Impact of an iDevice application on student learning in an occupational therapy kinesiology course

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Contributions: (I) Conception and design: All authors; (II) Administrative support: All authors; (III) Provision of study material or patients: All authors; (IV) Collection and assembly of data: All authors; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Background: As technology continues to evolve, and information is increasingly accessed through smartphones and tablets, it is essential for university faculty to reassess teaching methodologies. This study explored how use of an iDevice application (app) by participants enrolled in an entry-level occupational therapy kinesiology course affected student learning in the course. This iDevice app was developed through a collaboration between the lead author and the Department of Technology Enhanced Learning and Innovation at Augusta University.

Methods: The iDevice app was released to the public via the Apple® App Store at the midpoint of the kinesiology course. All students were invited to use the app. Focus groups were conducted with 19 students recruited from the first year cohort of occupational therapy graduate students. These focus groups were conducted at the end of the semester once grades had been submitted.

Results: Thematic analysis of focus group transcripts revealed three themes reflecting how participants perceived app use impacting their learning. Participants report the app facilitated learning through provision of visual content, serving as a reliable source of information, and generally supporting the learning process. The Kinesiology Pro Consult App provided on demand learning, allowing students to be more autonomous with their learning and take advantage of opportunities to learn anywhere and anytime. Finally, participants reported the app allowed them to be more efficient in their learning, possibly allowing more time for other courses.

Conclusions: Mobile device apps that support student learning in specific content areas may provide positive benefits to student learning both in the specific course related to the app but also in other courses as a result of increased efficiency in learning.

Keywords: Educational technology; education; professional; occupational therapy

Introduction

Technology use has become commonplace in many university classrooms and can be useful to both increase engagement of students with course concepts outside of the classroom and to help students master clinical skills (1). Smartphones are no longer only a tool for communication; in many cases they have become instrumental in social

and work life and, possibly, a powerful instrument in academic life (2). One way in which smartphones can support academic life is through the use of applications (apps) developed to support academic tasks. To date, there is limited research regarding the impact of smartphone apps on pedagogy and learning at the post-secondary level. There is, however, a growing body of literature that suggests a disjuncture between the instructional practices

Figure 1 O.T. Kinesiology Pro Consult (9).
Available online: http://www.asvide.com/articles/1756

of the education system and the student body it is expected to serve, particularly with respect to the roles of digital technologies (3,4). Internet connected mobile phones and tablets are especially popular among the Millennial and Generation Z students now enrolled in pre-professional healthcare programs (5). Additionally, postgraduate trainees and qualified practitioners wish to develop their clinical expertise, which they acquire through active practice (6). The clinical skills that develop into clinical expertise are first learned and practiced as students. Today's students may be more inclined to practice these skills when the information is easily accessible via technology (i.e., smartphone or tablet) rather than textbooks. Due to the popularity of smartphone use and the necessity to meet the needs of the new generation of students, it is helpful for educators to be knowledgeable in this area of technology.

Apps are computer programs written specifically for internet-connected mobile phones and tablets. Apps provide students the freedom of mobile learning at any time and any pace through their handheld devices (7). There is increasing interest from researchers, instructors, and clinicians in coupling smartphone apps as a means of delivering academic content and interventions (8). As technology continues to evolve, and the popularity of connected devices continues to increase, it is essential for faculty to reassess teaching methodologies and delivery. One way in which faculty can do this is through creation of apps to support student learning. An app can be utilized as an easy way to organize and access a large amount of information using a central media. Recognizing this, the primary author initiated the development of an app to support student learning in a content heavy applied kinesiology course. Both authors were then involved in development and implementation

of a study with the primary purpose to identify student perceptions regarding the impact of app use to facilitate learning. We hypothesized that students would consider the app as a more convenient, efficient mode to learn kinesiology concepts.

The kinesiology course was developed to facilitate students' capacity to examine movement activities related to a client's activities of daily living. To sufficiently analyze movements, it is essential for students learn assessment methods such as goniometric measurement of joint range of motion. This lecture/lab course met once a week for the three hour lecture then met on a different day for the two hour lab. The lab component included demonstration and practice of proper goniometric measurements. The course instructor modeled correct goniometric procedures at the beginning of lab and encouraged students to ask questions. Students were then expected to pair with a peer and learn at their own pace. Course instructor was present to provide needed assistance.

