Teaching Clinical Skills Online: Techniques, Student Feedback, and Lesson Learned

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Abstract

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Keywords

Online education, clinical skills, pedagogical approaches

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ABSTRACT
The use of online education has long been used in occupational therapy for both post professional and continuing education. In entry level programs, however, strict online education is not common due to the intensive clinical skills that the students must obtain. These are typically taught in lab format with consistent practice and faculty feedback. Due to the COVID 19 epidemic, many universities were forced to make a rapid transition to online learning with little preparatory time. While it is believed that many courses were conducive to this change in format, instructors of clinical skills courses were forced to identify creative and alternative methods of teaching and evaluating the hands-on skills. This paper outlines pedagogy used during the pandemic in teaching clinical skills, both physical and thinking, and students' responses to the online learning process. Evidence is scarce and does not fully encompass the concept of full clinical skills teaching in an online format. The need for further advancement in this area is highlighted along with potential methods to begin to shape online clinical skills learning.

At the onset of the of the COVID 19 pandemic, universities across the country were forced to rapidly transition to online teaching and learning. This created a question as to whether clinical skills could effectively be taught in an online format and whether students would be prepared to perform hands on skills in clinical practice. Although online learning has long been used by health professions in advanced degree obtainment and in continuing professional education, this format presumed an already established skill set among the students (Hollis & Madill, 2006).

The use of online learning has been found to have several advantages, including increased efficiency for the instructor and increased student satisfaction (Berman et al., 2009; Cook et al., 2005; Mangione et al., 1991; Santer et al.,1995). While several studies have evaluated the use of online modules, simulation, and hybrid delivery for entry-level clinical education, few have evaluated the effectiveness of online learning in hands on clinical skills (Botezatu et al., 2010; Durmaz et al., 2012; Kandasamy & Fung, 2009).

In the field of occupational therapy, some research has been conducted to evaluate the effectiveness of web-based teaching for clinical skills. In one study, Gallagher et al. (2014) evaluated the effectiveness of DVD training on occupational therapy student competence with manual handling. Utilizing a single-blind, randomized controlled trial, the authors randomly assigned students to a DVD or face-to-face training group. The results indicated there was no significant difference in the level of improvement between groups. In 2013, Hayden evaluated an online safe patient transfers module for occupational therapy assistant students. The author of this study utilized streaming video to deliver the course material. Students participated in pre- and post-tests to evaluate the students' cognitive knowledge, while videotapes of students performing the transfers were utilized to evaluate student performance. The results of this study indicated that students were able to learn this skill with beginning proficiency; however, most students reported that they would prefer at least one hands-on classroom session for instructor and peer feedback. More recently, Nicola-Richmond and Watchorn (2018) developed a web-based simulated learning resource for occupational therapy students. The authors developed 18 video case studies, which highlighted a variety of diagnostic groups. The students were given assignments requiring the use of the case studies. The results of this study indicated that students demonstrated an increase in perceived empathy and an increase in knowledge gathering. While not specifically related to clinical skill performance, this is indicative of online learning potentially enhancing clinical skill development.

Although applied to occupational therapy practitioners already in practice, one researcher evaluated the effectiveness of multifactorial online training methods on practitioner confidence. The results of this study indicated that online training methods were an effective strategy in increasing knowledge, therefore impacting the participants' confidence and clinical competence (Pittman & Lawdis, 2017). Similarly, Lindenmaier et al. (2018) studied the use of an e-learning module to compliment traditional classroom teaching for venipuncture skill development. One group of students received only in class training, while the other had access to online learning modules. The results of this study indicated that students in the study group demonstrated higher confidence; however, there was no significant difference in skill performance between the groups. Thus, it remains unclear as to the effectiveness of teaching clinical skills in a web-based format.

During the pandemic, many universities were forced to make a rapid transition to online learning with little preparatory time. While it is believed that many courses were conducive to this change in format, instructors of clinical skills courses were forced to identify creative and alternative methods of teaching and evaluating hands-on skills. The purpose of this paper is to outline the techniques used at one university to teach clinical skills and students' responses to the online learning process during the pandemic. For this paper, online learning is defined as web-based synchronous instruction.

