



Interactive Whiteboards in Library Instruction: Facilitating Student Engagement and Active Learning

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Abstract

Determined to keep up with the ever-changing instructional trends, academic libraries have been quick to adopt emerging teaching and learning technologies. Recent literature features many examples of technologies that have found a place in libraries' instructional programs: learning management systems, clickers, online tutorials, reference chats, and mobile devices, to mention the most popular ones. Curiously enough, despite their popularity in business and K-12 contexts, interactive whiteboards (IWBs) are rarely discussed in the context of academic libraries' efforts to embrace innovative teaching methods. This article addresses this omission. Present-day IWBs have evolved to include features that accommodate a variety of teaching strategies, including those appropriate for distance learners, providing a tool to encourage student engagement and participation. This case study shows how IWBs meet the varied needs of library instruction while offering librarians an opportunity to reshape and expand their teaching methods. By providing sample lesson plans and activities developed to incorporate the interactive features of IWBs, this article illustrates the versatility of this underutilized technology. To further encourage academic librarians to consider working with IWBs, we argue that incorporating IWBs, and thus fostering active learning strategies, into classes and workshops has allowed our library to meet new institutional priorities that emphasize effective teaching and student engagement.

Keywords: bibliographic instruction, interactive whiteboards, academic libraries, learning technologies

Learning and Teaching Technologies in Bibliographic Instruction

Eager to keep up with the ever-changing instructional environment, academic libraries have been quick to adopt emerging teaching and learning technologies. The literature from the last fifteen years alone documents libraries' bold initiatives to incorporate new technologies into bibliographic instruction. Learning management systems, clickers, online tutorials, reference chats, and mobile devices have all found a place in libraries' instructional programs, reshaping and improving the ways in which research skills are being taught.

At present, most colleges and universities make use of a learning management system (LMS) that supports synchronous and asynchronous teaching. As distance and online education programs proliferated, libraries promptly recognized the need to identify ways in which to make their services as well as instruction available to off-campus students through Blackboard, the best known LMS (Bell & Shank, 2004; Lawrence, 2006). The embedding of custom-designed asynchronous informational literacy video tutorials into course pages (Henrich & Attebury, 2012) is just one example from the extensive literature exploring the delivery of library instruction through Blackboard. Other initiatives include incorporating research skills modules and assessing student learning through quizzes (Smale & Regalado, 2009; Stone, Bongiorno, Hinegardner, & Williams, 2004) and converting a popular on-campus workshop into an online one by using Blackboard's discussion boards and video screencasts (Rempel & McMillen, 2008).

Audience response systems, known as clickers, are another technology widely embraced by teaching librarians. Used in a classroom setting since the 1960s (Dill, 2008), clickers have not so much transformed the content of instruction as they have changed the way in which librarians conduct their sessions. By encouraging student participation and allowing for instant formative feedback, clickers facilitate active learning in ways not available in more traditional settings (Collins, Tedford, & Womack, 2008). It is generally reported that clickers enhance student engagement (Dill, 2008; Deleo, Eichenholtz, & Sosin, 2009). When it comes to clickers' effect on learning, however, the research remains inconclusive. When Dill (2008) compared clicker-enhanced sessions with traditional ones, she found no difference in students' short-term recall of the covered material. Similarly, Moniz, Eshleman, Jewell, Mooney, and Tran (2010) were not able to show that students whose instructors used clickers throughout the session learned more than students in a non-clicker library workshop. In contrast, Holderied (2011) demonstrated that the use of clickers in library workshops not only increased student engagement but also improved learning outcomes when compared with a control group.

More recently, librarians have been experimenting with mobile learning, such as

tablets and iPads in particular, to enhance library instruction and facilitate student learning in general. The iPad lending program at the Art and Architecture Library at Virginia Tech was used by students in support of their coursework and related research as well as e-book reading (Tomlin, 2012). At the Preus Library of Luther College, Sullivan (2014) redesigned her library workshops with the newly acquired library iPads in mind. At each session she distributes the 25 pre-loaded iPads among students. Under her guidance, students perform hands-on exercises rather than passively listening to a lecture. Insofar as the tablets facilitate peer-to-peer collaboration and experimentation, and increase engagement, Sullivan (2014) finds iPads ideally suited for inquiry-based library instruction. Similarly, Tran, and Meadow (2014) see tablets' "potential to enable flexible pedagogy, dynamic use of space, and increase student engagement" (p. 113).

