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Using Ipads to Facilitate Library Instruction Sessions in a Scale-Up Classroom

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This study details a trial in which three undergraduate library instruction sessions were conducted on a class set of iPads, within a SCALE-UP classroom. The iPads suggested strong potential as replacements for desktop computers and demonstrated support for key active learning approaches: instant polling, content sharing, and navigation of web pages and databases. The SCALE-UP classroom has made notable contributions in promoting undergraduate learning, and its advantages were found to be extensible to library instruction. The pedagogy which the space is designed to reinforce, collaborative learning segments interspersed with lecture components, seemed to promote student engagement in library instruction sessions.

KEYWORDS Information literacy, active learning, tablet technologies, iPads, Nearpod, computer-assisted instruction, space utilization, SCALE-UP classrooms

INTRODUCTION

Library instruction is a key outreach activity offered by librarians to prepare students, especially undergraduates, to use library resources effectively. Experienced academic librarians, who support college and university students, have emphasized methods for making library instruction sessions (LIS) effective for promoting information literacy and library skills acquisition. As a result, a variety of teaching strategies have

developed which attempt to address the problems students encounter while trying to gather appropriate information for their coursework.

Since the majority of this process revolves around fostering fluency with the library website and electronic catalogs, the assumption that students need individual access to these screens throughout learning sessions is supported by the evidence base. Additionally, current research shows favorable learning outcomes are associated with active learning instead of lecture-only instruction formats.

Given that space and budgets are at a premium especially in the current economic environment, librarians strive to create dedicated spaces with ample resources for conducting their sessions. Achieving this goal implies not only equipment costs, but also maintenance and upkeep of these dedicated spaces. For this reason, libraries have invested in computer labs with stationary workstations usually outfitted with desktop computers, although in recent years laptops have become an attractive substitute. Even before Wi-Fi internet access was an expectation, librarians have been looking for opportunities to move students out of seated instruction situations (Bordonaro 2001). With the advent of tablet computers, most notably Apple's iPad, librarians are beginning to see real opportunities for integrating active and collaborative learning into library instruction sessions not just through their use, but in concert with the many inexpensive applications 'apps' that are developed to aid presentation (Wisniewski 2012).

The purpose of this research is to evaluate the efficacy of iPads as a replacement for desktop computers for use in undergraduate library instruction sessions. A secondary

concern is to elucidate the advantages of one active learning classroom arrangement: the SCALE-UP classroom.

LITERATURE REVIEW

A literature review of four key themes relating to this proposed project is intended to ground this study in the existing evidence base.

Library Instruction

Studies evaluating LIS using both objective and subjective measures have indicated that library instruction is needful for undergraduate students (Coupe 1993; Prorak Gottschalk and Pollastro 1994) and that it can increase student knowledge and confidence (Prorak Gottschalk and Pollastro 1994). An assistant librarian at the University of Wisconsin, measured a statistically significant increase in GPA of graduating seniors who had library instruction in upper-level (not freshman) courses (Bowles-Terry 2012). In a longitudinal study conducted at Purdue these associated improved skill levels were further related to changes in student expectations that correlated to improved "overall satisfaction with the library," (Stamatoplos and Mackoy 1998), a factor that is thought to be related to "repeat patronage and positive word of mouth" (Stamatoplos and Mackoy 1998). Taken together, these findings indicate that library instruction is contributing not only to institutional educational missions, but also to library patronage.

In order to establish a benchmark for information literacy skills, the Association of Academic and Research Libraries developed the *Information Literacy Competency*

Standards for Higher Education (ACRL 2001). It serves as a comprehensive outline for the skills an individual needs in order to:

- Determine the extent of information needed
- Access the needed information effectively and efficiently
- Evaluate information and its sources critically
- Incorporate selected information into one's knowledge base
- Use information effectively to accomplish a specific purpose
- Understand the economic, legal, and social issues surrounding the use of information, and access and use information ethically and legally

(ACRL 2001)

The document was approved by the Association of Higher Education and has served to guide the content of library instruction sessions ever since.

Active Learning

The research question addressed is how these sessions should be implemented and with what space and technological infrastructures. These questions introduce the need for a comprehensive approach where pedagogical methods complement and are reinforced by learning environments.