Through a collaboration with the university's Department of Technology Enhanced Learning and Innovation, the course instructor developed an iDevice app (for use with both iPad and iPhone) that provided visual and textual information regarding joint actions, the muscle(s) responsible for those actions, and the axis of motion as well as videos demonstrating goniometric measurements. Goals for development of this app included: increasing student attention during classroom demonstration by alleviating the students' need to capture video for future studying, decrease student requests for clarification of procedure after class, and enhance student learning of related skills and knowledge.

Videos of goniometric measurements were taken in one day using a traditional video camera. In addition, muscles that are responsible for the movement were highlighted and put into action on a 3D skeleton. Web/mobile app developers participated in the development of the iDevice App. Software used included Unity 3D, Xcode, Maxon Cinema 4D, and Adobe After Effects (*Figure 1*).

Methods

Study setting

This study took place in an entry level occupational therapy program in a public institution located in an urban context in southeastern United States. The total length of the program is 6 semesters and is completed in 2 years. This

study took place during participants' second semester in the program.

Study participants

Study participants were recruited from the first year occupational therapy graduate student cohort at Augusta University, Augusta, Georgia. All students were enrolled in an applied kinesiology course at the time of study recruitment and implementation. A total of 19 students (16 female and 3 male) taking the applied kinesiology course participated in the focus groups after providing informed consent; this was 43% of the students taking the applied kinesiology course. The mean age of the group was 24.56 years of age. The largest percentage, 83%, identified as being White, 9% African-American, 4% Asian and 4% Hispanic/Latino. The gender and race/ethnicity distribution generally reflected the overall cohort of students.

Procedures

The OT Kinesiology Pro Consult app was released to the public via the Apple® App Store at the midpoint of the applied kinesiology course. This app is available at no charge. All students were informed of the availability of the app as a potential resource to support learning in the course. There was no orientation or training provided to students on app use.

App evaluations should consider user feedback (10). Focus groups were conducted once the course was completed and final grades had been submitted. Both authors served as interviewers for the focus groups with participating students. Two focus groups were held to accommodate all participants while also keeping the size of the group small to encourage active engagement. Each focus group lasted approximately 45 minutes. The focus group was semi-structured in format and addressed questions such as, "In what ways did you find the app beneficial? Do you recommend the app, why or why not? How would you improve the app to enhance the learning experience? What were the limitations of the app?" Focus groups were audio recorded and transcribed. This study was reviewed and approved by the Augusta University Institutional Review Board .

Data analysis

Focus group audiotapes were transcribed; transcripts were then imported into MAXQDA (Version 11; VERBI GmbH, Berlin, Germany) for management. Authors then engaged in data analysis to interpret the data and determine the impact of app use on participant learning. In this process, data was read multiple times and emergent codes were developed using an open coding process. These codes were *in vivo* when possible. The codes were further analyzed and categorized to identify key themes that described how participants used the iDevice app to facilitate their learning (11).

Results

Overall, three themes emerged from analysis of the focus group data. All themes related to how the use of the OT Kinesiology Pro-Consult impacted participant learning. The first theme was facilitated learning. The second theme was *on* demand learning. Efficiency was the third and final theme.

Facilitate learning

Participants described several ways in which the app was useful to *facilitate* their learning. For many participants, the app's visual nature was valued, as described by these participants: "…seeing the visual was … a really quick way of understanding it deeper than just memorizing origin and insertion" and "I think having it in a video format versus just written out is very helpful especially if you are a visual learner." Several participants reported that the app provided them with a source of information that they could rely on when they were faced with discrepancies in how to measure range of motion. Students mentioned using internet based search engines and videos prior to the app being released to view visual demonstrations of goniometric measurements but recognized inconsistencies in these sources. "*I just liked the fact that it was very consistent and I knew it was right, I knew it was what I was supposed to learn*", "*I would Google [search] or something and it would be different and it's [Google search engine] not necessarily a reliable source but that [OT Kinesiology Pro-Consult app] was.*" Participants reported using the app to supplement learning in a variety of ways. Some participants used the app to create note cards for studying, as described by this individual: "*for me it was more of a resource to make note cards for me to study a little bit more independently and challenge myself*" and "*It helped me when I was making my notecards, I had the list of the origin and insertion of the muscle and then the back was the stationary and movable arm, just*