As the above overview shows, academic librarians continually investigate the teaching effectiveness of available tools and emerging technologies. The goal of instructional technology, after all, is not only to engage students but also to enhance their learning. It is in this context that we would like to bring attention to interactive whiteboards (IWBs) whose features accommodate a variety of teaching strategies, including those appropriate for distance learners, and have the potential to enable student engagement and participation. In other words, IWBs exemplify many of the recent innovations in information and communications technologies (ICT). And yet, IWBs are rarely discussed in the context of academic libraries' efforts to embrace innovative teaching methods, even though they are widely used in business and K-12 contexts. This case study seeks to address this omission. We discuss the implementation of IWBs at the Lloyd Sealy Library, John Jay College of Criminal Justice, demonstrating how IWBs can be used effectively to meet the versatile needs of present-day library instruction. IWBs offer librarians an opportunity to reinvigorate their teaching by developing new instructional strategies that take advantage of IWBs' interactive features. To further encourage academic librarians to consider working with IWBs, we argue that incorporating IWBs, and the active learning strategies their use in the classroom fosters, has allowed our library to meet new institutional priorities that emphasize effective teaching and student engagement.

Interactive Whiteboards: An Overview

IWBs are large touch-sensitive whiteboards, typically affixed to the wall or mounted on a portable stand at the front of a room. They can be used like a traditional blackboard or, with

the addition of a computer and projector, transformed into life-sized monitors. You can write on and operate IWBs with the touch of a pen, stylus, or your finger, toggling back and forth between the whiteboard and projected content. Anything you can access on a computer—documents, slides, images, web pages, applications, videos, and interactive software—can be projected on an IWB and then annotated or manipulated by touch. Depending on the model, IWBs can also be networked with other ICT equipment, such as wireless keyboards, scanners, laptops, tablets, and other mobile devices. If the introduction of traditional blackboards in the 19th century classrooms supported the shift to front of the room whole-class teaching (Greiffenhagen, 2002), IWBs are the modern day equivalent of a blackboard. They provide 21st century educators with a tool to interact with and move seamlessly between all types of content, connect to all types of devices, and create a dynamic classroom experience.

According to one report, Smart Technologies Inc. introduced the world's first IWB in 1991 and makes the world's best-selling interactive whiteboard (NEA's Member Benefits, 2016). Xerox has also sometimes been credited with creating the first IWB, which they called the Liveboard (Brigham, 2013). However, it appears the Liveboard may have been in development (Elrod et al., 1992) and not officially introduced to the market until 1993 (Brown, 1993). Setting aside claims of who was first, today there are many suppliers of IWBs. According to a 2014 market report, at least 14 companies sell IWBs, and sales of IWBs are projected to increase at a compounded annual growth rate of 15.95% through 2018, with most of this growth occurring in educational markets (Research and Markets, 2014).

When first developed, IWBs were solutions for businesses that wanted the ability to print, save, and share information used at meetings (Greiffenhagen, 2002). Content projected on the IWBs could be seen instantly by participants in remote locations, creating a common work surface that could be collaboratively changed and saved and/or shared for future use (Brown, 1993). Evidence of early use of IWBs in education is scant, with documented use limited to STEM teaching at the university level (Greiffenhagen, 2002) and clinical training (Murphy et al., 1995; Stephens, Cook, & Mullings, 2002). A reported sale of an IWB by Smart Technologies to the University of Nevada also provides evidence of some early use of IWBs in distance education (Moss et al., 2007).

In the 2000s a shift took place. IWBs were increasingly being introduced in educational settings around the world, particularly in K-12 classrooms (Greiffenhagen, 2002). Motivated by the belief that, for nations to stay competitive, they needed to embrace technologies that developed ICT literacy skills—namely the ability to access and navigate a plethora of information and communicate using technology—governments funded large scale purchases of

IWBs for use in schools (Thomas & Schmid, 2010).

IWBs in Educational Settings

K-12

Much has been written about the use of IWBs in K-12 settings, particularly in the UK, where the largest investments in this technology have been made. There are several literature reviews (DiGregorio & Sobel-Lojeski, 2010; Higgins, Beauchamp, & Miller, 2007; Glover, Miller, Averis, & Door, 2005; Smith, Higgins, Wall, & Miller, 2005) and an excellent comprehensive resource collecting a number of studies on the use of IWBs in K-12 settings (Thomas & Schmid, 2010). Common themes include the effects of IWBs on student motivation, learning, achievement, pedagogy, teacher training, and resources. The research consistently reports that students and teachers—especially the early adopters of this technology—readily embrace IWBs. When IWBs are used, student motivation and engagement increase. However, few studies show a corresponding positive effect on student achievement. Studies examining teachers' use of the IWBs repeatedly stress the importance of training and professional development, both to develop the technical skills needed to use this tool effectively and to support its effective integration into sound teaching practices.

