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## Feasibility of a Self-Paced Educational Intervention Protocol on Standardized Assessment of Public Building Accessibility

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# Feasibility of a Self-Paced Educational Intervention Protocol on Standardized Assessment of Public Building Accessibility

## Abstract

Limited research informs the implementation of web-based and mobile learning (mLearning) protocols for the assessment of public building accessibility in occupational therapy graduate students. This study tested the feasibility of a self-paced protocol designed to teach students how to evaluate community environment accessibility. Students across five sites completed an online learning module and community building evaluations. Students were randomized into lecture or lab educational groups and then crossed over to receive the second experience. Outcomes were student satisfaction, self-perceived learning, and knowledge on a researcher-developed measure. Data were analyzed using descriptive statistics. Two hundred and twelve students completed the study. The students were satisfied with their education and their community accessibility knowledge significantly increased from approximately 60% to 85%. Site and order of the learning components did not impact student ability to achieve competence. This multi-site approach is feasible and effective in instructing students in this highly protocolized and specialized area of practice.

## Keywords

Architectural accessibility, teaching, built environment, graduate education, distance education

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Standardized Assessment of Public Building Accessibility**

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**ABSTRACT**

Limited research informs the implementation of web-based and mobile learning (mLearning) protocols for the assessment of public building accessibility in occupational therapy graduate students. This study tested the feasibility of a self-paced protocol designed to teach students how to evaluate community environment accessibility. Students across five sites completed an online learning module and community building evaluations. Students were randomized into lecture or lab educational groups and then crossed over to receive the second experience. Outcomes were student satisfaction, self-perceived learning, and knowledge on a researcher-developed measure. Data were analyzed using descriptive statistics. Two hundred and twelve students completed the study. The students were satisfied with their education and their community accessibility knowledge significantly increased from approximately 60% to 85%. Site and order of the learning components did not impact student ability to achieve competence. This multi-site approach is feasible and effective in instructing students in this highly protocolized and specialized area of practice.

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Technology is ubiquitous in everyday life and has developed an enhanced presence in healthcare education and healthcare delivery alike. Leveraging virtual platforms and mobile devices in higher education can prepare students for integrating technology and mobile tools into practice (Kadimo et al., 2022). Although students are exposed to a variety of essential skills during coursework or fieldwork placements, minimal

consistency (such as that of technology inclusion in instruction) across programs and clinical sites can translate to variation between student experiences in establishing competency in various topics for preparing students prior to entering the workforce (Grant, 2019).

Occupational therapists play a central role in environmental assessment and interventions to improve participation among people with disabilities which necessitates mastery of inherently complex reasoning skills (Burns et al., 2017; Mendonca et al., 2023). Exposure to environmental accessibility content is necessary for students to develop their skills and competencies; however, due to the relatively specialized nature of public building accessibility assessment, many aspiring occupational therapists may lack experience or have inconsistent experiences with this content during their professional education. A solution is to develop knowledge and skills through a virtual learning platform. Literature supports the potential for improving knowledge and skills in occupational therapy graduate students through a variety of virtual learning platforms (e.g., Calabrese et al., 2019; Eberth et al., 2019; Ryan-Bloomer & Delahunt, 2022). The purpose of this study was to test the feasibility and student learning outcomes in public building accessibility using a web-based learning module and mobile learning (mLearning) public building accessibility element.

### **Literature Review**

Educating aspiring occupational therapy practitioners across the over 600 accredited and pending accredited programs to complete procedures with good fidelity can be a challenge (American Occupational Therapy Association, 2021). Occupational therapy education is unique with a distinct set of processes, way of thinking, and methods based on the science of occupation (Schaber, 2014). This can be seen clearly through Schaber's (2014) discussion of signature pedagogies, or the "disciplinary habits that set the discipline apart from others" (p. S41). Schaber posited that occupational therapy's signature pedagogies are relational learning (learning through human connection), affective learning (transformative learning affecting attitudes, beliefs, and values), and highly contextualized active engagement (learning through doing). These methods are a natural fit with the traditional face-to-face classroom. Increasingly however, educators are being required to accommodate distance education, hybrid learning, satellite campuses, and other technological modalities. In fact, more than 70% of master and doctoral entry-level occupational therapy programs offer some degree of distance education within their curriculum (Harvison, 2022). It has been found that no significant differences exist between on-campus and hybrid cohorts for measures such as grade point average (GPA) and board examinations for occupational therapy students (Jensen et al., 2021). Occupational therapy students reported enhanced competence and confidence in administering screenings during telehealth and face-to-face experiential learning opportunities (Ryan-Bloomer & Delahunt, 2022). Nonetheless, given the relational and hands-on nature of occupational therapy education, it is essential to ensure pedagogical methods are feasible and effective in virtual instructional contexts.

