

Using Case Studies to Engage Engineering Students in Library Instruction

Elizabeth Connor¹

Abstract – Specific teaching methods were used with Geospatial Representation students scheduled to attend library instruction sessions at The Citadel, the Military College of South Carolina. The class incorporated a snowboarding case study, popular articles, video clips, clicker technology, and engineering databases. The intention was to use subject content that would resonate with younger generations of learners and to focus on tasks that required higher-order thought processes (analysis, synthesis and evaluation). Students were divided into small groups that were introduced to the facts of the case and asked to consult the popular literature. As the case unfolded, students progressed to developing criteria to rank various ski resorts based on geographical and climatological data. After ranking the ski resorts, students were tasked with finding scholarly articles related to using GIS to make business/engineering decisions. Throughout the session, clicker technology gauged understanding of key concepts. The author describes some of the techniques designed to engage student interest and participation in this information-seeking assignment and explain the usefulness of discipline-specific case studies for developing and improving library research skills.

Keywords: audience response systems, case studies, clicker technology, library instruction.

INTRODUCTION

Audience response systems (clickers) and case studies have been used in a variety of academic settings as additional tools for engaging students in active learning. This paper describes the use of clicker technology and a snowboarding case study for two sections of civil engineering students receiving library instruction at The Citadel, the Military College of South Carolina.

Literature review

The journal literature related to college-level teaching and learning is replete with examples of using audience response systems (clickers) to take attendance, ascertain student comprehension of course content, pace class sessions according to comprehension of key concepts [Kolikant, Drane, and Calkins, 12], provide immediate feedback to faculty and learners alike [Connor, 7], allow shy students to participate confidently and anonymously [Stowell, Oldham, and Bennett, 23], foster peer discussion [Chen, Whittinghill, and Kadowec, 4; Lucas, 14], increase class participation [Dallimore, Hertenstein, and Platt, 8], “gauge reactions to questions or situations” [Moss and Crowley, 18], reduce the “distance” between the faculty member and the students [Cole, 6], identify knowledge

¹ Associate Professor of Library Science, Daniel Library, The Citadel, 171 Moultrie Street, Charleston, SC 29409, elizabeth.connor@citadel.edu

gaps [Koenig, 11], and increase academic achievement [Mayer, Stull, DeLeeuw, et al., 15; Gauci, Dantas, Williams, et al., 9]. Trees and Jackson [25] point out that “[p]ractice, feedback, and active involvement constitute three important elements of classroom learning processes.” Lantz [13] suggests that “clickers may...affect student learning without the students realizing their effectiveness.”

Shaffer and Collura [22] evaluated the effectiveness of clickers in introductory psychology classes, and stated that “[s]tudents thought that using the clickers produced more interaction, made the lecture more interesting and entertaining, enhanced the clarity of the examples, and provided a smoother transition to the results.” According to Revell and McCurry [21], clickers allow nursing students to familiarize themselves with typical exam questions. Much has been published about the use of clickers in introductory courses or classes with large enrollments. A group of physics students was surveyed about their opinions of clickers; “9 out of 10 students responded that they would recommend the use of clickers beyond the first year” [Milner-Bolotin, Antimirova, and Petrov, 16]. Other research suggests that the biochemistry class section that incorporated clickers had “significantly more students in the highest achievement category (91-100%)...than in any other section [taught] over five academic terms” [Addison, Wright, and Milner, 2]. Mechanical engineering students were “taught using traditional lecture and case teaching methods” [Yadav, Shaver, and Meckl, 28]. While no measurable differences in content mastery between the two approaches were detected, the relevance of “authentic problem solving” was compelling [Yadav, Shaver, and Meckl, 28]. The use of clickers in Statics courses yielded “indirect evidence that the students...learned at least as much as students learned in a variety of classroom and institutional settings, and using a variety of teaching styles and techniques” [Chen, Whittinghill, and Kadlowec, 4] based on student performance on the Statics concept inventory.