Since the 1880's librarians have noticed the limitations of lecturing (passive learning) in library instruction sessions, and a variety of alternative approaches have synthesized within cognitive learning theory around "active learning" methods which are activity-based and allow for discovery of material, promoting "higher cognitive processes such as analyzing, synthesizing, and evaluation" (Lorenzen 2001). In comparing an active learning activity with a standard search strategy lecture, Senecal and Fratantuano (2008) of Dickinson College conclude, "the search strategy methodology does not allow for enough flexibility on the part of the user, and emphasizes process over analysis. The

more cognitive-based exercises tried as an alternative approach encouraged students to think critically about what they found and share that information with each other."

"Cooperative learning" or "collaborative learning" are the common terms used for transferring these active learning strategies to pairs or small groups of students. Lorenzen points out that these scenarios mirror humankind's first educational rituals in hunter-gatherer societies that were subsequently legitimized by intellectuals like Socrates, Rousseau, Dewey and Piaget (2001).

Ross and Furno compared learning outcomes of active and passive learning contexts within instruction situations in a higher education library. This comparative study affirmed that active learning strategies "produce improved learning outcomes" (2011). Their findings, along with those of Dabbour (1997) who found largely favorable student ratings of active learning library instruction modules, underscore the rationale for implementing active learning strategies and providing for the necessary infrastructures within libraries to optimize them.

Collaborative Learning Spaces

In research literature, active and collaborative learning are related to different needs in terms of classroom space. In her highly referenced 1992 outline of methods for integrating active learning into library instruction, Jeanetta Drueke suggests librarians "arrange the classroom to encourage participation, putting chairs in a circle or in clusters." She goes on to emphasize a methodology where physical library materials are arranged in stations and students follow a traveling progress to each of them. Since then, a tension has emerged in this approach with the advent of online catalogs and the

dramatic changes in technology that have often required the need for multiple desktop computer terminals. Mottaghifar (2011) emphasizes an "urgency to teach users how to become more effective, efficient, and independent in their information searching," and Munro argues for the importance of closely mimicking real research problems (2006).

Electronic library classrooms are recounted by Soderdahl as the wave that preceded learning space design: "The instructor's station was positioned at the front of the room, with students evenly spaced in five rows, all facing forward. This design was typical for early electronic classrooms" (2011). Libraries without these dedicated spaces faced the attendant problems of closing public workstations while conducting instruction sessions (Pilston 2002).

The results of a 2011 case study in which a space planning project utilized librarian experience in what students do and how they behave within academic libraries emphasized the need to accommodate emerging digital technologies (Beard and Dale 2010). The authors argue that the process "enabled the creation of learning spaces that are flexible and responsive to the changing needs of users" and sets up a library-specific argument for an alignment between "space and purpose." One of the key implications in reconsidering the computer hardware choices for library instruction is that it explodes the computer lab scenario and opens up the opportunity for library instruction spaces to be reimagined in the ways that promote flexibility and responsiveness.

Investigation of collaborative learning space design is emerging in many other academic levels and disciplines. Within higher education, the Physics department of North Carolina State University has distinguished itself in the field of collaborative

learning space design through the leadership of Robert Beichner and his Student Centered Active Learning Environment with Upside-down Pedagogies (SCALE-UP) classrooms (Beichner 2000;2006;2011). As the title indicates, the project has sought to extend active and collaborative pedagogy to classes that previously divided time between vast lecture halls and smaller laboratory breakout groups. The design consists of a roaming instructor with a centrally-located instruction station surrounded by a varying number of round tables, each seating a maximum of nine which are further segmented into three, three-person groups. Typical classes involve students working on a series of activities. Brief lectures, often less than 10 minutes, are interspersed with 'tangibles' (hands-on observation or measurement of a physical object) and 'ponderables' (investigation of a complex problem or phenomena) (Beichner 2006a). Although the design is supported by a digital projector for the room and a laptop computer for each small group, the system hinges on table size:

> Originally, the word technology meant "systematic treatment." Based on that idea, the round tables are the most important instructional technology in the classroom. The ideal size was found after experimentation with half a dozen table geometries. The 7-foot diameter permits table-wide conversations while being both large enough to avoid crowding and small enough for efficient use of space. Tables that are too large actually discourage table-wide discussions. (Beichner 2006)

As of 2013, the SCALE-UP program has been adopted by well over two hundred other colleges and universities seeking to incorporate active learning into learning space design. Beichner links the system's advantages to interaction and dialogue: "I think 'active' is the key word here. Creating an environment where students are intrinsically

(i.e. internally) compelled (rather than obligated) to participate and cooperate creates the most positive energy amongst human interactions" (Beichner, 2011). The physical setup is key to success: "The room layout allows the instructor and teaching assistants to reach every student and engage them in Socratic dialogues as they work" (Beichner 2006).

The motivations for the SCALE-UP intervention are analogous to some of those experienced by LIS instructors. Waning interest in the learning material and low learning outcomes were demonstrated in a high failure rate (Beichner 2006a). Since its implementation, SCALE-UP has been associated with decreased failure rates overall and dramatically decreased failure rates (75%) for minorities and women (Beichner 2006). Beichner attributes these outcomes to peer interaction: "We believe this success results from the social interactions and risk-taking the room design and SCALE-UP, North Carolina State University instructional approach promote." Although many variables, particularly the probable benefits of long-term group cohesion and accountability through grading, are not extensible to LIS, the possibility that the SCALE-UP design might have transferable advantages for LIS, is nonetheless worthy of consideration.

Tablet Technologies

This study seeks to evaluate the perceived effectiveness of a specific tool- the iPad, although it is important to note that similar tablet technologies would conceivably translate.

Prior to Apple's introduction of its tablet computer, or iPad, in April 2010, a study examining mobile learning trends conducted by Babita Gupta and Yangmo Koo of

California State University, Monterey Bay, anticipated its educational potential through gauging educational uses of the smaller but otherwise quite similar iPod. The authors found that 64% (n=47) of surveyed iPod users indicated that they had used this much smaller device for their educations. The iPod was found to be the most frequently used mobile device for learning. The authors conclude that although 98% (n=47) of respondents were in agreement that there is need for methods that facilitate learning regardless of place or time, mobile devices were not being used to facilitate learning in a systematic way (Gupta and Koo 2010).

A case study of a recent pilot program where iPads were issued to students and teachers within a high school found the iPad to be a useful tool in limiting distraction and promoting exploratory behaviors (Beard and Dale 2010). Survey results showed the iPad fostered collaboration in ways that laptops didn't. The authors also note the district found the program to be financially cost-saving in unexpected ways, through both material and paper costs.

Since library catalogs have moved online, the argument promoted by skeptics in other educational contexts that analog materials offer similar lower-cost outcomes is not as useful a consideration for library instruction as it might be in other contexts. However, the research conducted to examine what specifically this new technology allows users to do that they could not otherwise do is nonetheless useful, particularly in terms of active and collaborative learning. A scholarly analysis of iPad apps found there were several that "support truly innovative teaching and learning in the sense that they represent resources that extend what educators and students could otherwise do" (Murray and

Olcese 2011). The authors utilized four categories for educational technologies introduced by Means in 1994: *tutor*, *explore*, *tool* and *communicate*. A fifth category was added to represent a key 21st century learning strategy: *collaborate*. The applications that extended educational possibilities revolved around this fifth category which the authors acknowledge is largely owed to the hardware and operating system components that provide seamless connectivity and synchronicity, allowing for sharing across devices and users. Although desktop computers share these hardware and operating system components, many applications are limited to mobile devices like the iPad.

METHODS AND MATERIALS

The PI is a library instruction intern and is thus familiar with ongoing instruction lesson plans and settings. An adaptation of the lesson "Beginning the Research Process" which is typically used in the lab with desktop computers, was modified for use with iPads in the SCALE-UP space.

The majority of the iPads were borrowed from the technology lending program and allowed for a 1:1 ratio, or one iPad for the instructor and one for each student. Experiments suggested that two default settings on each iPad would need to be adjusted: autocorrect was disabled and the amount of idle time prior to screensaver was lengthened. Documentation of the financial requirements for a class set of iPads is detailed by Wolnick and Burks's 'Classroom in a Box' (2012).

