

ENGAGING PHARMACY STUDENTS: EXPERIENCING VIRTUAL REALITY IN THE CLASSROOM AND CONNECTING GROUPS AND COMMUNITIES WHO NEED PHARMACOLOGICAL ADVICE WITH MOBILE APPS

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Abstract

Pharmacy practice goes beyond drug dispensing and prescription checks. More importantly, it is about connecting patients and continuously performing medication reviews because patients' health conditions change over time [1]. This case study reports how a pharmacy educator redesigned the curriculum so that students could gain both cognitive knowledge and awareness of the human side of pharmacy practice through virtual simulation and connecting vulnerable people in the community.

Pharmacy students in the 21st century are used to learning with technologies such as notebook computers, virtual reality devices and mobile applications [2]. Pharmacy students in Hong Kong have much exposure to the use of mobile devices for communication with peers, and they are highly encouraged to use mobile applications to find drug information and useful and reliable medical references with medical mobile applications. However, because they have very limited opportunities to know the communication and consultation process with doctors and patients, it would be a valuable experience if they can experience it through immersion in virtual reality devices using their mobile phones or notebook computers as preparation for clinical internships. A mobile application for e-health support for patients is under development, and it will gather health records of individual patients, information on drugs being prescribed and the pharmacist, and medical appointment data. These students may be able to build a holistic conceptual understanding of medical support for patients from hospital to being discharged into the community.

Keywords: Virtual reality, mobile application, professional preparation, community.

1 INTRODUCTION

Emerging technologies have become indispensable in higher education, and educators can consider adopting a variety of pedagogies to engage their students. While students may be evaluated on their satisfaction on the implementation of innovative pedagogies, there are limitations on how much impact can be made on student learning when educators adopt learning-focused use of technology [3]. To create learning challenges by using emerging technologies such as immersive virtual reality and mobile applications, educators may want to see if students spend more time on tasks and ultimately promote deeper understanding and effective disciplinary practices. This paper reports on the adoption of emerging technologies in the pharmacy program in a university in Hong Kong, examining how pharmacy students gain experience through the integration of immersive virtual reality in the classroom and their responses to such a learning experience. The second part of the paper reports on a mobile application that is under development, which will serve to build drug knowledge and good habits on drug adherence, and connect medication users with pharmacy professionals.

2 IMMERSIVE VIRTUAL REALITY IN THE CLASSROOM

Bandwidth in many classrooms and lecture halls in the university is not sufficient when streaming videos for over 30 students, and a variety of output formats have been considered. The output of 360-degree virtual reality videos was set to three formats so that students could choose any of the formats. Because all students attending the class had notebooks, they could use web-based non-immersive viewing of the virtual cases. However, in order to experience close proximity with the virtual doctor and patient in the cases, two options were set: (1) head-mounted display with sensors; and (2) smartphone mode with Google card boxes. Before attending class, students needed to install apps in their mobile phones for viewing the 360-degree videos.

In class, the teaching staff guided the students to explore a VR case with a student wearing a head-mounted display with sensors that illustrated the clinical process (Fig. 1), and students view the 360-degree capture of web-based or tablet-based cases (Fig. 2). Afterwards, the students examined the clinical case with peers either using tablets or their own smartphones mounted with Google card boxes.



Figure 1. Student using HMD with sensors while the professor explained the clinical diagnostic processes to the class.



Figure 2. Students viewing 360-degree capture of web/tablet-based virtual cases.

2.1 Results of using VR cases in the class

The first-time experience of viewing the process of observing responses from a patient and interaction with a doctor through using either the web-based or the immersive mode of virtual cases was not positive [4]. The main focus of students was about medication management, i.e. drug dispensing, although they liked the opportunity to be situated as if they were in a real clinical setting to assess a patient and their clinical treatment. However, they preferred to have more time for discussion and questioning in paper cases, because there was limited class time in the program.

Virtual cases can allow students to explore and rehearse how to communicate with patient and doctor in a safe environment for them to practise professional skills [5]. Nevertheless, it is essential to enable them to shift focus from drug dispensing to a patient-centred approach that includes building a relationship with the patient, patient-centred communication and ultimately an improved adherence to taking prescriptions to raising awareness of self-managing care after discharge from a hospital [6].

3 PHARMACY MOBILE APP DEVELOPMENT

Medication adherence is only 50 percent for drugs prescribed for chronic diseases in developed nations [7]. Non-adherence can be unintentional, where patients intend to take their prescribed medicines but ultimately do not (e.g., due to forgetfulness), or intentional, where patients make an active decision not to take their medicine [8]. In Hong Kong, medication is prescribed by doctors, but medication adherence is only 75 percent, the main reason for non-adherence being concern about side effects [9]. Nevertheless, using mobile applications to provide dosage instructions, and to send alerts and reminders, can improve medication adherence [10][11]. The mobile application is designed with

consideration of (1) having a database of drug information for medication users; (2) having users keep a medication-taking log; (3) having the next appointment marked and reminder set; and (4) connecting with pharmacy professionals.

3.1 Technical design and development

The mobile application provides a more ready connection with medication users in Hong Kong, and it is connected with a web platform Ampoule (<http://www.ampoule.org.hk/>) in which users can ask questions of pharmacists or arrange an appointment for consultation with a registered pharmacist. The design and development phase started in September 2018 with input from both the teaching professional and registered pharmacists. The prototype was tested in March 2019 with student pharmacists [Figure 3] so that they could provide feedback on the functionality and user-friendliness of the application [Figure 4], and be aware of how they can be connected with medication users when they become registered pharmacists.



Figure 3. Ampoule mobile application.

Item check	App screen	Comments and suggestion
3) Some patient go to public hospital do not know their doctor's name		End user can input 'no/ don't know'

Figure 4. Collection of feedback after testing in the design and development stage.

4 DISCUSSION AND CONCLUSION

Pharmacy practice has changed from being predominantly drug dispensing to more patient-centred care in which education on drug information for safe medication, involvement of patients in decision making, and ways to improve patient engagement, such as medication education, counselling and health management, are more important. To achieve this, mobile applications have bridged the gap between professional pharmacists and medication users in the community [2][12]. At the same time, pharmacy education in Hong Kong has also undergone continuous enhancement in the curriculum. Although change in the teaching spaces in the university is limited, educators can integrate some of the emerging technologies in the classroom.

As pharmacy students have notebooks and smartphones when attending classes, educators can get them to maximize the learning opportunities using those devices. Although students can make use of the devices to support their understanding of drug dosage and detailed up-to-date clinical references with apps, they cannot replace human-to-human interactions [13]. The use of immersive virtual reality aims to present a close encounter with student pharmacists with doctor and patient, so that students build a personal understanding and have empathy in a clinical setting [14][15]. Undoubtedly, students still need to have real interactions when they start their internships. The virtual environment serves to provide a safe context for students to practise and rehearse not only the questions they should raise or respond to, but also to make them aware of the subtlety in patients' emotions and their responses to medication in actual situations.

Although pharmacy students in Hong Kong are very familiar with mobile apps for daily activities, they may have different perceptions when using apps for professional preparation [16]. By involving them in the design and development of a health-related mobile application, they will then have a better understanding about medication user behaviour and can participate in the design and development process of the application for community use.

Living in an ever-changing environment, educators can create many unprecedented learning opportunities using emerging technologies in pharmacy education so that the next generation of pharmacists are well equipped with both a patient-centred approach in practice and a holistic competence in professional practice when they serve in the community.

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