Instructional Methods

During the shift to online distance learning following the closure of universities and colleges throughout the United States, there were more questions than answers as to how to make the online format as effective as the face to face traditional classroom format. As universities continue to develop more robust online teaching strategies, the short-term response to this pandemic could well become the future of higher education (Devaney et al., 2020). The use of online techniques and platforms including gamification, alternative lectures, and more are going to remain prevalent in the future. Therefore, it is imperative that higher education institutions find ways to develop and implement pedagogically effective techniques for student learning.

Identifying methods, platforms, and online learning preferences will be something that higher education faculty continue to address. Utilizing the principles that Knowles (1992) identifies in adult learners, faculty can truly break down their current curriculum and lectures/labs to ensure that the information is adequately and effectively conveyed to their students in this new medium of learning. Knowles identified four concepts of adult learners: (1) a need to understand why they are learning something; (2) they prefer experiential learning; (3) their desire for problem solving in learning; and (4) the concept of immediate value (Knowles, 1992). These factors of adult learners support the use of case studies, simulations, discussions versus direct lecture, and self-assessment of the learner.

These pedagogical approaches were utilized at a university in the Mid-Atlantic region which currently has several operational occupational therapy programs including a post-professional Doctorate, entry-level Doctorate, entry-level Masters, and entry-level Bachelor's to Master's for which there is one cohort remaining. The methods described below were utilized during a musculoskeletal lecture and lab course following the transition to online learning. The students who participated in this class were the last cohort of the Bachelor's to Master's program and were in the Bachelor's portion of the program.

Course Description

Prior to the transition, this three-credit course was offered in a 15-week semester with a one-hour long lecture and one, three-hour lab per week. The lecture portion was delivered utilizing PowerPoint presentations highlighting various diagnoses and assessment and intervention strategies for each. The laboratory time was utilized to practice hands on skills, assessments, and intervention techniques. Lab sessions were

typically focused on small group learning stations as well as hands on skill building. Blackboard© learning management system was utilized to provide student access to lecture and lab materials as well as assignment instructions.

Upon transitioning to the online learning format, teaching methods had to be adapted. While the in-class time remained the same, approaches to teaching and learning were altered. Utilization of various online teaching platforms were incorporated as well as more individually focused intervention and assessment worksheets. Labs were not able to be completed in the small group format that was typical, therefore the individual worksheets and problems were utilized more. Both the lecture and lab sessions remained synchronous throughout the duration of the semester despite being online. Blackboard© continued to be utilized for class materials but was also used as a method of collecting student assignments. In addition, online office hours were increased, and several online small group meetings were utilized to go over major assignments and provide effective feedback.

Instructional Methods: Lectures

Use of Web Resources
Each week the students were provided with several additional web-based resources including national association and informational health websites related to the topic, YouTube videos, and instructional step by step handouts/tutorials for techniques. Additionally, instructor led videos for functional transfers and kinesiotape techniques were also provided. Faculty developed these resources weekly as they were not a consistent part of the traditional classroom experience. However, in lieu of not having hands on activities to ensure learning, these resources provided a method of learning especially for the kinesthetic learners in the classroom.

Weekly Quizzes
The students completed a simple six question quiz at the beginning of each week's lecture which focused on the readings for that week. Two quiz platforms were utilized to identify which offered the best features as well as ease of access for the students to complete the quiz. The first quiz platform was Blackboard's© test feature which allowed for extended time for students with academic accommodations, the ability to go back and check questions as well as the ability to see either one question at a time or all of them at once. However, these add on features were controlled by check boxes that the instructor could easily miss, which caused some frustration among the students. Another difficulty with Blackboard© tests was the time required to input each question and answer as well as the time to submit to the grade center. The second platform that was utilized was Akindi©. This was new to the university and still in the beta mode as it was being adjusted to fit the needs of the faculty. Akindi© allowed for a more realistic side by side view of the test questions and a test answer sheet akin to a traditional scantron. Additionally, adding test questions was very easy as the platform used an uploaded PDF of the test rather than individual question input. An additional PDF with highlighted correct answers automatically populated the answer sheet. Submitting

grades directly to the grade book was very simple and intuitive. Finally, making changes to the test following completion was simple and intuitive, taking minutes instead of hours to correct 40 exams.