After researching teaching applications and considering leading the session without a content delivery application, the teaching application 'Nearpod' was selected.

A free application, IdeaFlight, did not deliver the option to move from slides to the internet browser and back again; it was abandoned for that reason. Nearpod is free to users, but access to the desired capabilities, internet browsing, polling, and quiz functionality, is gained through a yearly fee of $120. At the time of the study, Nearpod was only available for iPad and Nook, but since then, it has been made available for Android devices.

The SCALE-UP space is equipped with a digital projector, although Dr. Beichner shared that he is currently experimenting with the much less expensive AppleTV for this purpose. Content is delivered from the instructor's iPad from slides which are accessed from presentations uploaded to the Nearpod cloud. Once the instructor iPad has initiated a session, a four letter session pin is issued, and the slides are downloaded onto the student iPads by referencing the session pin. The slides are not viewable until the instructor issues the slides one by one within the context of the lesson. This preparation took place before the lesson.

Utilizing these materials, three library instruction sessions were conducted in the SCALE-UP space. The library sessions were requested by the instructor in advance based on her own scheduling preferences. When the opportunity to conduct the sessions aligned with the SCALE-UP room availability, the instructor was presented with the option to have her classes participate in the study.

The lesson plan was intended to deliver information to students about current approaches to selecting and refining a topic for a typical English 101 research paper and tools and methods for doing so. Other information about accessing resources and getting

help was also integrated. Requesting that students arrive with a research topic in mind for their upcoming class assignment has several drawbacks, principally because they have not yet absorbed some characteristics and criteria for choosing and refining successfully. A secondary concern is that if students are asked to arrive with a topic, those who do not and are not able to arrive at one immediately, are limited from full participation during the active learning portions of the lesson. For these reasons, the approach was to assign each student a broad topic and then through the course of the 50 minute session, offer opportunities for learning how to refine it based on the student's personal interests and search results.

Since the SCALE-UP classrooms are designed to foster three groups of three at a round table, students were instructed to focus on a broad research topic (an ocean or sea) and two other students seated beside them at the table were pursuing the same topic. Since the class was only 50 minutes, the potential of having students work in the larger table-size, nine-person groups was not explicitly promoted by the lesson plan.

A supervising librarian was on hand and participated in teaching, although the lesson did not require it. The English 101 course instructor agreed to greet students at the door and was asked to request that they leave all their personal belongings except a pen for taking notes near the entry of the classroom. The students were invited to sit at one of three tables outfitting each student with a place card which identified the broad topic, a particular ocean or sea, an iPad, and a piece of scratch paper for notes.

Initial information about the lesson theme was delivered using the available slide projector and was projected not only on a screen at the front of the classroom, but on screens at the back and sides of the room as well.

Once the lesson began, students were asked to log in to the lesson using their first names and the name of their given ocean or sea. The application then delivered their individual responses to the interactive portions of the lesson using the name as entered; this enabled the roaming instructor librarian to locate students based on their topic and address them by their first names.

After some initial information relating to library resources and explanation of characteristics of too broad/narrow topics, a brief poll was taken on the appropriateness of a sample topic. The poll was intended to alert students early in the lesson if they were unable to identify a topic that was too broad. Nearpod offers the capability to analyze and return poll results instantly, and although the instructor knew how each student answered the question, the pie chart depicting correct and incorrect answers which the instructor could send back to students did not identify individual responses. The poll was followed by a succession of more detailed slides conveying information about overly broad and narrow topics.

At this point in the lesson, students were introduced to a journal/database entitled CQ Researcher, which is an important resource for undergraduate research as it is full of relevant information with multiple viewpoints relating to contemporary issues. The students were asked to search for the name of their ocean or sea and to skim any article offered in the search results for intersecting information related to their topic. They were

asked to confer with their group members and decide together on one refined topic to submit to the instructor. Once submitted, a few were selected and shared with the whole class by the instructor.

