Information Technology Self-Efficacy and Confidence Amongst Health Professions Students Enrolling in a Telehealth Educational Course

Rodrigo Mariño
Melbourne Dental School
University of Melbourne
Melbourne, Australia
e-mail: r.marino@unimelb.edu.au

Mark Merolli
Dept of Physiotherapy, School of Health Sciences,
University of Melbourne; Centre for Digital
Transformation of Health
Melbourne, Australia
e-mail: merollim@unimelb.edu.au

Daniel Capurro
Melbourne School of Engineering
School of Computing and Information Systems
University of Melbourne; Centre for Digital Transformation of Health
Melbourne, Australia
e-mail: dcapurro@unimelb.edu.au

***Abstract*—A telehealth course was designed to provide entry-to-practice health professions students with a set of foundational knowledge and skills needed to succeed as a virtual health care practitioner in an age where remote care has become increasingly needed. In preparation for the large-scale testing and validation of the course, this study examined the level of technology proficiency (reported as self-assessed 'confidence') amongst the future healthcare workforce. This assessment was undertaken among students from four health sciences departments at the University of Melbourne, Australia. Students were invited to participate in the study by completing an online, anonymous, 68-item questionnaire. Relevant to this manuscript, the questionnaire included 22 items pertaining to Internet and Information Communication Technology (ICT) use, adapted from Technology Proficiency Self-Assessment Questionnaire for 21st Century Learning (TPSA C-21). Results indicated that access to technology and frequency of use of the Internet was high, with 57.7% of the students accessing the Internet, at least, every 30 minutes. When students were asked about their level of confidence with ICT, responses suggested that students were confident in their ability to perform all the task included in the TPSA C-21. Nonetheless, students felt less confident with the administrative aspects of mobile technology and in its use as a tool for their future role as health professionals. Findings indicate that students have adequate proficiency. The study identified some areas in which support, and further development may be required.**

Keywords – students; use of ICT; technology proficiency

I. INTRODUCTION

Telehealth (telemedicine, virtual care, etc.) has developed and continues to advance rapidly for several reasons. These include but are not limited to progress in Information and Communication Technologies (ICT), increasing patient's expectations and preferences, and a need for flexible models of care [1][2]. Telehealth is a useful vehicle to improve equity of access and opportunity for care to patients, help solve specific health problems, and expand the possibilities of continuous training/furthering development for health professionals [1].

More recently, it has been observed how, in a short period of time, due to the COVID-19 pandemic, an expansion in the use of telehealth and ICT from all its modalities of practices, to ensure that health services are provided and made available to the population [3][4]. This situation has highlighted the urgent need and obligation to train our future health workforce to new, modalities of practice, which undoubtedly will involve some form of telehealth to operate effectively [5][6]. Health professionals of the digital age must develop proficiencies and competencies in this area and understand its opportunities and limitations of working under this "new normal".

The Faculty of Medicine, Dentistry, and Health Sciences, The University of Melbourne developed and evaluated a blended learning experience to provide entry-to-practice health professions students with a set of foundational skills and knowledge needed to succeed as a virtual health care practitioner [7]. This learning experience will equip health professionals with the core capabilities that are necessary to work in diverse multidisciplinary scenarios and address current and new demands in health care using telehealth and ICT.

The modules in this course provide access to theoretical elements of the state of the art in telehealth and generate spaces for reflection that allow health professional students to acquire the basic core knowledge to go beyond teleconsultation and remote triage. The course also allows students to identify those healthcare services and procedures that could be successfully provided through telehealth. The emphasis is not on technology, but on the ability of students to:

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- communicate with various stakeholders (i.e., patients, other clinicians, care teams)
- deliver patient-centered education and care
- effectively adopt new technologies
- identify barriers and facilitators to care using this model
- work in multidisciplinary healthcare teams.

This paper is organized in five sections. The first Section provides the foundation for understanding the need for a telehealth course and the structure of such a course and presents the aims and objectives of the study. Section II describes the methodology used in the pilot test the course. Section III presents the results of the trial, including students involved in the course. Sections IV and V discuss the results of the trial and conclude on its findings, respectively. Further steps are also discussed in last section.

The specific objective of this study was to assess the level of self-assessed technology proficiency amongst the future healthcare workforce. This assessment was undertaken with students across four interprofessional health sciences Departments/Schools at the University of Melbourne, Australia: Dentistry, Physiotherapy, Social Work, and Audiology and Speech Pathology.

This evaluation was considered an important first step alongside an understanding of implementation challenges and associated issues to aid in integrating telehealth into the educational environment.

II. METHODS

With the approval of the Human Research Ethics Committee from The University of Melbourne (Study ID: 20529), students from five health science award courses (across four departments) at the University of Melbourne were recruited to participate in this project. These courses were: Dentistry, Oral Health Therapy, Physiotherapy, Social Work, and Clinical Audiology.