Guest Lecture Via an Online Platform
A highlight for many of the students was a guest lecture on amputation that was conducted using a web-based platform. The students were asked to write a discussion post describing what they learned from the guest speaker and how this might impact their future practice.

Guided Notes
For in-depth lectures that could easily be overwhelming, the use of guided notes was implemented. Guided notes can be narrative or bullet style and encompass those areas that are either easily overwhelming or very specific and need the student to truly focus and comprehend. According to Heward (n.d.), "guided notes (GN) require students to actively respond during the lecture, improve the accuracy and efficiency of students' notetaking, and increase students' retention of course content" (para. 1). This technique has proven effective in previous courses and is always well received by the students. Guided notes were provided specifically for the burn and cardiovascular lectures. The students were able to fill in the notes during class and ask questions throughout that were prompted by the guided notes sheet. This was a way to encourage participation in the lecture and led to some profound discussions where critical thinking was evident. This may not always be the case with a regular lecture style teaching strategy. As a faculty member, using guided notes also allowed for more streamlined delivery of the information. It ensured that the most important information was expanded upon in a way that students were able to recall and demonstrate understanding.

Nearpod Learning Platform
The use of this web-based learning platform for the class topic was engaging and received well. Nearpod "creates an inclusive and immersive learning experience by allowing students to actively participate in every lesson" (Nearpod.com, 2020, para 6). This resource included images, GIFs, videos, games, and collaborative discussions throughout the lecture. These resources were added directly to the PowerPoint slides and allowed the addition of formative quizzes and learning games to take place during the lectures. This helped to break up the monotony of online lectures and encouraged every student to participate in a low stress environment so that learning could naturally occur.

Kahoot
Kahoot is a type of gamification learning system. "Game based learning or gamification rests on the experiential nature of a game that allows learners the opportunity to be fully involved in the learning cycle. Game-based learning also garners learners' full attention and promotes knowledge retention due to its 'play nature'" (Tan Ai Lin et al., 2018, p. 566). The faculty utilized Kahoot to create informal assessments in order to determine how many students were completing the required readings. Simultaneously, the Kahoot provided a format for education on the topic at hand, without the use of a formal

PowerPoint. Using the quiz questions to gauge the student's knowledge of the topic, then elaborating on the specific question or topic at hand appeared to assist in cementing the information for the students. Faculty also felt that the students were more engaged and there were more group discussions surrounding a single question than during a typical lecture.

Instructional Methods: Labs

Intervention Case Study
Students were issued a progressive case study in which they were required to create treatment sessions based on the client's current medical status. Students were given five choices of treatment modalities that included coins, checkers, puzzles, cards, and paperclips. The students were instructed to choose one item from the list and use that item for each progressive treatment session (see Appendix A). This assignment was developed to enhance students' understanding that the art of occupational therapy is how treatments are set up regardless of the selected treatment modality and that any item can be used therapeutically if it is set up correctly. Neistadt et al. (1998) looked at clinical reasoning focused case studies and found case studies did increase the quality and intricacy of treatment activities that participants selected. Others have evaluated the use of case-based learning and found that students had better performance, more confidence, and less anxiety in applying critical thinking in the clinic than those who participated in traditional classroom lectures (Allen & Toth-Cohen, 2019; Bowman, 2017). These findings are very similar to what was observed during this activity as well as the comments received from the students.

Physical Agent Modalities (PAMS)
In traditional classroom settings, students are able to practice the use of PAMS and demonstrate an understanding of the current evidence and appropriateness of each modality. With the rapid transition to online learning this hands-on practice was not possible. Students were presented with the background and use of each modality via PowerPoint presentations. This was followed by YouTube videos on each modality. Finally, students were required to read an article that provided an in-depth analysis of current evidence on the use of PAMS (Hartzell et al., 2012). Furthermore, each student was assigned a specific modality on which to focus and develop a discussion post related to the assigned modality. Within their post, students had to summarize the findings and describe whether they would use that modality and for what purposes based upon the evidence. They then had to reply to other posts providing their opinions on the other modalities.