Next, the students were introduced to Summon which is the meta-search tool that retrieves articles from a majority of the university's academic journals, magazines and newspaper subscriptions. After a series of slides on how to use some of the limiters in Summon to narrow their results, the students were given about ten minutes to search their topic, and refine it even further through identifying related articles. They were also invited to select one article, to use the affordances in Summon to choose a citation style, and to e-mail the citation and a link for the article to their personal e-mail address.

Finally, students were shown a set of slides which introduced them to information regarding call numbers for finding books in the stacks, and how to request books from a new automated retrieval system in a new library on campus. They were introduced to a digital browsing tool and information about interlibrary loan. The last slide detailed methods for getting assistance from librarians and was intended to provide visual reinforcement of what had been shared verbally at earlier points in the session.

RESULTS

In the initial poll designed to determine if students could recognize an overly broad topic (Figure 1), 86 percent, thirty-eight students (n=44) responded correctly. Five students, or 11 percent, responded that the topic was 'just right' and one student responded that the topic was 'too narrow.'

After searching in CQ Researcher and skimming an article for ideas related to their ocean, the students submitted the first round of narrowed topics as groups. These represented evidence of general success in the intended outcomes for the activity.

At the session's close, student feedback was collected using the same questions as in other LIS conducted within a computer lab learning environment. The questionnaire screens are represented in Figures 2-4.

Of the forty-eight students who participated in the three sessions, forty-four responded to the survey questionnaire. Three rated the session at '3' or 'fair,' twenty gave a '4' or 'good,' and twenty-one rated the session a '5' or 'excellent.' The mean response was thus 4.41. The three students who rated the session as 'fair' provided the following feedback when asked what could have been better about the session:

- "Perhaps more interaction...and structure with the interaction points"
- "More interaction among ourselves"
- "I think it was good for its purposes."

The same three students had the following to say about what they learned:

- "Different ways to research"
- "Cq researcher is very helpful"
- "I learned how to use CQ Researcher."

Of the six students who demonstrated an initial knowledge deficit concerning whether the 'fish in the Indian Ocean' topic was too broad for a 5 page paper due in two weeks, five responded, and are identified in Table 1.

Two main problems with the technology went unresolved for all three sessions. The first problem related to the Wi-Fi connection, perhaps because the iPads were not able to use the 'secure' Wi-Fi network and were relegated to the 'guest' network. In each session there were 3 or 4 students who lost connectivity at least once. When this occurred, the student had to back out of the Nearpod app and resolve the connectivity issue before re-logging in and continuing. If an iPad program were to be adopted, the problem would likely be resolved through utilizing the university's 'secure' network. Laptops used within the SCALE-UP classroom are registered through this network and experience few connectivity issues. In addressing this question, Todd Burks of University of Virginia, who originated that school's 'Classroom in a Box' iPad program, verified that connectivity problems were resolved when the required network was specified in the network profile saved to each iPad. UVA uses an unsecured network which is not its guest network for the program.

The second problem was with the Nearpod application internet browser. Perhaps because the application is designed with K-12 students in mind, the internet browser did not at the time it was used, feature a 'back' button. Not only were students accustomed to relying on a back button, in some cases they navigated to screens that did not present clickable icons or other 'breadcrumb' features for return. For example, if a student selected to explore an article, and then wanted to return to her search results, in many circumstances she was unable to do so. This presented a major challenge to some, particularly for students who seemed to be most actively participating in the activities. The only option for students who were completely 'stuck' was to log out of the Nearpod

app, and then log back in. The July 31, 2013 update features the addition of a back button to the internet browser and resolves this issue.

Six of the forty-four total responses to how the session could be improved identified these problems with the technology. One student preferred computers, (there were laptops in the room that were not utilized): "Using computers instead of iPads. Computers feel a little more versatile but using the iPads was still a good idea." Another student implied that the set-up could work well with fine-tuning: "The technology needs some catching up, but it's on the right track." Two students were more vague and referencing "technical difficulties." One student responded that better Wi-Fi was in order, and one more related that the browser needed a back-button. Twenty-four students responded without proscriptions for improvement: that 'nothing' could be improved, that it was 'helpful,' or that they would not change anything. One student was undeterred by the technical issues: "It was fine how it was. I like the use of technology."