Emerging technologies offer exciting opportunities to improve student learning outcomes by providing tools and training that have the potential to be accessed beyond the limited time traditionally dedicated in the classroom. Mobile technology has become increasingly popular in recent years and offers opportunities to meet student learning wants and needs. As mobile devices such as smartphones and computer tablets have become more immersed in everyday life, so has the concept that these devices can be used to support teaching and learning (Basak et al., 2018). In fact, the idea of mobile learning (mLearning) enables educators to re-think learning and shift away from authoritarian-type based teaching structures toward the concept of a community of learners (Heflin et al., 2017). mLearning refers to learning which occurs when learners use their mobile phones or tablets as a device for learning activities. It is well-accepted by students, is positively received among healthcare students, and can improve both learning and education outcomes (Baghcheghi & Koohestani, 2021). mLearning offers opportunities to interact with course content beyond the traditional classroom geographical and temporal constraints (Jeno et al., 2018). Furthermore, mobile applications (apps) to facilitate learning may promote student engagement in learning activities by providing immediate access to content and enhanced hands-on-learning opportunities (Jeno et al., 2018).

Virtual learning can be employed without hesitation as research shows this pedagogy does not negatively impact performance on assessments (Cowan et al., 2022). In general, many distance-learning strategies have been positively viewed among healthcare students; however, negative perceptions about some elements existed (e.g., issues with connectivity, unclear instructions/ expectations; Pires, 2022). It is recommended that healthcare programs continue to offer face-to-face hands-on coursework elements and encourage social and academic engagement between peers and with faculty when virtual platforms are used (Cowan et al., 2022).

Unfortunately, a dearth of evidence exists examining self-paced protocols with mLearning elements for essential skills in occupational therapy such as public building accessibility assessments. We are unaware of any virtual protocols that examine if it is feasible or to use this type of learning protocol with occupational therapy students; particularly across institutions. The self-paced learning protocol used in this study was designed to teach occupational therapy students how to evaluate public building accessibility. This topic is a strong fit for a self-paced learning module, as all occupational therapy practitioners are expected to be able to modify the environment to enhance performance of daily occupations. However, practitioners who provide complex environmental modifications are encouraged to have advanced study of construction, architecture, structural design, and legislative guidelines (Mendonca et al., 2023). Therefore, training through a self-paced learning protocol allows students to learn from faculty with dedicated expertise in this area.

The purpose of a feasibility study is to assess the research and intervention process and to answer the question “can it work?” (Orsmond & Cohn, 2015). Feasibility studies answer the question through five objectives evaluating: 1) recruitment capability and sample characteristics, 2) data collection procedures and outcome measures, 3) the

acceptability and suitability of the training procedures, 4) the resources and ability to implement the study, and 5) the participants' responses to intervention. Therefore, this study sought to test the feasibility of a virtual self-paced learning protocol on public building accessibility including a web-based learning module and hands-on mLearning component implemented in the context of the community. In addition to feasibility questions, our research question was, can a web-based education and hands-on mLearning community assessment protocol lead to improved student learning?

## Methods

### Study Design

In this experimental pre/post crossover study, occupational therapy students across five sites at four institutions completed an online training module and building evaluation using a novel standardized assessment (Schwartz et al., 2013; Smith & Schwartz, 2019; Williams et al., 2015). Students were randomized to complete either the learning module lecture or the community environment evaluation lab first. Students then crossed over to receive the other intervention component. Study procedures were reviewed and approved by the University of Wisconsin-Milwaukee University's Institutional Review Board (IRB). An IRB Authorization Agreement was completed to cover research activities across institutions.

### Participants

The students in this study were master-level students enrolled in graduate level occupational therapy programs in academic year 2019-2020. All students from specific courses were invited to participate in the research study at each program. Student progression in the program varied and included both first and second year students. All students in the course completed the web-based learning module and engaged in a community accessibility building evaluation. Students, however, could choose if they wanted to share their data for research purposes and participate in the research specific activities. Students who chose not to participate in research specific activities engaged instead in a reflective writing exercise requiring equal time. Study participation did not impact the student's grade in the course and the course instructor was blinded to study participation.