Fewer articles have been published about how clickers and cases can be used to transform library instruction. Pre- and post-tests used to measure “student retention of information presented in [a library instruction] class” showed that immediate assessment allowed the librarian/instructor to keep the students focused on the tasks at hand [Petersohn, 19]. At Gettysburg College, [Wertzberger, 27], librarians used clickers to assess information literacy competencies during library-based bibliographic instruction sessions. Librarians at Johnson & Wales University integrated information literacy instruction into science courses and used clickers to make sessions more interactive [Moniz, Eshleman, Jewell, et al., 17].

Library Instruction for Engineering Students

At The Citadel, undergraduates are expected to think critically and creatively, demonstrate effective communication skills, “apply abstract concepts to concrete situations, and possess the methodological skills needed to gather and analyze information” [The Citadel, 5]. To these ends, The Citadel’s reference/instruction librarians create and teach library instruction sessions that prepare students to identify information needs, develop information-seeking strategies, and locate and access authoritative sources of information, in accordance with information literacy standards developed by academic librarians [ACRL, 1].

The challenge was for the library session to go beyond the demonstration of specific database interfaces and design exercises that would intrigue and engage engineering students enrolled in two sections of Geospatial Representation. The author chose a case study on snowboarding from a collection of case studies developed by the University of Buffalo [26]. Each case is peer reviewed and

features a realistic and compelling scenario that is supplemented by links, bibliographic citations, and extensive teaching notes.

“Snowboarding in New York State: A GIS Case Study,” was developed by geography faculty members at the University of Buffalo, State University of New York [Brunskill and Badurek, 3]. This case was designed to use ESRI ArcView software, but the librarian/instructor at The Citadel adapted it for use by civil engineering students. The University of Buffalo will provide a CD-ROM loaded with ArcView shapefiles related to cities, counties, interstate highways, ski resorts, and maps of New York, Canada, and states surrounding New York, for any faculty member interested in using this case.

In adapting this case for Citadel engineering students, the idea was to progress from the popular literature on snowboarding to developing criteria for assessing and ranking specific ski resorts in New York state to accessing the professional civil engineering literature in one 50-minute session.

METHODS

As each student entered the assigned teaching space, he or she was assigned randomly to a group, given a set of handouts (case study, popular articles on snowboarding, and suggested sites and resources to use in class), a laptop, and a clicker. Students sat at square tables that seated four students each. Depending on the size of the class, there were five or six tables. The instructor explained that the class would focus on a problem related to choosing the best resort site for starting a snowboarding business.

Using eInstruction clickers and PowerPoint [Rabinowitz, Kenmodle, and McKethan, 20], the librarian/instructor displayed an introductory multiple choice question on the screen, in an effort to determine how familiar students were with snowboarding. Interestingly, based on their answers, the majority of students enjoyed the sport as both spectator and participant, despite attending college in South Carolina. This first question also served as an icebreaker activity to familiarize the students with using radiofrequency clickers, and discussing the reasoning behind individual answers.

Students were instructed to take turns reading the case aloud, one paragraph at a time. As the case unfolded, students learned about the characteristics of resorts that have successfully offered snowboarding activities. Groups were tasked with developing criteria for evaluating and ranking the specified resort sites.

After developing and discussing criteria, students worked in groups to explore demographic information for specific towns (epodunk.com), weather forecasts (www.snow-forecast.com/) and existing resort Web sites (Catamount Ski Area, Gore Mountain, Hickory Ski Area, Holiday Valley, HoliMont Ski Resort, Hunter Mountain Snow Ski Resort, Kissing Bridge, and Windham Mountain) to determine the economic and geographic viability of snowboarding in a specific place. Clicker technology was used to vote on the best location. The “winning” site was projected on the screen, and several snowboarding videos from the top three resort sites were played.

The librarian initiated a discussion of scholarly sources, peer review, and how engineers use the literature to develop ideas and refine decisions. The students used their clickers to choose the most scholarly source from a list of six engineering article citations.