Orthotics
Prior to the transition to online learning, students would have had the opportunity to fabricate three orthotics including thumb spica, resting hand, and wrist neutral. Because it was felt this was an important experience, the fabrication lab was moved to an upcoming class within the curriculum. In preparation, students received an orthotics lecture in which YouTube videos were included. Students were instructed on pattern making and were required to create orthotic patterns for each of the above listed

orthotics. Additionally, they were given case examples and were required to identify which orthotic would be most appropriate for the disorders that were outlined. Students then submitted the patterns, and the case study answers via the Discussion Board feature on Blackboard©.

Ergonomic Evaluation

Using the Occupational Safety and Health Administration (OSHA) Computer Workstations eTool (OSHA, 2020), students were instructed to evaluate a workspace. Because the state was on lockdown due to the pandemic, students were able to evaluate their own workspace or the workspace of someone in their home. Students were instructed to complete the checklist and make recommendations based on their findings and clinical judgement. Students submitted pictures of the workspace with their checklist and recommendations. This assessment could not have been more well timed as the pandemic shutdown required many people to create a space for learning within their homes. The students were able to utilize their knowledge of anatomy and physiology, positioning, and activity analysis to analyze their own workspaces and identify appropriate consultative-based recommendations.

Use of Small Groups in Treatment

During education focused on the Patient Driven Payment Model (PDPM) and the effects that they may experience and the need for small group interventions in a physical disabilities setting, the students were tasked with identifying a small group intervention (Centers for Medicare & Medicaid Services, 2020). The students were then broken into groups of four in breakout rooms and were given four clients with varying ages and diagnoses. They were then tasked with identifying what type of group would be appropriate and creating individual and group goals to meet the already established rehabilitation goals. Two faculty members rotated between the group rooms to facilitate and monitor conversations. The students were then brought back together in the main room and were able to share their own and their group's clinical reasoning related to the choices they made. There was significant discussion that followed and continued idea sharing.

Video Submissions

The students in this group were fortunate enough to have learned functional transfers including those specific to precautions and certain diagnoses prior to moving to distance learning. In order to ensure competency, the students were instructed to complete a specified list of functional transfers via video submission. The students were asked to record themselves completing the transfers on someone within their home. Given the social distancing requirements during that time, students who did not have someone in the home were asked to demonstrate and verbalize the techniques of functional transfers as though they were providing client education. The students identified that they had to do multiple takes of the videos which further enforced their learning. The video submissions were viewed by the instructor and critiques were made so the students could understand what areas they needed to focus on improving, if any. The use of videos has been found to be an effective way to provide observational feedback while assessing the student in order to determine a student's understanding of the

material (Boateng et al., 2016). This is especially important when considering dynamic education and techniques such as functional transfers, client range of motion, client assessments, and other clinical skills in which students may need to demonstrate competency in a distance learning format.

Burns and Amputations Lab

These topics were combined in a lab to ascertain the student's ability to identify and prioritize the case study client's top three functional performance deficits. They were then tasked with creating three different consecutive treatment sessions (approximately 30-45 minutes each) in order to address the problem areas. The students were split into small groups, where they had to justify their prioritization of the deficits, as well as identify how these functional performance deficits were impacting the client's daily functioning. The students were provided with immediate feedback regarding their interventions and their ability to prioritize. This assisted the faculty in identifying those students with any clinical reasoning or problem-solving deficits that would potentially carry over into clinical fieldwork. The research completed by Neistadt et al. (1998) reiterated that clinical reasoning case studies were identified by the participants as helpful because they were required to write down their rationale for their chosen interventions. Additionally, the participants in this study noted they used the case study information to identify more active interventions (Neistadt et al., 1998). This was corroborated by what the students in this class demonstrated following this activity. Instead of a session focused on education or discussion, many of the groups had active observational performance as the main component of their consecutive sessions.

Outcomes

At the completion of the semester, students in the adult musculoskeletal course were asked to complete a brief survey about their experiences and perceptions of the rapid transition to online learning. The response rate for the survey was 25% (N=10). The survey was designed by the course instructor and included eight questions which were to be rated on a 5-point Likert scale with 1 = very dissatisfied and 5 = very satisfied. Additionally, students were asked for qualitative feedback regarding activities that they found worthwhile and areas for improvement.