### Instrumentation

Several assessments were used to investigate the feasibility of the study.

1) *Recruitment capability and sample characteristics.* To quantify recruitment capability, the research team quantified the number of participants invited to participate as well as the number consented into the study. For sample characteristics, participants completed a demographics questionnaire describing their age, gender, race/ethnicity, and current GPA.

2) *Data collection procedures and outcome measures.* To understand any issues around data collection procedures, the research team met weekly to review process and issues. Minutes were kept to detail issues that arose. Outcome measures were assessed for variability as well as ceiling and floor effects.

3) *Acceptability and suitability of the web-based educational procedures.* In the self-paced learning module, students were asked to indicate their satisfaction on a four-point Likert-like scale after each module component. The research team was also able to review the completion metrics in Canvas, the learning management system in which the learning activities took place.

4) *Resources and ability to implement the study.* In weekly team meetings, the research team discussed the ability to implement the study. Issues were noted in the meeting minutes. The research team also compared performance on the knowledge quiz outcome measure by site to examine site effects.

5) *Participants' responses to intervention.* The participant's response to intervention was measured through a researcher (JS) developed knowledge quiz that tested students' knowledge of the community accessibility evaluation content. The knowledge quiz included 20 multiple choice questions as well as two short answer questions. In the short answer questions, the students were asked to list the accessibility issues present in a picture of a bathroom and an entrance.

## **Educational Components**

### ***Learning Module Lecture***

The learning module consisted of completing a self-directed electronic learning module on accessibility and building evaluation. The learning module was hosted on the learning management system Canvas and consisted of narrated presentations, videos of people with disabilities experiencing environmental barriers, pictures, reflective questions, and links to key resources. Specifically, the module discussed the following:

- Key terms in community accessibility evaluation
- Importance of community accessibility
- Occupational therapy role
- Theory guiding evaluation
- Policy impacting community accessibility
- Tools to evaluate the accessibility of community spaces
- Community accessibility evaluation process
- Building elements and features
- Using the AccessTools assessment tool
- The students completed the learning module at their own pace over the course of approximately two hours.

### ***Community Building Evaluation mLearning Lab***

Students were assigned to evaluate two casual counter-service type restaurants using the AccessTools app in student pairs. AccessTools is an iOS-based app that evaluates the accessibility of 13 building elements (doorways, routes, restrooms, signage, floor and ground, reception and information, seating, ramps, stairs, elevators, parking and restaurants). Integrated into the app-based assessment are a variety of helpful features to help students understand and determine accessibility, including help text and overview videos. The assessment also uses a trichotomous tailed sub-branching scoring approach, allowing students to "drill down" to see more specific questions for when more assistance is needed to understand the accessibility of a building element.

Data collected with the AccessTools app was not analyzed for this feasibility study but a post-assessment was given after completion of this step.

### **Procedures**

Researchers attended the course in which community accessibility evaluation was taught and invited all of the students in the course to participate. The four universities included 5 campuses which were both private and state institutions. Each university embedded the learning activity in different courses with a commonality of assistive technology content within the course. Interested students completed the informed consent documentation. All students in the course completed the learning activity (online module and mLearning lab), but only outcomes for students who consented to study participation are presented here. All study activities were completed in Canvas. Participants first learned about the module and completed the demographics questionnaire and pre-test knowledge quiz. Using simple randomization, students were evenly randomized to complete either learning module lecture or building evaluation. After completion of the first portion of the educational component, students again completed the knowledge quiz. Finally, students completed the other condition (either the online learning module or building evaluation) and completed the knowledge quiz again. The pre-test and post-test knowledge quiz included the same questions each time, but students were unable to view their quiz or see the correct answers until the end of the full learning experience.

### **Data Analysis**

Meeting minutes were reviewed to identify any issues regarding data collection procedures or factors affecting the researchers' ability to implement the study. Descriptive statistics were used to document participant characteristics, participants' satisfaction with the learning module, and scores on the knowledge quiz pre- and post-tests. For the short answer question on the pre- and post- tests, two researchers independently reviewed the list of accessibility issues identified in the short answer questions against a full list of issues identified by the full team. The reviewers demonstrated good agreement evidenced by a kappa correlation coefficient of 0.79. To further increase the reliability, the number of issues found by each student as determined by reviewers was subsequently averaged. This average number of issues was used to tabulate descriptive statistics. To understand the preliminary response to intervention, researchers evaluated the effect of the education intervention on the participants' knowledge quiz across the group assignment using a two-way ANOVA. A second two-way ANOVA was performed to understand the differences between outcomes at the four sites.