Demonstrating the principle that integrating any new ICT into an educational system is a process, Thomas and Schmid (2010) divide the research in K-12 settings into three major phases. The earliest phase was characterized by small-scale case studies—typically documenting the experience in a single classroom. This first phase was conducted by enthusiastic adopters of this new technology and focused on primary schools. As mentioned above, these studies reported that both teachers and students liked IWBs as they increased student motivation and engagement.

The second phase focused on how IWBs were actually being used in classrooms and how they supported established pedagogies. Large scale studies conducted across entire school districts or municipalities showed that IWBs were being used to engage multimodal resources that included use of the whiteboard, text, graphic, video, and audio content; improve the pace and use of classroom time; and enhance opportunities for interactions among the whole class. The study of the whiteboard expansion project in London by Moss et al. (2007) found that IWBs were being used to move between and sometimes manipulate text, images, video, and sound, either using local resources or those available through the Internet. There was also

evidence that some teachers were varying the pace of delivery of content by moving quickly or slowly through various modalities and using a varied pace to create opportunities for more student interaction by employing the IWB writing and drawing tools to annotate content or create new content for the whole class. However, during this phase the differences in teacher skills and the need for readily available resources by subject became apparent. In addition, although there are some studies showing that teaching with IWBs can lead to gains in student achievement, most studies show a modest impact (DiGregorio & Sobel-Lojeski, 2010).

The focus of the third phase of research was on developing programs and policies to optimize the integration of IWBs into the curriculum (Thomas & Schmid, 2010). The major finding was that simply providing new technology is not enough. Both technological and pedagogical professional development programs have to be established and ongoing in order to support wide-scale and effective integration of this technology into the curriculum.

Higher Education

Despite some early documented use of IWBs in the STEM fields, clinical training, and distance education, the research about the use of IWBs in higher education is not extensive. The existing literature relates to the training of future K-12 teachers (Smith, 2002; Campbell & Kent, 2010; Mott, Sumrall, Rutherford, Sumrall, & Vails, 2010); the positive perceptions of IWBs by students (Lai, 2014); the lack of success in a science lab on electricity in demonstrating significant differences in student achievement (Akbaş & Pektaş, 2011); the benefits of using IWBs to teach in specific subject areas, namely, retail mathematics (Greene & Kirpalani, 2013)), as well as a proposal to use networked IWBs to improve the delivery of course content across multiple university campus sites (Dawson, 2010).

Consistent with studies in the K-12 settings, the research in higher education settings supports the positive impact IWBs have on affective learning goals by encouraging students to participate more or by creating an enthusiastic atmosphere for learning. Greene and Kirpalani (2013) found a significant improvement in students' class performance using IWBs. However, the link between use of IWBs and improvements in student achievement has yet to be widely established.

Libraries

The research on the use of IWBs in libraries is similarly scant. The literature confirms that many academic libraries have installed IWBs in library classrooms (Brigham, 2014) or are installing them in collaborative library workspaces (Appleton, Stevenson, & Boden, 2011;

Hussong-Christian & Stoddart, 2014; Raths, 2013; Wang, 2008; see also Ochoa, Walker, Barrett, & Hines, 2012, who propose that librarians are best suited for teaching education students how to use this interactive technology).

Research addressing the actual use of IWBs in library instruction involves small case studies focused on teacher and student perceptions of this technology. Brigham (2013), a medical reference librarian, makes the case for the usefulness of IWBs in academic libraries. Schroeder (2007), an academic librarian, discusses how IWBs helped meet the affective learning goals in teaching freshmen by holding their attention and motivating them to learn about research. Knight (2003), another academic librarian, reports on the transformative impact of teaching research skills with an IWB that enabled her to move seamlessly through digital content, including library databases, and use the writing tools to effortlessly annotate that content while walking around and maintaining interaction with the whole class. As was the case in earlier research involving the use of IWBs in K-12 settings, these small case studies share the characteristics of the first phase of research; that is, they discussed the instructors' experience using the technology and what they heard or observed from students. The observations were idiosyncratic, not structured, and did not include efforts to measure the impact IWBs had on student learning or on how they increased student engagement.