The first question referred to the use of Blackboard© Collaborate for weekly live class meetings which generated a mean score of 4.1. One student stated, "blackboard collaborate…would reconnect a lot causing me to miss chunks of the lesson." This demonstrates initial challenges to providing online learning due to platform limitations. Students were also asked about the use of breakout rooms for small group work which yielded a mean score of 4. The consensus from the students indicated that small group activities forced them to use clinical reasoning, and identify the tasks or performance patterns that each case study client demonstrated difficulty with in order to match the setting and reach the goal of creating the occupational therapy client group. They did state this was challenging but also worthwhile.

When asked about the use of alternative resources such as Nearpod and YouTube, students' scores averaged 4.4. Many of the comments received from students were positive, stating enjoyment with the learning, feeling part of the classroom again, and enjoying the learning checkpoints that occurred throughout the presentation. The use of Kahoot was well received and allowed for more interaction and participation during the class. Kahoot is typically well-received by students as it adds a competitive edge and required mandatory participation due to the nature of the web-based tool. Faculty enjoy the use of Kahoot as an alternative to a traditional lecture. These web-based resources assisted the students in supplementing their weekly traditional based PowerPoint lectures. Using these supplemental resources, the students were able to get a more in-depth view of the diagnosis, typical presentation, and intervention techniques as applicable.

Another question referred to the use of diagnostic specific intervention case studies for enhanced learning. The mean score for case studies was 4.6. (see Table 1). The students asked for more case-based intervention activities as they felt that they were very worthwhile and truly added to their education. They again mentioned increased clinical reasoning skills development utilizing case studies.

The use of video capture of physical skills for instructor feedback produced a mean score of 4 and the use of discussion boards for further analysis of content yielded an average score of 4.1. The students identified that they required multiple takes of the videos which further enforced their learning.

Students rated the use of guest lecturers the highest, with a mean score of 4.9. In the qualitative comments, half of the students commented about the impact of having an injured speaker, with one student stating, "the guest speakers were extremely helpful, as it was the closest thing to being on fieldwork." The comments were consistent in terms of receiving knowledge and feeling as though they truly understood how occupational therapy can benefit clients. Guest lectures provide students with differing perspectives and alternate resources for use in the future which in turn provides a greater breadth to their learning (Hughes Miller, 2014).

Finally, students rated the use of the Akindi© testing platform at 4.1.(see Table 1). The concern was that Blackboard© check boxes could be overlooked by the faculty and this caused some frustration among the students; therefore, they preferred Akindi© over Blackboard©.

Table 1

Survey Outcomes (N=10)

	On a Scale of 1 – very dissatisfied, 2 – dissatisfied, 3 – neutral, 4 – satisfied and 5-very satisfied	Mean Score
Question 1	Use of Blackboard© Collaborate for weekly live class meetings	4.1
Question 2	Use of breakout rooms for small group work	4
Question 3	Use of alternative resources (Nearpod.com, YouTube videos, etc.)	4.4
Question 4	Use of cases and creation of Interventions with specific restrictions for specific populations (FM, Burns, Amputees, Groups)	4.6
Question 5	Video capture of your physical skills for instructor feedback	4
Question 6	Use of discussion boards for further analysis of content (PAMS, etc.)	4.1
Question 7	Use of guest lecturers when applicable and able to provide a deeper look at content	4.9
Question 8	Use of Akindi© testing platform	4.1

Upon review of the students' qualitative statements (see Table 2), several aspects of the course were perceived as helpful. Half of the survey respondents commented that the case study was helpful. One student stated:

> My favorite activity from this class was taking one object and creating six different therapeutic sessions with it. I felt that this really challenged me to think therapeutically and come up with creative ideas that addressed the problem areas.