made that a lot easier." The app also provided a resource for participants to double check their understanding of course content or the accuracy of their notes from class:

"*I used it as like a double check a lot because I would think that I remembered it one way from seeing it in class and like from what I would scribble down real fast in lab when we, when he would measure it and go over it, and it would either correct what I was thinking or reinforce like oh, okay, that is how you would measure it, you want the patient to be supine or prone.*"

Several participants report the app was a complement to the course, which further enhanced their learning experience.

"*I thought it was a really good compliment to class. I liked [instructor] actually demonstrating it in person, I liked learning it that way but then to have the app to kind of compliment that. So I wouldn't want to just learn from the app but it was a great resource to have to reinforce it.*"

"*I also liked the skeleton portion [on the OT Kinesiology Pro-Consult app] … it made more sense with the origin and insertion and why that muscle made that movement happen. I felt that really tied it well with class and lab because I could hear the prime movers and see a picture of them but being able to see it move dynamically on a skeleton was very helpful.*"

On demand learning

In addition to facilitating learning, the app provided participants with the opportunity for more autonomous and on-demand learning. This had the effect of providing students with more opportunities to take responsibility for their own learning, both within and outside of the classroom.

"*In lab it allowed us to be more independent and autonomous because obviously [instructor] couldn't walk around to every person so if we had a question about a movement that we didn't see right we could go to the app with our lab partner and not have to wait for [instructor] to come around and answer a question. It cleared up questions faster than just having to wait for [instructor].*"

"*… definitely my favorite thing about it was that I could study anywhere and at times when I wouldn't normally study because I wouldn't have my books with me or my computer but I could still like get it out and use my app.*"

Efficiency

The final theme that emerged from analysis of the focus group data was the theme of efficiency. Participants reported that because the OT Kinesiology Pro-Consult app was endorsed by the course instructor as the definitive

expectation for goniometry in the course, they were able to be more efficient in their studying. This is illustrated in the following quotes:

"*I felt like it made my studying more efficient because I didn't have to go and pull up the slides or go into a text to look for the information, just having it in one place made looking for the information easier which gave me more time to study.*"

"*For me it just helped decrease the time I had to search for stuff, I mean that's really the main thing. It really, probably helped me in other areas just being able to take more time to study other parts of the course.*"

Discussion

Mobile technology is increasingly being incorporated into education settings, including in the education of students in the health professions. Participants in this study felt that incorporation of the OT Kinesiology Pro Consult app into the applied kinesiology course resulted in positive benefits related to their learning process and time management. Judging the place and value of technology is difficult since technology is often used in combination with other learning tools or activities (6). A key feature of the OT Kinesiology Pro-Consult app is that it was developed as a supplement to the learning materials, not to replace materials, or to eliminate face-to-face time in the applied kinesiology course. Findings from this study may not be generalizable to scenarios where apps for mobile devices are used to replace content or course experiences, rather than supplementing them.

Mobile device use is abundant in the lives of today's students. This increase in mobile device ownership gives instructors a new avenue for delivering course content (12). Many of today's college students have familiarity with the use of apps on mobile devices and require little training. There was no instructor lead orientation or training in the use of the OT Kinesiology Pro-Consult app for any of the students, regardless of study participation. There are directions built into the app however many participants reported never using these instructions. Ease of use of mobile device apps may have an impact on positive influences on student learning.

As students began using the app in class, the instructor felt as if students took more responsibility in their own learning by referring to the app to answer their questions about content related to goniometry during class and between classes, rather than depending on the instructor to answer their questions or validate their understanding of content.