Student Engagement and Learning

Why have academic libraries been interested in learning technologies, including IWBs? And why have librarians been concerned about student engagement and learning? One explanation lies in the academic library's historic position vis-à-vis its larger institution and trends in higher education. The academic library's mission is often articulated in response to its larger institution's strategic plans and educational goals, along with prevailing trends in higher education (Appleton, Stevenson, & Boden, 2011). Over the last 30 years, institutional mandates have shifted in response to calls for reform in undergraduate education—reforms that prioritize student learning (“How are we doing,” 2003). During this time institutional and professional accreditation bodies were “shifting their attention from input measures (faculty, courses, books) to outcomes measures (what students learn)” (Smith, 2001, p.30). In other words, there was a move away from teacher-centric models of learning to a model that focuses on student experiences and learning outcomes; this includes the knowledge and skills students acquire (Smith, 2001). This shift also changed assessment practices and concerns. Institutions were

increasingly required to create and implement student outcomes assessment programs (Smith, 2001).

It was in this context that the National Survey of Student Engagement (NSSE) was introduced in 1998 to give colleges a tool to evaluate their performance and make necessary changes (Kezar, 2006). Conducted annually, NSSE targets more than 100,000 randomly selected first-year and senior students at four-year colleges (Schroeder, 2003). It assesses two components of student engagement: time and effort spent on “educationally purposeful activities” and the extent to which institutions involve students in “activities that lead to student success” (Schroeder, 2003, p. 10). Walker and Pearce (2014) explain that colleges are now focusing on student engagement because it involves institutional factors that they can directly influence, including academic support services and enrichment programs.

The literature reflects libraries’ concern about their role in this new assessment landscape—a landscape focused on student engagement, success, and learning outcomes. This emphasis on learning outcomes has led to a change in the mission of libraries from a “content view (books, subject knowledge) to a competency view (what students will be able to do),” what they have accomplished, and how the library and its resources contribute to learning (Smith, 2001, p. 32). Based on results from NSSE and the national Documenting Effective Educational Practices (DEEP) study, Kezar (2006) found that libraries make a critical contribution to student success and engagement by

- increasing academic challenge through library instruction and teaching information literacy skills;
- enhancing active and collaborative learning using current technologies and offering workshops, as one example; and
- building a supportive campus environment by providing spaces with research and technical support services.

Libraries further support engagement efforts by building faculty-librarian partnerships, promoting course redesign, and offering neutral interpretations of NSSE data—neutral in the sense that libraries are not tied to a specific discipline or to the administration (Kezar, 2006). Libraries, then, have a critical role to play in fostering student engagement.

Although academic libraries are tasked with responding to larger institutional mandates and missions, they are also driving institutional change through initiatives that introduce new learning technologies and spaces. Appleton, Stevenson, and Boden’s (2011) study of new learning spaces at four university libraries in the UK reveals how academic libraries are leading

institutional change by redesigning their spaces and implementing new learning technologies. They found that these spaces are informal and encourage collaborative learning. Similarly, the University of Iowa's Main Library led institutional efforts to improve student learning, student success, and undergraduate retention by being the first on campus to redesign their classroom into an active learning space (Soderdahl, 2011). This active learning space included mobile furniture and laptops to encourage collaboration and movement in the classroom (Soderdahl, 2011; see also Lippincott, 2006). By introducing modular furniture and learning commons-type spaces, libraries are making spatial and technological changes in their classrooms to engage students and enhance information literacy instruction.

Over the last several years, John Jay College has situated itself and its institutional priorities within these wider trends in higher education where outcome-based assessment and student engagement are central. For example, the College established a campus-wide assessment committee in 2011 that coordinates assessment efforts for both student learning and institutional effectiveness (John Jay College of Criminal Justice. Campus-Wide Assessment Committee, n.d.). In 2013 the College introduced a faculty-student engagement fund to support activities outside of the classroom, such as faculty and student lunches (John Jay College of Criminal Justice. Faculty-Student Engagement Program, n.d.). The fund was introduced to support student success and retention. The Lloyd Sealy Library has received these funds for lunches and new student orientation activities. Evidence of the College's efforts to increase student engagement is also contained in the institution's assessment reports (John Jay College of Criminal Justice. Office of Institutional Research, 2013). Aligning itself with this larger institutional focus on student engagement, the Library decided to revamp its library classroom and instruction practices by acquiring interactive whiteboards. As of today, the Library is the only space on campus with IWBs.

IWBs at the Lloyd Sealy Library

Institutional Context

John Jay College of Criminal Justice, a senior college in the City University of New York (CUNY) system, was established in 1964. Offering a wide range of undergraduate and graduate degrees as well as professional certifications, the college is known for its justice-oriented curriculum that combines liberal arts and sciences. In the fall of 2014, student enrollment exceeded 15,000, with 62% of undergraduate and 46% of graduate students coming from

underrepresented minorities groups, mainly Hispanic and African American (John Jay College of Criminal Justice, 2014). About 42% of undergraduates are the first in their families to attend college, and about 72% of them come from families whose annual income is less than \$50,000 (John Jay College of Criminal Justice, 2013). Not surprisingly, given the college's reputation in the field, criminal justice is the most popular undergraduate major (49%) and also the most popular master's program (34%) (John Jay College of Criminal Justice, 2014).