Table 2

Qualitative Findings from the Survey- Worthwhile Activities (N=7)

	Student perceptions of **Worthwhile** Distance Learning Activities:
1	Akindi© testing platform was preferred over Blackboard© tests
2	Guided notes were identified as helpful
3	Guest lectures were noted specifically by four of the students as being very helpful
4	Supplemental web-based resources such as Nearpod, Kahoot, YouTube Videos were identified as being very beneficial to learning needs by three of the students specifically
5	Challenging the students to create interventions based on case studies was identified specifically by four of the responders
6	Weekly quizzes, discussion board posts, and required responses; individual at home interventions and orthotic patterns were also noted
7	Feedback and encouragement from faculty was specifically noted by three of the responders as being worthwhile

Interestingly, the students also felt the weekly reading quizzes were beneficial. One student stated "I hate the reading quizzes BUTTTTTTTT [sic] they did help me learn the material better. I think I finally learned how to study and where my student weaknesses are." This was received well as it required them to prepare for class and have more meaningful conversations about the topic. Initially this was a source of additional stress for the students; however, as seen through the survey results, it became apparent that it was beneficial and something they truly appreciated. Additionally, students reported finding the guided notes and hands on activities such as making orthotic patterns helpful.

While the students reported many positive aspects of online learning, they also had some suggestions for improvement (see Table 3). Several students reported that the online lab activities were time consuming and made completing their reading assignments difficult. Additionally, students would have liked more intervention videos included as well as more feedback on lab exercises. While the students rated the use of case studies as beneficial, a few students would have liked more walk-through case studies that could be done as a whole class versus individually.

Lastly, a few students gave specific suggestions for lab activities including designing their own intervention ideas with items from around their home and demonstrating the interventions on a web-based platform. Additionally, one student suggested an assignment in which the students make posters to demonstrate their knowledge, stating:

> I'm not sure if this is what you mean by hands-on, but to break away from our screens, we could be assigned to make mini posters with information and upload pictures? It could be a choice to make an online poster or paper poster. I make mini posters to study from and it's fun.

Table 3

Qualitative Findings from the Survey – Areas of Change (N=8)

	Student perceptions of **Areas of Change/Improvement** for Distance Learning
1	Even more synchronous lab time to get more feedback on their activities and assignments
2	Continued use of case studies for learning needs and clinical reasoning development
3	Better virtual classroom platform (WebEx and Blackboard© Collaborate were difficult to use and had several connection issues)
4	Use of household items to create interventions and video record for faculty feedback
5	Provide more faculty identified internet resources instead of students having to find them
6	More organized picture of week to week assignments and readings to use time more constructively
7	One student verbalized not appreciating the scrolling and zooming required for Akindi©
8	One student requested there to be more tests with smaller amounts of information instead of a cumulative final exam

The results from the survey were appreciated by the faculty and are currently being used to prepare and organize for any potential hybrid or fully online requirements for this clinical lab-based course as the pandemic continues. Collaborating with the students throughout the experience has shown to be worthwhile and has created a more conducive learning environment for the students.

Discussion

As online education becomes more common in universities across the nation, it is important that we begin to identify the effectiveness of online learning for clinical skills. Medical and nursing programs have been using this style of learning for a while longer. According to Gormley et al. (2009), one of the greatest challenges seems to be a lack of cohesiveness related to online programs. The ability to have access to and use the technology platforms needed for distance education is another area of challenge.

In a study by Gormley et al. (2009), medical students reported that videos, images, and clinical skills checklists were not utilized. Students who took a deeper look at online learning and spent more time preparing for class using the online learning resources were found to be more successful in utilizing clinical reasoning skills (Gormley et al., 2009). Students in this study also noted that discussion boards were appreciated as they allowed for open communication with their peers and faculty while reflecting on what they had been taught (Gormley et al., 2009). This study also demonstrated that students who identified online videos and images as valuable were more successful with implementation of clinical skills. It assisted them with the visual component of patient care (Gormley et al., 2009). This is consistent with the results from the students enrolled in the musculoskeletal course who cited discussion boards and supplemental learning platforms such as videos, Nearpod, Kahoot, and more were worthwhile.

The use of weekly quizzes has been utilized in several disciplines to ensure that students complete readings prior to class and to assess gaps in knowledge. One study reviewed the impact of weekly quizzes on final exam performance (Landrum, 2007). The author found that students demonstrated improvements on final exam scores when utilizing the weekly quiz. Additionally, students supported the use of weekly quizzes to exam their knowledge (Landrum, 2007). Similar to our findings, while students did not enjoy the quiz a week approach, they did feel strongly that their performance was stronger due to these assignments. This perception correlates to findings by Becerra et al. (2019) who studied the use of weekly quizzes as a predictor of final academic performance and found that there was a strong correlation between the two (Becerra et al., 2019).