### **Results**

The research team successfully implemented study procedures across four universities across a total of five campuses. Through this experience, the research team was able to describe the feasibility across the five objectives evaluating: 1) recruitment capability and sample characteristics, 2) data collection procedures and outcome measures, 3) the acceptability and suitability of the educational procedures, 4) the resources and ability to implement the study, and 5) the participants' responses to intervention.



### Evaluation of Recruitment Capability and Resulting Sample Characteristics

For this objective, 230 students were invited to participate. Approximately 95% of invited students engaged in the study (n=219). Participant demographics can be seen in Table 1.

**Table 1**

#### *Demographics of Study Sample (N=219)*

<b>Characteristics</b>	<b><i>M</i></b>	<b><i>SD</i></b>
Age (Years)	24.53	3.29
GPA	3.63	1.08
	<b>n</b>	<b>%</b>
<b>Sex</b>		
Female	176	80.37
Male	13	5.94
Refused	30	13.70
<b>Race</b>		
Asian	17	7.76
Black	7	3.20
Multiracial	9	4.11
Refused	44	20.09
White	142	64.84
<b>Ethnicity</b>		
Hispanic	48	21.92

### Evaluation and Refinement of Data Collection Procedures and Outcome Measures

As learning outcome measures, the knowledge quiz and short answer questions performed soundly across several parameters. The assessments were free of ceiling and floor effects and demonstrated good variability across students. This is evidenced by the baseline scores and standard deviation for each assessment. At baseline, students scored an average of 61.51% (sd=12.90) on the knowledge quiz. They correctly identified 14.87% (n=2.53, sd=7.10) of accessibility issues in the image of the entrance and 11.58% (n=4.24, sd=8.73) of accessibility issues in the image of the restroom.

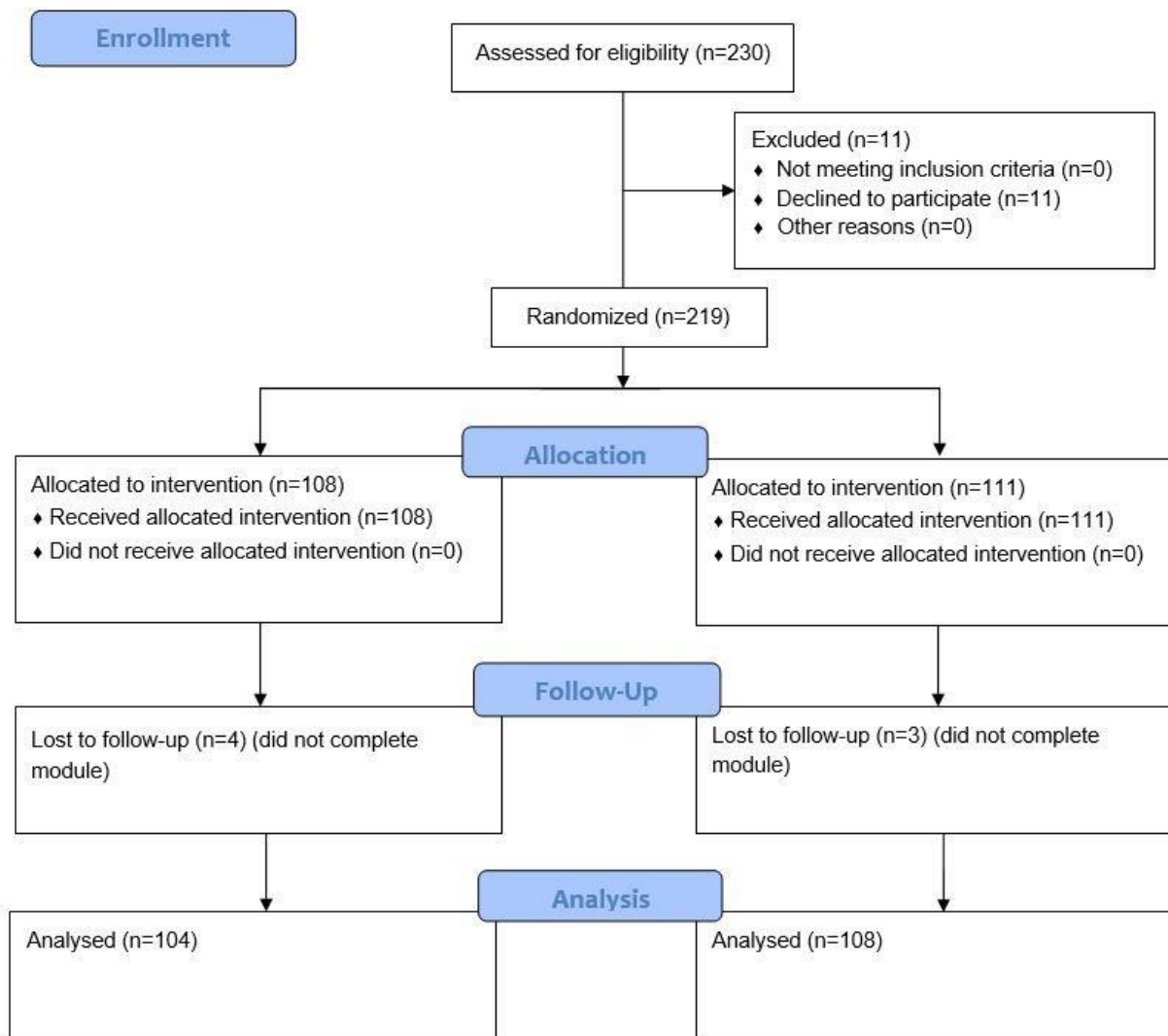
In terms of the data collection procedures, there were some difficulties with data integration between sites. As the learning experience was integrated into each university's own Canvas Learning Management System, each campus research team had to pull and integrate the data from each site into a single file. This proved time consuming as compared to typical data collection approaches. However, this data collection approach was the easiest for the students who were accustomed to completing learning assignments in Canvas.