The most popular suggestion for improvement, appearing in seven out of forty-four responses, related to needing more 'time;' these comments divided between more time needed to scope topics and more time to search. This response represents a notable departure from the lecture-based LIS feedback since students typically comment about equally that sessions should be both longer and shorter. In the 50-minute sessions with the iPads, there was no mention that the session should have been shorter.

Another notable absence from the improvement feedback were comments about low visibility or bad acoustics of which there are usually at least two in the sessions conducted in the computer lab setting. The students did not reference the SCALE-UP

space in their feedback, although it is important to keep in mind that many are already accustomed to these spaces as they are well-used by other classes. Three students thought that the sessions could be improved with even more ‘interaction.’

When identifying something they learned in the session, out of the forty-four responses, thirty-one students related that learning revolved around the websites explored during the activities, ten students mentioned Summon by name, and eight cited CQ Researcher. Nine students referenced information relayed during the lecture: the availability of virtual chat, interlibrary loan and methods for book retrieval. One student explicitly established that discovery balanced between the lecture and activity portions: *(What is one thing you learned from today's session?)* “That space lasers impact the pacific ocean And that summon works great for researching topics.”

The English instructor offered her own feedback via e-mail and generally felt the sessions went “really well.” She elaborated that “the technology side seemed to work. It's unclear if students were more engaged with the technology or if it was the subject matter, but I definitely didn't feel that the technology, even with the glitches, got in the way of the lesson's goals.”