Guest lectures have often been a favorite of occupational therapy students during face to face sessions. Students report that understanding the lived experience and speaking with guests who have experienced an injury or illness firsthand provides them with the differing perspectives of their potential clients. Providing guest lectures in an online format can provide challenges due to technology, managing the interactions related to student questions, and considerations of distraction from the varied remote locations (Pennell et al., 2015). Similar to our findings, despite some of these challenges, studies have demonstrated high levels of engagement and interest with participating in online guest lectures (Laird & Kuh, 2005).

Guided notes have been used across disciplines with good results. Haydon et al. (2011) reviewed the effectiveness of guided notes in assisting students who struggle with learning academic content. The results of their study indicated that guided notes had a positive effect on student performance. Additionally, Glodowski and Thompson (2018) found that the use of guided notes produced statistically significant improvements in student outcomes including quiz scores and note accuracy.

Active online learning activities and informal assessment opportunities have been widely studied. Specifically, the use of Nearpod for online education has proven to be effective in promoting active learning and increasing student satisfaction (Hakami, 2020; Tornwall et al., 2020). Similar results were identified for Kahoot, formative assessment, or breakouts from traditional classroom activities (Wang & Tahir, 2020). As with the use of Nearpod, the students in this class enjoyed the use of Kahoot as a break from traditional lecture methods. Additionally, unfolding case study use has been shown to increase critical thinking, clinical reasoning, and knowledge (Bowmen, 2017; Carter & Welch, 2016; Englund, 2020). Although little literature was found to support this in occupational therapy, these studies reflect our findings for this course.

Teaching safe patient handling online can be a challenge. Several researchers have assessed the effectiveness of online and hybrid training in patient transfers. Similar to the approach used in this class, Hayden (2013) reviewed the effectiveness of teaching safe patient transfers online. Students in this study were given pre- and post-tests and were required to videotape their transfers. The transfers were than rated utilizing a competency checklist. The results indicated that although students preferred hands-on sessions, their knowledge was significantly improved (Hayden, 2013). In 2019, Eberth et al. conducted a study utilizing a hybrid approach to teaching patient handling. These authors used narrated online modules, video, photos, and threaded discussion as well as some hands-on training. The results indicated that although students' knowledge and self-efficacy improved, students would have preferred more hands-on time with the instructors (Eberth et al., 2019). This is reflective of the experiences of both student and faculty in this class indicating that there may be some things that require more face to face interaction. Alternative methods may be required as universities remain or return to strictly online formats.

Similar to our experience, Westbrook (2012) found that the utilization of online groups and discussion boards for collaborative learning was effective in enhancing knowledge and student satisfaction by increasing socialization and facilitating peer to peer knowledge translation. In addition, the use of YouTube has been shown to increase student engagement and understanding of material (Burke & Snyder, 2008; Hasamnis & Patil, 2012). The use of these tools was effective in teaching some of the lab material including orthotic pattern fabrication, amputee education, physical agent modalities, and ergonomic assessments.

Although other disciplines have been utilizing online learning as a component of teaching clinical skills, most of the literature supports hybrid methods in clinical education (Kelly et al., 2009; McCutcheon et al., 2018). With the rapid transition to online clinical skills education during the COVID pandemic, educators lost the ability to present the material in a hybrid format. This transition required occupational therapy faculty to quickly research and trial various methods of presenting the skills and assessing the students' ability to perform those skills.

While some techniques have been widely researched, specific techniques and evaluative measures have not been found in the literature. Identifying active learning scenarios and activities that simulate the traditional hands on lab are important in enhancing the student experience and ensuring that the specific clinical skills have been mastered. The use of video demonstration and evaluation was an effective way to ensure that students were performing transfers safely and correctly. Creating innovative clinical reasoning case studies were imperative in ensuring that students were able to identify and develop appropriate interventions for a variety of diagnostic groups. Requiring students to create orthotic patterns, complete ergonomic evaluations, and perform comprehensive literature reviews were ways to engage students in active learning outside of the traditional classroom. As stated by Ives (2020), "Teaching online requires an intentional, thoughtful approach to instructional design" (para 2).