## Evaluation of Acceptability and Suitability of Intervention and Study Procedures

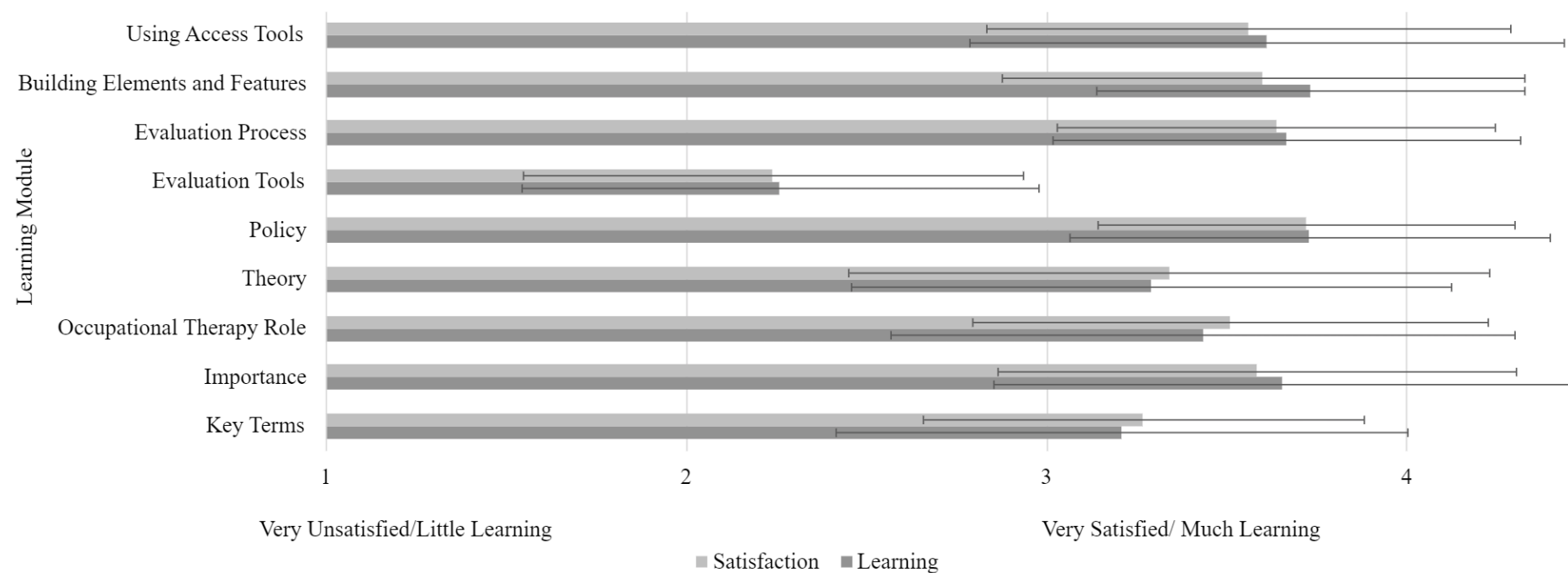
The participants demonstrated variability in the level of effort and thoroughness put into the learning modules with some students quickly completing all modules and other students taking a more thorough approach. Seven individuals (3%) failed to complete the assignment. The flow of participants can be seen in Figure 1.