This allowed the instructor time to provide more in-depth feedback regarding clinical conditions, dysfunction, and other topics related to kinesiology that was not included on the app. This may have resulted in students achieving deeper levels of learning of course concepts and content.

The findings of this study have several implications for occupational therapy education. Mobile device apps may be useful to students to help them answer many of their procedural and basic understanding questions during and between classes. This allows the instructor to better use class time to foster deeper learning and address other questions related to the course. App use may support students to be more independent and autonomous learners both during class and when studying. In addition, app use may result in greater efficiency of studying for participants. One drawback to the use of app technology is that participants may not all have access to the app if they lack the appropriate device; this may result in inequities if app technology is heavily emphasized within the curriculum.

There are several limitations to this study. The findings reflect the outcomes and experiences of a small, convenience sample of participants from one occupational therapy educational program using one specific mobile device app. Students in other types of programs in different institutions may have different experiences with the use of app technology. In addition, other health professions programs may have expectations for student learning that differ from the expectations in occupational therapy. In addition, this study occurred within the context of a course that was face to face; student and instructor perceptions in distance learning courses may differ from these findings. There also may have been an unaccounted for maturation process within the course as students developed content knowledge and study skills that may not have been influenced by the OT Kinesiology Pro Consult app.

Faculty may benefit from resources that support them to learn more about how to incorporate mobile technology apps into their courses. This could involve education regarding the range of available apps, strategies for critiquing apps to determine appropriateness for academic use, and in app development. Additionally, as the cost of textbooks continues to rise, apps may emerge as a more cost effective mechanism for content delivery.

In conclusion, participants perceived positive benefits to their overall learning process and autonomy in the course. The impact of app use on autonomous learning can support program goals to foster a foundation for lifelong learning. Increased efficiency of studying as a result of app use may have a positive benefit on student learning in other areas of the curriculum. Since many apps are offered at no cost or low cost, course instructors and students may find them to be a useful and innovative educational supplement.

Acknowledgements

Footnote

References

1. Blumberg P. Assessing and improving your teaching. San Francisco: Jossey-Bass, 2013.
2. Vázquez-Cano E. Mobile distance learning with smartphones and apps in higher education. Educational Sciences: Theory and Practice 2014;14:1505-20.
3. Bowen JA. Teaching naked: how moving technology out of your college classroom will improve student learning. San Francisco: Jossey-Bass, 2012.
4. Gabiel M, Campbell B, Wiebe S, et al. The role of digital technologies in learning: Expectations of first year university students. Canadian Journal of Learning and Technology 2012;38:1-18.
5. Payne KB, Wharrad H, Watts K. Smartphone and medical related app use among medical students and junior doctors in the United Kingdom (UK): a regional survey. BMC Med Inform Decis Mak 2012;12:121.
6. Bullock A, Webb K. Technology in postgraduate medical education: a dynamic influence on learning? Postgrad Med J 2015;91:646-50.
7. Keeley K, Potteiger K, Brown CD. Athletic training education: there's an app for that! Athl Train Educ J 2015;10:190-9.
8. Dennison L, Morrison L, Conway G, et al. Opportunities and challenges for smartphone applications in supporting health behavior change: qualitative study. J Med Internet Res 2013;15:e86
9. Hughes JK, Kearney P. O.T. Kinesiology Pro Consult.

Asvide 2017;4:439. Available online: http://www.asvide.com/articles/1756

10. White BK, Burns SK, Giglia RC, et al. Designing evaluation plans for health promotion mHealth interventions: a case study of the Milk Man mobile app. Health Promot J Austr 2016 [Epub ahead of print].

11. Merriam SB, Tisdell EJ. Qualitative data analysis. In: Qualitative Research: A guide to design and implementation, 4th ed. San Francisco: Jossey-Bass, 2016;195-236.

12. Chen B, Seilhamer R, Bennett L, et al. Students' mobile learning practices in higher education: a multi-year study. Educause Review 2015. Available online: http://er.educause.edu/articles/2015/6/students-mobile-learning-practices-in-higher-education-a-multiyear-study