Implications for Occupational Therapy Education

There are important implications for entry level occupational therapy education as it relates to the teaching of clinical skills using an online format. There are inherent risks to future clients if the education of future therapists and therapy students is not effective in adequately preparing them for many of the "hands-on" skills including transfers, orthotic fabrication, modalities, and intervention and assessment. Educators must ensure competence in these skills prior to allowing patient contact through fieldwork education. Additionally, if students present to fieldwork without having mastered these basic entry level skills, academic settings risk the possibility that these sites may decline future students. In order to continue to support intelligent, competent, and forward-thinking occupational therapists, educators must be vigilant and flexible in order to provide the best comprehensive education despite the learning format. Continued exploration of online pedagogy is essential to identifying methods that will ensure student competence with hands on clinical skills. Although moving away from the traditional face to face learning format may prove to be overwhelming, there is evidence of hybrid teaching models (traditional with online) working well and demonstrating positive student success. A study by Jensen and Lally (2018) demonstrated that both traditional and hybrid methods were effective in developing positive student outcomes. The study they completed used a retrospective model and the groups demonstrated that the Fieldwork Performance evaluation (FWPE) scores, grade point average and National Board of Certification of Occupational Therapy (NBCOT) exam scores were not significantly different.

Conclusion

Although several entry-level courses in occupational therapy are conducive to online learning, clinical skills education can be a challenge in this format. While past research has evaluated the effectiveness of hybrid clinical education, little literature was found to discuss the teaching of hands on clinical skills in a strictly online format. With the changing environment due to the pandemic, it is imperative that occupational therapy educators identify alternative online pedagogy that is both effective at increasing knowledge and embraced by students. During this time, occupational therapy educators should share and discuss techniques in teaching in order to ensure the development of competent future practitioners.

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Appendix A

Intervention Case Study Assignment

Lab Activity April 2, 2020

Part I

Directions: Read the following case study. Choose **ONE** of the following items to create a treatment plan for the stated problem. Describe the activity that you would carry out and in detail, outline how you would set up the activity to address the stated issue (ie, where you would place items, what would your directions to the client be?).

Available treatment items:

Coins   Checkers   Puzzle   Cards   Paperclips

Joy G. is a 48-year old married mother of 3 active boys, ages 12, 15, and 18. She enjoys attending her sons' sporting events and providing "Mom-Taxi" services for her sons and their friends. She also loves her part-time job as a hairdresser at a popular salon. Seven months ago, Joy began noticing stiffness in both hands in the morning that lasted longer and longer. Stiffness now lasted more than 1 hour every morning and included hands, wrists and ankles. This stiffness has resulted in decreased Fine Motor Coordination.

Part II

Directions: Joy has returned to your care with a new problem. Using the **SAME** item you chose in Part I, outline a new treatment activity to address the new issue providing details on directions and set up.

As her hand issues progressed, Joy noticed that she is now having difficulty with identifying objects without being able to see them (stereognosis).

Part III

Directions: Joy has returned to your care with a new problem. Using the **SAME** item you chose in Part I & 2, outline a new treatment activity to address the new issue providing details on directions and set up.

As you are working with Joy, you notice that she has difficulty with in hand manipulation and palm to tip translation.

Part IV

Directions: Joy has returned to your care with a new problem. Using the **SAME** item you chose in Part I, 2 & 3, outline a new treatment activity to address the new issue providing details on directions and set up.

Most recently Joy noticed pain in her right and left shoulders when she would cut or blow dry her client's hair. She now has limited shoulder range of motion with flexion / scaption limited to 90 degrees.

<div align="center">Part V</div>

Directions: Joy has returned to your care with a new problem. Using the **SAME** item, you have been working with throughout, outline a new treatment activity to address all of the stated issues providing details on directions and set up.

Problem List:

Astereognosis, decreased fine motor coordination, decreased in hand manipulation and palm to tip translation, decreased shoulder range of motion.