**Figure 1**

*Consort Flow Diagram*



When asked directly, students indicated that they were satisfied to very satisfied, and learned much to very much across the learning modules. One module, "Evaluation Tools," scored low in both satisfaction and self-perceived learning. Figure 2 demonstrates student perceived learning and satisfaction across each of the modules.

**Figure 2***Self-Perceived Learning and Satisfaction with Learning Modules*

\*Note. Each learning module was provided through the web-based Canvas element of the learning activity.

### Evaluation of Resources and Ability to Manage and Implement the Study and Intervention

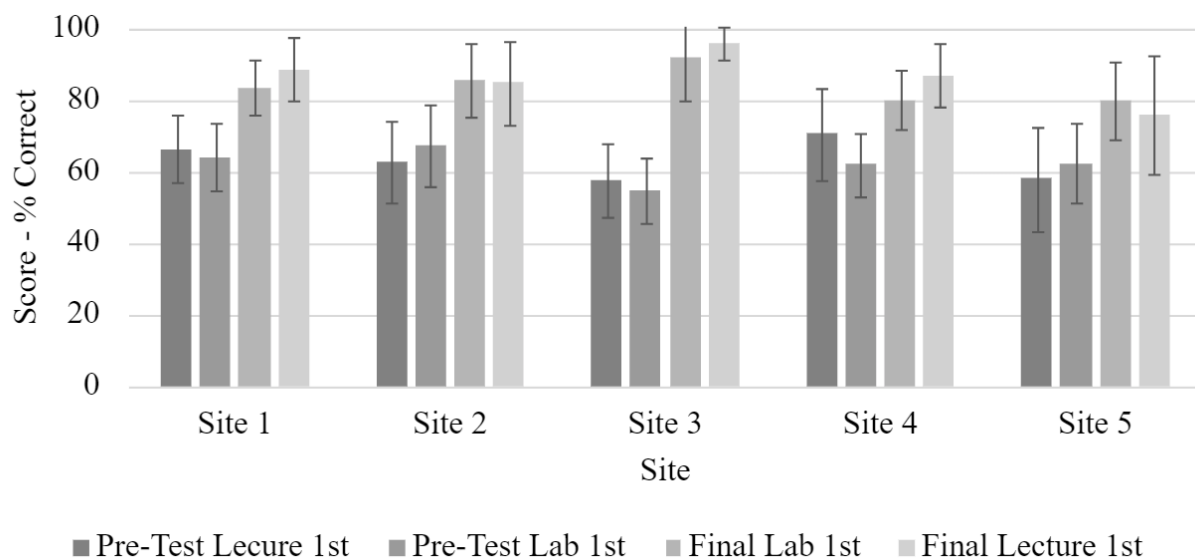
Using the Canvas Commons feature, the research team was easily able to upload and then deploy the exact same learning experience across campuses. The procedures of this study randomized half of students to complete the learning module lecture first and half of students to complete the community evaluation lab first. A combination of passwords and prerequisites were used to ensure that the students completed the correct portion at the correct time. Several students found this aspect confusing resulting in several questions to the research team. All issues, however, were able to be resolved.

Two two-way ANOVAs were performed to analyze the effect of location and group on the knowledge quiz at pre- and post- test. At pre-test, the two-way ANOVA revealed that there was a statistically significant interaction between the effects of location and group assignment ( $F(4, 202) = 2.45, p = 0.047$ ). Simple main effect analysis showed that location did have a statistically significant effect on the participants' knowledge quiz for both groups (Lab first:  $p = 0.001$  and Lecture First:  $p = 0.003$ ). However, simple main effect analysis showed that group did not have a statistically significant effect on the participants' knowledge quiz at any of the five locations.