Data was collected between August and September 2021. During this period students were invited to participate in the study by first completing an online anonymous, 68-item questionnaire. The questionnaire included items on socio-demographic characteristics and course level data, as well as Internet utilization information (i.e., frequency and devices used). Additionally, the instrument included 22 items asking about Internet and information communication technology (ICT) use, adapted from Technology Proficiency Self-Assessment Questionnaire for 21st Century Learning (TPSA C-21) [8]. The instrument also contained a subsequent 34 items about perceptions surrounding using telehealth [9]. Students' perceptions around telehealth were captured according to the Unified Theory of Acceptance and Use of Technology (UTAUT2). The UTAUT2 is a validated and reliable framework for examining elements of technology acceptance and has been adopted in several studies [10][11].

Socio-demographic information reported in this analysis included age, sex, and course of study.

Internet utilization information included: Frequency of online access; participants classified themselves according to frequency of visit to Internet sites, as 'At least hourly, 'At least daily, 'At least weekly', 'At least monthly', and 'Less than once a month'. The device use list included 9 alternatives: Mobile smartphone; tablet (i.e., iPad); desktop computer; laptop; smart TV; gaming console (i.e., Xbox, PlayStation); smartwatch (i.e., Apple watch, Fitbit); eBook reader (i.e., Kindle, Kobo, etc.); and smart home assistant (i.e., Google Home, Amazon Alexa).

The TPSA C-21 was assessed on a 5-point ordinal Likert scale, according to the response that best described their confidence in using the Internet and ICT as 'Strongly disagree' to 'Strongly agree'. These responses were weighted as 'Somewhat agree'= 0.5, 'Strongly agree'= 1, all other responses = 0. The weighted values were added to yield a total confidence (proficiency) score.

Sample size calculation were based on the minimum requirements to detect a change from pre- to post-intervention (i.e., participation in the telehealth course), it was estimated that a total sample size of 26 participants would be necessary to detect a mean difference of five-tenths (0.50) of the standard deviation in major outcomes between paired observations of participants (pre-test vs. post-test), at the uni-dimensional significance criterion of 0.05, and a power of 0.80 [12]. The study used convenience samples of male and female students, 18 years or older, enrolled in the aforementioned courses.

Data were analysed using IBM SPSS to statistically compare results between different socio-demographic and Internet use variables. Given the small sample size, only basic descriptive information on the distribution of selected socio-demographic and study variables was performed. Categorical and ordinal variables were analysed utilizing Chi square analysis (χ^2). For continuous variables (technology proficiency results), data were analysed using one-way analysis of variance (ANOVA) to examine main effects of each of the independent variables on the dependent variable under study.

III. RESULTS

In total, 26 students enrolled in the training course and completed the pre-assessment instrument. The majority (82.6%) were female and aged 29 years-old or younger (76.9%). Nine participants were from the Dental School (34.6%), 23.1% were from Physiotherapy, another 23.1% were Social Work students, and the remaining 19.2% were Audiology students.

All participants had access to a smartphone and a laptop. Frequency of use of the Internet was high (Table I), 57.7% of the students accessed the Internet at least, every 30 minutes. Another 23.1% access very hour. No statistically significant differences in frequency of use were found by profession, sex, or age group.

TABLE I. FREQUENCY OF ONLINE ACCESS (%)[A]

Every 10 minutes	Every 30 minutes	Every hour	at least once a day
42.3	15.4	23.1	19.2

a. N= 26

When students were asked about their level of confidence with technology (their self-assessed proficiency), results indicated (Table II) that they were confident in their ability to perform most of the tasks. Confidence scores ranged from 13.0 to 22.0, with an overall mean of 19.8 (s.d. 2.5). Half of the participants scored 18.0 points or more in the confidence scale. There were no significant differences by gender, age group, frequency of use, or profession.

Except for one item (item 11), participants scored highly in all the items (>55.0%). In particular, they all (100%) strongly agreed that they were able to: find webpages related to my subject matter interests (Item 1); use the computer to create a slideshow presentation (Item 7); and download and view streaming movies/video clips (Item 20). In another seven items, all students were either Strongly or Somewhat confident that they would (Items 3,6,9,18,19,21,22); and that they confidently would download podcasts and audio books; or send phots via a smartphone; or and safe and retrieve files from the cloud.

On the other hand, although the majority (> 50%) were strongly/somewhat confident in their proficiency, they were less confident in areas requiring deeper skills such as: creating a database of information (26.9%) (Item 8); integrating mobile technology in their work or creating a blog (26.9%) (Item 14). Students were also less confident in describing software programs or apps they would use in their role as healthcare professionals (19.2%) (Item 10), and to a lesser extent using social media tools as part of their role as health professional (7.6%) (Item 13).

Healthcare profession students felt less confident in two items: writing a plan with a budget to buy technology that would support me in my role as health professional (Item 11); and on how to create their own webpage (Item 2). When asked about how satisfied they were writing a plan with a budget to buy technology that would support me in my role as health professional, although the majority was either somewhat confident or slightly confident (57.7%), 15.4% was neutral and, more importantly, another 26.9% somewhat or strongly disagree with the statement.

The majority were also confident (strongly: 30.8%; or somewhat: 30.8%) that they could create their own webpage. However, 15.4% were neutral, and another 19.2% were somewhat confident and 3.8% was not confident.