The Lloyd Sealy Library Instruction Program

The unique profile of John Jay students, including their educational and socioeconomic background, frames the Lloyd Sealy Library's efforts to promote and teach information literacy at the college. We are committed to reach as many students as possible, but, like many academic libraries, we have to work within staff and resource limits. Consequently, the Library is strategic and selective about the forms of instruction it provides. We want to introduce students to the principles of research and the resources at their disposal at the very outset of their college careers and then expand their information literacy skills in major-specific research methods courses. Accordingly, we have been concentrating our outreach on ENG 101: Basic composition, a required freshman course that models the process of academic inquiry and introduces conventions of college-level research. We also work with 300-level courses organized around a larger project that requires students to follow discipline-specific research protocols and use specialized resources. (Besides these full-period sessions, we offer shorter workshops for other courses that include a research component.) The ENG 101 and 300-level library sessions are customized for each class as we aim for course-integrated library instruction so that students can learn the key concepts of information literacy, acquire a better understanding of the research process, and apply new skills, all in the context of their course as they work on their assignments.

IWBs training and policies

Our decision to purchase IWBs (two screens placed in the front of the room and one on each side wall) was largely influenced by the fact that using their interactivity is optional. The librarians participating in our instruction program vary in their enthusiasm about and comfort with new technologies. Moreover, the teaching load is not uniform with some librarians teaching on rare occasions only and others conducting workshops on a regular basis. The varied teaching load undoubtedly influences the comfort level with and willingness to experiment with the new teaching methods called for by IWBs. Moreover, librarians are not the only ones

making use of our classroom. The room is also made available to regular faculty who choose to conduct research sessions by themselves. Without the option of not using the IWB's interactive features, we would have to train each faculty member even if they needed the classroom once, which would pose a logistical challenge. To accommodate the variety of IWB users, we developed a training program that accounts for their different needs and factors in our time constraints.

The coordinator of instruction and the systems manager were charged with exploring and mastering the IWB's setup and interactive features. Having chosen three main functions and modes that would be most useful for teaching (the mouse pointer, the highlighter, and the whiteboard modes), they invited teaching librarians for hands-on training. Training sessions were held multiple times so that everyone, including our adjunct librarians, could learn and practice working with IWBs. After the training each librarian was encouraged to get comfortable with the IWBs on their own depending on their schedule and availability. The coordinator of instruction and the systems manager were available for consultation at all times.

The training needed to be extended to librarians who do not normally teach since they set up the classroom and IWBs for regular classroom faculty who conduct sessions in the library without librarians. While this group's training emphasized turning on and off the system, we also invited each non-teaching librarian to become familiar with the interactive features.

The last group we targeted for training was faculty members who regularly make use of the library classroom and may therefore be interested in learning how to use the IWBs for more than the traditional on-screen projection only. When making a booking, a faculty member is offered training. If willing, the instruction coordinator or systems manager meets with them for an individual session. The names of trained faculty are put on a list so that they can check out the stylus otherwise unavailable.

The initial training described above will be supplemented by future workshops that will add new interactive features. We also plan to have sessions during which librarians share the new teaching methods they developed as a result of working with IWBs. Appendix 1 features a sample of workshop activities we designed in order to take advantage of the IWB's features.