At post-test, the two-way ANOVA revealed that there was not a statistically significant interaction between the effects of campus location and group assignment ( $F(4, 202) = 1.92, p = 0.11$ ). Main effect analysis showed that location did have a statistically significant effect on the participants' knowledge quiz ( $p \leq 0.001$ ). However, main effect analysis showed that group did not have a statistically significant effect on the participants' knowledge quiz ( $p = 0.132$ ).

**Figure 3**

#### Knowledge Quiz Results

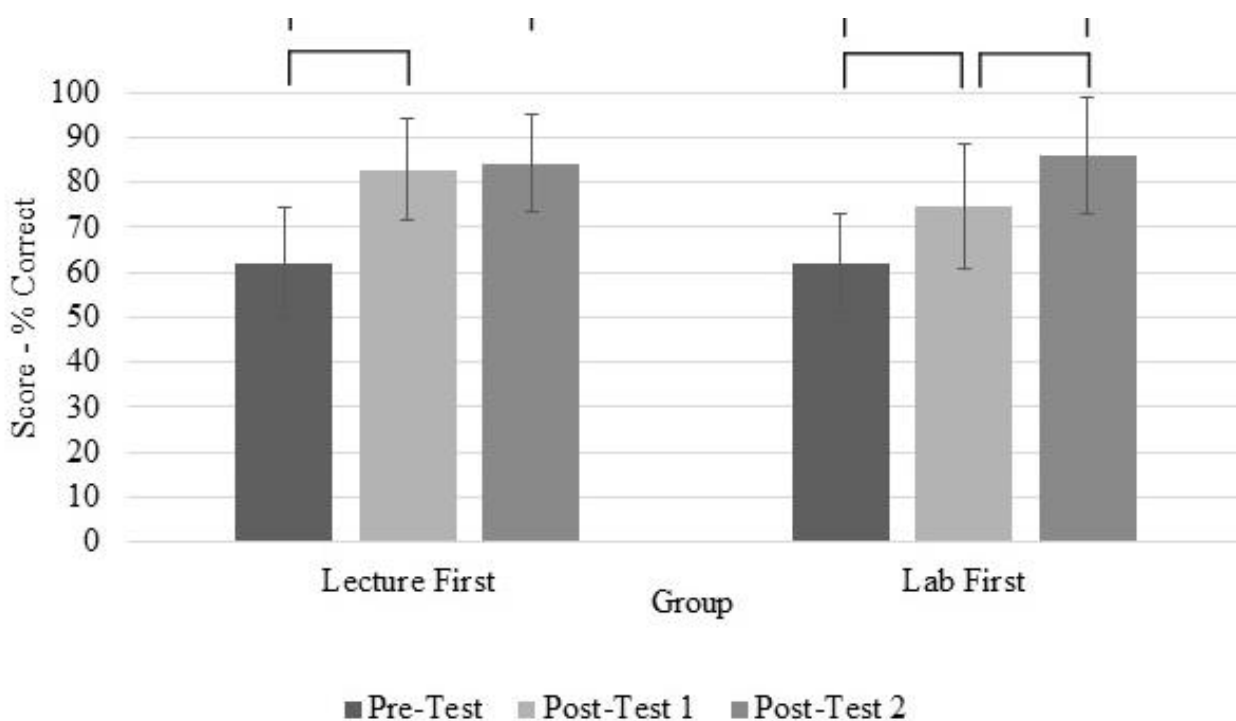


### ***Preliminary Evaluation of Participant Responses to Intervention***

Student scores on the knowledge quiz increased from approximately 60% to 85% after completion of both learning experiences. Figure 4 demonstrates participants' scores on the knowledge quiz as the learning experience progressed. There was no significant difference between groups at pre-test. Scores for students who received the lecture first, significantly increased after taking the web-based learning module, but the additional increase in scores after the lab was not significant. In students who completed the lab first, their scores increased significantly after the lab and then again after the lecture. When comparing the final scores, there was no significant difference found between the two groups, suggesting that the gain in knowledge after completing both the on-line learning module and the building evaluation was comparable.

**Figure 4**

*Knowledge Quiz Scores as Learning Experience Progressed*



Students also completed the short answer questions where they were asked to look at an image of an entrance and a restroom and asked an open-ended question to identify any accessibility issues. At baseline, the students identified 2-3 issues on the image of the entrance and 4 issues in the image of the restroom. After learning module, students identified two more accessibility issues. Specifically, students in the lecture first identified 3 issues in the entrance and 5 issues in the restroom. Students in the lab first group, identified 3 items in the entrance and 6 items in the restroom. There was no increase in either group from post-test activity 1 to post-test activity 2.