Figure 1

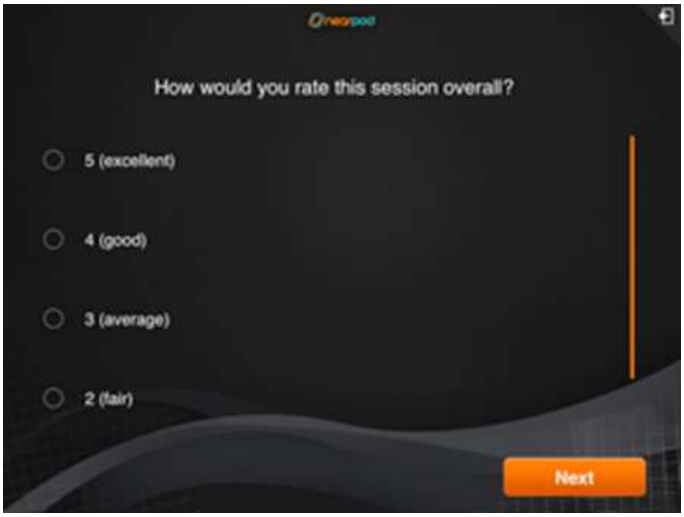

Figure 2

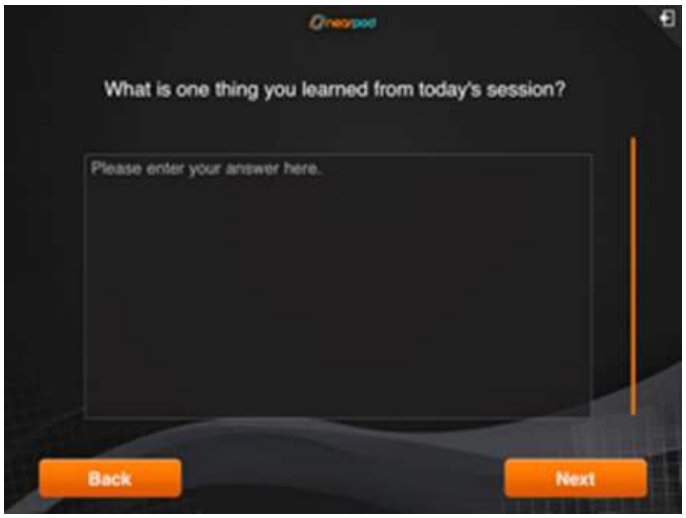

Figure 3

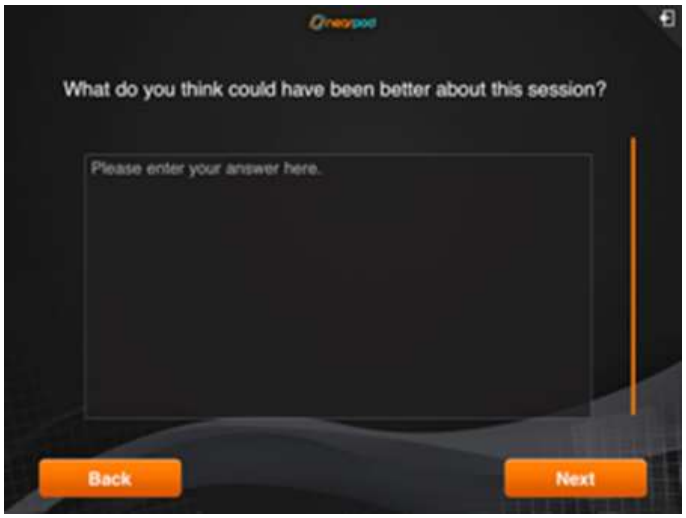

Figure 4

Photo credit: Anne Burke

Figure 5

DISCUSSION

Given that the technical difficulties have high potential for resolution, the iPads utilizing the Nearpod app presented an important advantage in one clear way. By keeping the students focused on the lesson during lecture portions, the application seemed to increase focus and limit distractions. The 'instructor as pilot' approach went hand in hand with a disadvantage; the instructor was in command of all the iPads, and when time came to move on, there was no ability to leave students to work longer on a given activity, customizing it to their own paces.

The iPad/Nearpod combination did seem to foster collaboration. Instantaneous group sharing allowed for content created by the student to pass to the instructor and then on to the class, and thereby provided the opportunity to discuss key advantages and ideas

for topic improvement. In the group settings, each student was able to explore different research articles and pass their iPad over to a neighbor for viewing. The polling functionality, however, was the one feature demonstrated in the sessions which truly extended the instruction capabilities. The other advantages could have been achieved with other technology, but would have likely required more time, which was at a premium in a 50 minute session.

As the course instructor indicated, the addition of the iPads also seemed to promote student engagement. It is possible that this is accounted for by the novelty of the technology. Nonetheless, the possibility that students were more engaged is supported by the lack of improvement feedback citing the session as too long, which is typical in other formats.

Both the Nearpod application and the SCALE-UP space fostered movement between the lecture and activity portions of the lesson, thereby allowing for the lecture to be interspersed with activities. Since students were already seated in their groups they were ready to collaborate when asked to do so, but were less inclined to be distracted during lecture since the teacher was piloting their iPads during those portions.

The SCALE-UP classroom space allowed the instructor to roam freely to help students and generally complemented and reinforced all aspects of the instruction. Students were easily approached from behind where their screens were most easily viewed. In computer lab settings, the instructor often has to traverse in an awkward shimmy between aisles and make space between rows to stand. The advantages of the ‘roaming instructor’ included dialogue with students, helping when the storied technical

difficulties arose, and also maintaining task focus. One student who was texting from her lap was discouraged from continuing when the instructor stood nearby.

The round tables of nine had the advantage of grouping the class into neighborhood-like sets which did seem to foster interaction and collaboration among students who were not otherwise working together. The seating arrangement also afforded easier conversation between neighbors. The only minor disadvantage of the SCALE-UP space that was used were the columns at the center of the tables which hindered the view of the students who sit directly across from one another. However, this classroom was atypical; it was located in the basement of a building that had undergone renovation and the columns seemed to be serving as structural support.

CONCLUSION

Based on the three trial sessions conducted with a class set of iPads in a SCALE-UP classroom, from the perspectives of instruction librarians and undergraduate students, the iPad represents strong potential as a replacement for desktop computers for use in undergraduate library instruction sessions. The SCALE-UP classroom has already made notable contributions in promoting undergraduate learning, and its advantages were found to be extensible to library instruction in this trial. While presenting a few disadvantages that would need to be, and have potential to be corrected, the iPad and Nearpod tools demonstrated support for collaborative learning approaches including: instant polling, the ability to share content, and the ability to navigate the library web page and databases. Additionally, the pedagogical approach which the SCALE-UP space

is designed to reinforce, collaborative learning segments interspersed with lecture components, seemed to promote student engagement in library instruction sessions.

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