Assessing the Impact of IWBs

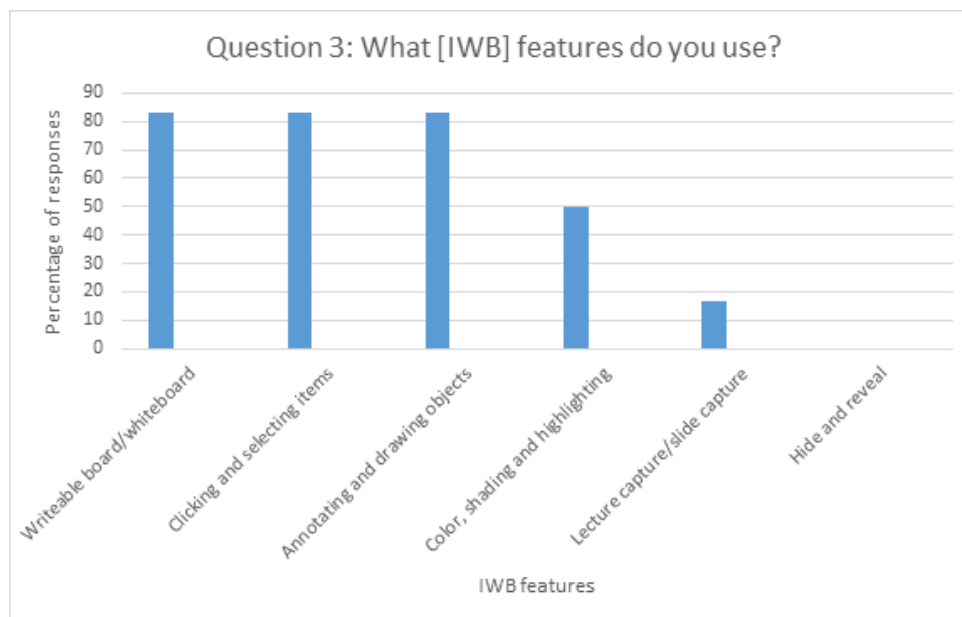
After two semesters of teaching with IWBs, we decided to poll our colleagues about their experience with the new technology. We hoped that two terms provided sufficient time to

become comfortable using the IWBs and to feel emboldened to experiment with teaching styles and lesson plans. Curious as we were about the most utilized features and teaching innovations, it was also crucial for us to identify any need for repeated or additional training.

Lloyd Sealy Librarians

An anonymous six-item questionnaire (see Appendix 2) was distributed electronically to teaching librarians during the 2015 spring semester. The questionnaire was designed to determine which IWB's features were being used, record the number of librarians who have received formal training, collect initial feedback and samples of teaching activities, as well as to gauge the level of interest in different training methods in the future. Out of twelve teaching librarians on staff, nine responded (75% response rate). More than half of the respondents (55.6%) said they are comfortable using the IWBs, while approximately a quarter (22.2%) are only somewhat, and a quarter (22.2%) are not comfortable at all. Six respondents indicated which IWB features they use (Chart 1), with most (83.3%) indicating they use the writeable board as well as the click, select, annotate, and draw features. All of the respondents would prefer to attend additional training in-person, while 25% would also be interested in online training.

Chart 1: Interactive features used by John Jay teaching librarians.



In addition, respondents were asked to describe any special IWB activities they use to engage students and comment on their overall experience with the IWBs. We received a

wide range of responses. One respondent uses the multiple IWB screens to simultaneously demonstrate and compare features in different databases. Another commented that touching the IWB screen to open and close links and tabs is easier for students to follow than trying to track a mouse's movements. One respondent suggested that teaching librarians create a shared file of lessons and activities. Another noted the need to practice using the boards ahead of time and to rethink teaching tactics. One noted some of the drawbacks of the IWBs, such as the delayed response time of the interactive stylus and advanced tools that are too complex for occasional users to master.

The feedback revealed that, given the varied comfort levels with IWBs, more hands-on training is in order, if only to master the technical aspects of the technology. Furthermore, it became clear that we should also invite librarians who found new ways to teach with IWBs to demonstrate their techniques to the rest of us. Seeing how others work with IWBs, as one respondent suggested, may be an effective way to encourage innovations among all the teaching librarians. As a result of issues raised by these questionnaires, a shared file of IWB lesson plans for library instruction will be created, featuring, among others, classroom activities included in Appendix 1.

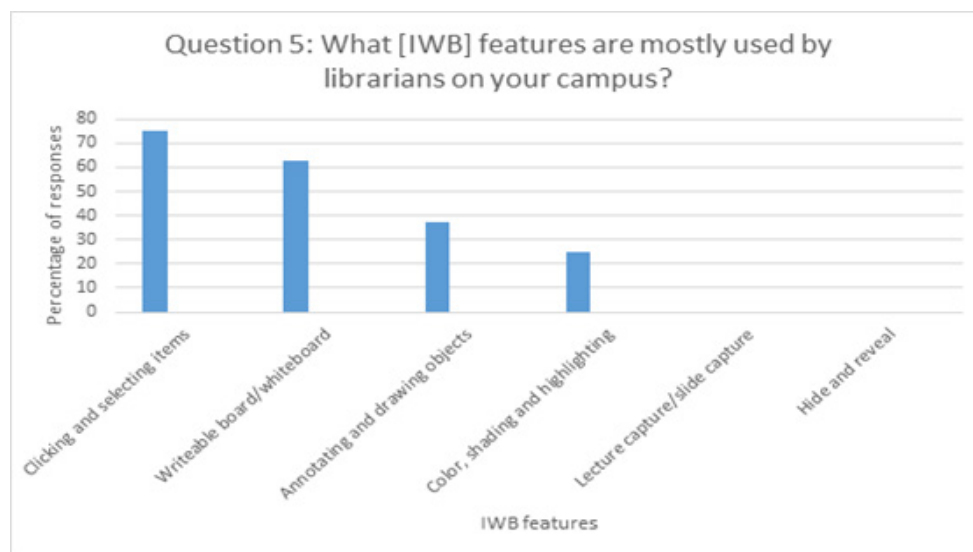
In addition, efforts will be made to offer face-to-face training on a regular basis — some on basic instruction and some introducing advanced features, such as hide and reveal and drag and drop. With only two semesters of teaching experience using the new IWBs, our instructional strategies have been changing gradually as we become more comfortable and familiar with its features and potential pedagogical applications. Currently, functions, such as clicking and selecting items using the IWB stylus, and tools, such as drawing, annotating, and highlighting, are being used to enhance our sessions and maintain student interest. Some of the sample learning activities in Appendix 1 require students to use the IWBs to present their findings to the class. To date, students have been fascinated by the IWBs and are curious to use them. Gradually, we will be devising similar engaging learning activities.