TABLE II. STUDENTS' RESPONSES TO TECHNOLOGY PROFICIENCY QUESTIONNAIRE (%)[A]

I FEEL CONFIDENT THAT I COULD.....

Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
1. Use an Internet search engine (e.g., Google) to find webpages related to my subject matter interests? [a]				
-	-	-	-	100.0
2. Create my own webpage?				
3.8	19.2	15.4	30.8	30.8
3. Find primary sources of information on the Internet that I can use in my role as a health professional				
-	-	-	11.5	88.5
4. Use a spreadsheet to create a bar graph?				
-	-	3.8	26.9	69.2
5. Create a newsletter with graphics				
-	-	11.5	38.5	50.0
6. Save documents in formats so that others can read them if they have different word processing programs				
-	-	-	7.7	92.3
7. Use the computer to create a slideshow presentation				
-	-	-	-	100.0
8. Create a database of information				
-	7.7	19.2	23.1	50.0
9. Use technology to collaborate with other people who are distant from where I am				
-	-	-	3.8	96.2
10. Describe 5 software programs or apps that I would use in my role as health professional				
-	11.5	7.7	30.8	50.0
11. Write a plan with a budget to buy technology that would support me in my role as health professional				
11.5	15.4	15.4	34.6	23.1
12. Integrate mobile technologies into my role as health professional				
-	3.8	23.1	19.2	53.8
13. Use social media tools as part of my role as health professional				
-	3.8	3.8	23.1	69.2
14. Create a wiki or blog to have peers collaborate				
-	11.5	15.4	34.6	38.5
15. Use online tools to communicate from a distance in my role as health professional				
-	-	3.8	15.4	80.8
16. Communicate with someone in a one-to-one environment in which the other person has their own device				
-	-	11.5	11.5	76.9
17. Find a way to use a smartphone in my dole as a health professional to collect people's responses				
-	-	7.7	19.2	73.1
18. Use mobile devices to connect to others for my professional development				
-	-	-	19.2	80.8
19. Download and listen to podcasts/audio books				
-	-	-	3.8	96.2
20. Download and view streaming movies/video clips				
-	-	-	-	100.0
21. Send/transfer photos or other data via a smartphone				
-	-	-	3.8	96.2
22. Save and retrieve files in a cloud-based environment				
-	-	-	19.2	80.8

b. N= 26

IV. DISCUSSION

The ability to integrate 21st century technology for learning is an expectation for educators. If educators want to ensure that the future healthcare work forces are digitally trained, then self-efficacy and technological abilities are important constructs [13]. The information provided by this cohort of students would indicate that students in healthcare professional courses at the University of Melbourne are highly proficient, and able to use a wide range of technologies regularly in their daily lives.

This was a cohort of students who have been exposed to ICT in education since, at least, high school. Present results demonstrated how technology skills have evolved in the 21st century among digital natives [14]. Students were confident in their ability to perform all the task included in the TPSA\C-21. This scale is widely used as a measurement tool for research about technology proficiency in 21st century learning. This was important to verify, as it has been found among healthcare students that not all are frequent users of ICT [14]. Furthermore, studies have also purported that Internet use by students was mostly for non-professional related purposes [15][16]. Students in this study felt less confident in some administrative uses of ICT technology and in its use as a tool for their future role as health professionals. Thus, although students seem to have adequate proficiency and confidence, the study also identified some areas in which support, and further development may be required. It points to important issues to be considered in the design and delivery of technology-enhanced curricula in the future.

Although this study provides valuable insights into the technology proficiency and confidence in the ability to perform among dentistry and health professions students, it is not without limitations. The most obvious one was the cross-sectional nature of the study, which precludes a strong conclusion about technology proficiencies amongst the future healthcare workforces. Additionally, this assessment was undertaken using a self-selected sample. This introduces the influences of variation between participants and non-participants in terms of technical self-competency, experience with technology, and other factors. Also, the study relied on self-reported data, which may not be an accurate reflection of the relationship between self-perceived and actual technical competency. However, considering these limitations, we believe that the current approach was adequate given the exploratory nature of the study.

Finally, it points to the different areas of competence that healthcare students must acquire for the use of ICT and Digital Health as a competence [13,17]. These and other developments of ICT, such as with artificial intelligence, robotics, self-learning machines or the need to analyse large amounts of data, will require the development of new competencies among healthcare professionals [13,18].

V. CONCLUSIONS

A telehealth course was designed to provide health professions students with a set of foundational knowledge and skills needed to succeed as a virtual health care practitioner. This study examined the level of technology proficiency (reported as self-assessed 'confidence') amongst the future healthcare workforce. Students in healthcare professional entry-to-practice degrees at the University of Melbourne are technologically proficient, able to use a wide range of technologies regularly in their daily lives. They seem to have adequate proficiency and confidence in their ability to perform all the tasks explored in this evaluation. Nonetheless, the study identified some areas in which support, and further development may be required.

Large-scale testing and validation of the course will follow. However, this initial evaluation provides valuable information, which could be used during the redesign of health science curriculum. It would enable curriculum which meets the needs of students, the healthcare profession, and the community.

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