errors that may have serious consequences for the entire simulation. Such errors may be incorrect psychological indicators, incorrect navigation mechanisms, and non-compatibility with certain devices. During the original testing, such errors were found and addressed before exposing students to the VE. These errors included incorrect lung sounds, incorrect blood gas values and issues with navigation, which caused some users to experience extreme nausea.
5. *Connectivity is the mainstay of learning through the platform.* The literature underscores the value of connectivity as integral to remote teaching and learning.[1] The utility of this desktop-based virtual reality platform hinges on the internet connectivity available to students. The initial download of this platform is through a zero-rated university website; however, future use will require students to use their internet resources, which might limit the utility of the platform. Further improvements to this platform need to be directed towards minimal data use.
6. *Time and support commitment.* The initial development of such a system is time-consuming. The original VE took 19 months to design, develop, test and implement. Subsequent changes took ~3 months. Extensive

training is required for lecturers, but not as much for students, as was found in previous research endeavours.[2] A dedicated support person is needed to assist with queries. At this stage, the developer is fulfilling this role, but the ideal solution would be to establish a separate support structure in the future.

What will be kept in practice?

Our intervention, namely the desktop-based virtual reality platform, was necessitated by the abrupt disruption of planned clinical learning activities as a result of the COVID-19 pandemic. It is envisaged that after the COVID-19 pandemic disruption, all the elements of this platform will be integrated into the mainstream undergraduate nursing programme. While this intervention was designed and tested on some volunteer nursing students, we plan to expand it for all levels in the undergraduate nursing programme. Furthermore, this desktop application will also include multiple scenarios for the various student levels, and tools used in the development of this application, such as Unity (Unity Technologies, USA) and Visual Studio (Microsoft, USA) will be integrated into future virtual clinical education environments.

What we will not do in the future

Before the COVID-19 pandemic, students had to wait for planned educational sessions for them to experience the virtual clinical learning platform. These planned educational sessions were usually timed, and students did not always explore simulation activities fully or have an opportunity to replay the sessions. Based on experience, we have realised that the desktop application could increase student access to the virtual clinical learning environment from their remote locations before planned educational sessions. In future, we will not limit student experience of virtual reality only to planned institution-based simulation sessions but integrate the desktop virtual clinical learning.

Conclusions

The COVID-19 pandemic has forced the rapid development and adoption of education-related innovations. A desktop-based virtual reality platform could enhance access to virtual reality by undergraduate nursing students from remote locations. Such an education-related innovation may improve the thinking operations of nursing students, resulting in better quality nursing graduates.

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Evidence of innovation

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