Following this activity, students were asked to find one scholarly journal article about the use of GIS technology to make business decisions in civil engineering. Database choices included CentralSearch, CrossRef, Academic Search Premier, IEEEExplore, ScienceDirect and Wiley InterScience. One student from each group used the instructor's workstation to demonstrate their search strategies and show the articles the groups had found.

The final activity was a one-minute card that required students to reflect and write about one thing learned in the class session.

RESULTS

Although the author has used these approaches for library instruction in other disciplines, the results for engineering education remain preliminary. As mentioned, assessment involved asking students to reflect on what they have learned.

Students' reflective comments included the following:

- the library has discipline specific search criteria
- I learned some useful steps for determining a suitable source based on the citation only
- today I learned that you can cross reference materials for your paper in order to find more sources
- I didn't know that the databases would give you the citations; that's very helpful
- GIS can be used in topics such as snowboarding
- I did not know about CrossRef with Google or Academic Search Premier
- I learned how to analyze articles to view which one had the most potential as being scholarly
- how to get a journal online or article; it will be very helpful for history and such
- I learned that the search databases not only search massive amounts of credible sources but also cite sources for you
- I didn't know that GIS can be used for other than surveying/civil engineer projects
- that there are civil engineering-specific searches
- how to quickly search a database and hints to finding the most "scholarly" resources
- I did not know that engineering had its own searchable database online (specific to the subject)
- refining my searches to find exactly what I want; easy and efficient methods of citation; use of more library resources
- a very quick and efficient way to get text involving subject and also how to get it cited
- I learned how to look up stuff for specific topics
- civil engineering databases; folder option for Academic Search Premier (citations)
- the easiness of accessing the databases and how to better use the system in choosing the proper sources
- how to decide how scholarly a subject is

Future plans include using standardized measures to assess learning outcomes and repeating the case studies technique later in the semester with the same course sections.

CONCLUSION

The intention of this class was to use subject content that would resonate with younger generations of learners and to focus on tasks that required higher-order thought processes (analysis, synthesis and evaluation). Students progressed from reading popular articles about the sport, to developing criteria, to collecting and analyzing information about specific resort towns, to consulting the professional literature for more information about the use of GIS technology to justify business decisions.

As with any tools, and regardless of the course content, the importance of advance planning and effective classroom management techniques cannot be overstated. Time is needed to write or adapt a relevant case study, research and craft effective multiple choice questions, and plan the pace of the class. Instructors need time to familiarize themselves with the case study content, and practice interacting with clicker technology software.

Discipline-specific cases are particularly useful for transforming humdrum library instruction sessions into dynamic and memorable activities. Clickers engage learners throughout the allotted time, increase the quality of faculty-student interactions, and help assess whether learners grasp the subject matter, think critically, and apply their knowledge in new and creative ways. For example, if most students choose the incorrect answer related to scholarly sources, more time can be devoted to that aspect of the class content.

A lively mix of real-world examples incorporated into case studies, hands-on activities, and clicker technology can be used to engage and sustain student interest and attention in library instruction sessions, regardless of academic discipline. Cases and clickers can be used judiciously to pace and deliver instruction that will appeal to present and future generations of users [Connor, 7] who are easily distracted during library instruction and adept at playing interactive games [Immerwahr, 10] that require manual dexterity.

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Name of the First Author

Elizabeth Connor is a distinguished member of the Academy of Health Information Professionals (AHIP), and edits book reviews for *Medical Reference Services Quarterly*, *Journal of the Medical Library Association*, and Doody's Reviews. Research interests relate to how scientists develop habits of mind and how case studies can be used to engage and sustain learning. Recent publications include *A Guide to Developing End User Education Programs in Medical Libraries; Planning, Renovating, Expanding, and Constructing Library Facilities in Hospitals, Academic Medical Centers, and Health Organizations; An Introduction to Reference Services in Academic Libraries; Evidence-Based Librarianship: Case Studies and Active Learning Exercises*; and *An Introduction to Instructional Services in Academic Libraries*.