Coordinators of Library Instruction across CUNY

Since John Jay College and the Lloyd Sealy Library are a part of the CUNY system, we also wanted to get a sense of IWB's use by other libraries in the system. Accordingly, an eight-point questionnaire was sent electronically to library instruction and information literacy coordinators across the CUNY system. Eleven out of twenty-four coordinators responded (46% response rate). Of the institution types represented by the pool of respondents, four were from community colleges, six were from senior colleges, and one from a graduate-level institution.

More than half of the respondents (54.5%) confirmed that their libraries have IWBs. Slightly less than half of the respondents have received training in using IWBs (45.5%). Among the respondents who received training all had in-person training, one had online training, and one was self-taught. Chart 2 summarizes the IWB features used by CUNY librarians at large. A large percentage of librarians use the click and selection features (75%) along with the writeable board (62.5%). Respondents did not share any lesson plans or special IWB activities. In the future, 100% of respondents said they would attend in-person training while 20% said they would also prefer online training.

Chart 2: Interactive features used by instruction and information literacy coordinators across the CUNY system.



The data gathered in the questionnaire are consistent with findings in the literature: IWBs are more widely used at lower grade levels. Indeed, our CUNY data show that more community than senior colleges are using IWBs and that the graduate school is not using them at all. The lack of ongoing training was consistently identified as a shortcoming, and our data reveal that after receiving initial training those skills must be consistently reinforced with practice and with more training, especially for librarians who may have lots of breaks between teaching sessions. Furthermore, using the IWB as a life-sized touchscreen—using your finger or a stylus—is easiest and was identified as the way a majority of our respondents interacted with them. Using more advanced features, such as hide and reveal, takes more training and practice. Surprisingly, many of our respondents were able to make use of the writeable board in

conjunction with the projected computer screen. Manipulating back and forth between these two screens takes a fair amount of skill and should bode well for learning other, more advanced features.

Assessment of IWBs: Next Steps

After a few more semesters of teaching with the IWBs, we plan to follow up with another questionnaire related to librarians' use of the boards. Importantly, we also plan to assess student learning. According to Houlihan and Click (2012), assessment involves measuring the skills or knowledge that students acquire following an instruction session. Surveys are a popular assessment tool distributed at the end of class, but Choinski and Emanuel (2006) remind us that they often capture user satisfaction and not learning outcomes.

The library literature is limited in terms of assessment methods for one-shot sessions and even more limited when it comes to assessing teaching technologies such as IWBs. Knight (2003) summarizes the positive student reactions to IWBs in an academic library but does not address any outcomes-based assessment. Other authors have written about the benefits of using pre- and post-tests to assess library instruction sessions (Bryan & Karshmer, 2013; Houlihan & Click, 2012). Bryan and Karshmer (2013) write that, while pre- and post-tests contain the same questions, the pre-test is issued at the beginning of a class to establish a baseline of knowledge. The results of the pre-test are then compared with results from the post-test, the post-test being issued at the end of class. We may consider issuing pre- and post-tests to a randomized sample of first-year classes. To establish a control group, a randomized sample of first-year classes would be selected to receive instruction using only projected images and a chalk board. We would then compare the results of the pre- and post-tests for both types of classes.

Summary

The Lloyd Sealy Library experience shows that IWBs are a useful—if underutilized—classroom technology that other academic libraries should consider adopting. IWBs meet the versatile needs of library instruction. By taking advantage of IWB's varied features, librarians can readily reshape and improve the ways and formats in which they teach research skills. Adding IWBs and incorporating active learning strategies into library classes and workshops foster student engagement, a key component of effective teaching.