## **Discussion**

In this feasibility study, occupational therapy students completed a web-based lecture and a community evaluation lab experience as part of a research study on educating multiple students across campuses and institutions to complete complex therapeutic approaches. This study is the first in a line of research to understand the feasibility of this approach, or more plainly to understand “can it work?” (Orsmond & Cohn, 2015).

We successfully completed all five objectives of a feasibility study. We found that students were willing complete the entire learning activity and share their data for research purposes (objective 1). The primary outcome tool, the knowledge quiz, performed well and can be used in future work. The Canvas learning management system enabled the study team to easily deploy the learning experience across institutions in a manner that was easy to use and familiar with the students but proved time consuming for data retrieval (objective 2 & 4). The students were satisfied with the learning experience (objective 3), and the students’ knowledge of community accessibility significantly increased from pre-test to post test (objective 5). Most importantly, the students were better able to identify accessibility barriers in the community after completing the learning experience. Data across the objectives indicate a successful feasibility study with appropriate methods for further research.

The data also present interesting findings about deploying a learning experience across sites. The content area of community accessibility requires practitioners to undergo advanced study of construction, architecture, structural design, and legislative guidelines (American Occupational Therapy Association, 2015). As part of this learning experience, we were able to bring the experiences of experts to over 200 students. As any educator may suspect, at baseline there were differences between sites, who were characterized by different curriculums and student experiences. However, across sites, the learning experience was able to bring students from below the competency threshold (<70%) to well above 80% for most sites. This suggests that learning experiences curated by experts can be deployed across programs to give students access to the best knowledge and skills in unique and advanced practice areas.

Although it may appear that incorporating a pre-packaged learning module is a simple way to provide expert instruction, the learning module actually requires a strong commitment by the course instructor. For this learning experience, the course instructor was required to identify restaurants a priori that were amenable to having students evaluate their building. However, it is possible to have students evaluate a restaurant of their own choosing. Another challenge is resources as this experience required access to a standardized assessment on an iPad. Several of the course instructors required additional time to make the iPad available to students. These barriers, access to the community and materials, however, are common issues experienced by course instructors on many topics in occupational therapy.

**Limitations**

This study was not without limitations. First, students enrolled in the study came from universities with faculty having expertise and enthusiasm for accessibility and assistive technology. This may have influenced the acceptability of the learning opportunity among students. In contrast, other programs with different areas of focus might have different student interests and thus impact acceptability outcomes. Second, the program was self-paced so students were afforded the opportunity to work through the modules independently. It is possible that students may have skipped sections or completed lab or lecture elements in a different order than assigned. Lastly, we completed the study in Canvas because it is familiar to students and functions well for the learning module. However, Canvas is not designed as a data collection tool and a different platform such as RedCap may have been better suited for collected data for this study.

**Implications for Occupational Therapy Education**

The emergence of virtual learning platforms has revolutionized how graduate-level students can both learn and access information. Shifts within programs and curricula moving toward hybrid approaches for learning offers significant implications for occupational therapy education. Technology offers innovative learning options for accessing content beyond the traditional boundaries of the classroom. Additionally, mLearning presents opportunities for hands-on application of learned knowledge and skills which gives students the opportunity to interact with the content and construct meaning through application. Occupational therapy programs seeking to implement novel approaches to delivering education on public building accessibility may consider integrating a similar strategy using virtual learning such as our protocol that leverages web-based modules and mLearning that was feasible, improved student learning outcomes, and was suitable and acceptable among master-level occupational therapy graduate students.

**Conclusion**

In this study, we educated over 200 occupational therapy students across five sites on evaluation of community environments. Findings from this feasibility study suggest that this approach is feasible, and the education enhanced students' skills in assessing accessibility of public buildings. More importantly, we believe that this protocolized web-based education also provided an experience that develops a true-to-life understanding of the challenges faced by people living with disabilities. We anticipate that the web-based education and hands on evaluation experience may activate a generation of occupational therapists to be advocates for community accessibility and that other educators can use these approaches to teach and motivate entry level occupational therapy practitioners to engage in novel and advanced areas of practice needed to help the profession achieve its vision of maximizing health, well-being, and quality of life for all people, populations, and communities (American Occupational Therapy Association, 2017).

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