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Appendix 1: Learning activities incorporating IWBs

A: Generating keywords and keyword search techniques (Total time: 10-15 minutes)

Expected Learning Outcomes

Students will be able to

- brainstorm and identify keywords related to their research topic or research question;
- generate related terms and synonyms for their keywords;
- apply Boolean operators and truncation symbols in their keyword search.

Explain the learning outcomes and why we are covering keyword searching

- Explain that library databases use keyword search principles. Typing a sentence or question into a library database is not an effective way to search.
- Mention that Google uses similar keyword search strategies.

Demonstrate and explain

1. On the interactive whiteboard display two sample research topics from the class (ask the instructor for sample topics beforehand).
2. Demonstrate how you would identify keywords from the first research topic, highlighting or circling keywords on the board, e.g. , What is the trafficking route of poached rhinoceros horns? ---> trafficking, poached, rhinoceros.
3. Ask students to identify keywords for the second sample topic on the board.
4. Explain that this is an initial step and that students will likely modify their keywords as they conduct research.
5. As a class generate synonyms and related terms for the keywords on the board.
6. Explain AND, OR, NOT and the truncation symbol drawing Venn or other diagrams. You can also use the kinesthetic “Boolean Simon Says” activity from *The Library Instruction Cookbook* (Odlevak, 2009).

Practice: Pair-work

- Prepare a very brief pair-exercise worksheet with two or three questions that ask students to apply what they have learned about keyword searching. Here are two sample questions:
 - If you were looking for results that included poachers and poaching activities, what would you type in your search to include these possibilities? (Answer: use the truncation symbol).
 - If you were looking for articles about laws pertaining to poaching in South

Africa or Kenya, what keywords and operator(s) would you use in your search?
(Sample answer: (law* or legislation) and poach* and (South Africa or Kenya)).

Present answers

- Display the assignment questions on the whiteboard.
- Call upon a group or ask volunteers to write their responses on the board.

Recap

- Reiterate the learning outcomes
- Transition to the next portion of your session. For example, we then demonstrate database searching and explain how we are going to apply our knowledge of keywords to a database search. If you have more than one whiteboard you can display previous slides from the keyword demonstration to remind them how to generate keywords and demonstrate keyword searching on another whiteboard.

B. Visible versus Invisible Web (Total time: approximately 15 minutes)

Expected Learning Outcomes

Students will be able to

- distinguish between the “visible” and “invisible” web;
- identify scholarly sources;
- focus, narrow, and broaden a research topic with an index or facets;
- share and cite results in a library database.

Explain the learning outcomes and why we are exploring the differences between the visible and invisible web

- Go over the expected learning outcomes, mentioning what they should know by the end of the exercise.
- Acknowledge that learners may be familiar with search tools, such as Google, but that general search engines only search the visible web or web sites that are freely available to anyone with an Internet connection.
- Explain that library databases are typically part of the invisible web or sites that general search engines cannot access.

Demonstrate and explain

1. Select a broad research topic -- e.g., “death penalty”
2. Conduct a Google search of “death penalty” and highlight
 - a. number of results;

- b. ability to filter results by types of materials, e.g., scholarly sources;
 - c. tools for focusing, narrowing, or broadening results;
 - d. tools for sharing and citing results.
3. If you have two IWBs, activate the other screen. Leave the Google search on display and use the second screen to conduct a search on “death penalty” in a library database and highlight
- a. number of results;
 - b. ability to filter results by types of materials, e.g., scholarly sources;
 - c. tools for focusing, narrowing, or broadening results (namely database index); write down any relevant index terms;
 - d. tools for sharing and citing results.
- (NOTE: if you don't have two IWB screens, then save the search results from the Google search and conduct your library database search in a new tab so you can toggle back and forth to show the differences.)
4. Ask students to compare and comment on results on both screens.

Practice: Hands-on Exercise

Ask students to perform the following exercises if they have individual computer access. Ask for volunteers to demonstrate same steps on the IWB (one volunteer per step)

Exercise 1: Explore a library database

- a. Go to the library homepage.
- b. Find and open up interface for [name library database].
- c. Conduct a keyword search of a broad topic such as “human rights.”
- d. Go to subject index and insert this same broad topic to look for ways to focus, narrow, or broaden topic. Modify your search using this subject index tool.
- e. Limit results to peer reviewed articles written after 2000.
- f. Select one of the results and email it to yourself in APA citation format.

Exercise 2: Use Google to find peer-reviewed articles written after 2000 using the same search terms used in the library database search (one volunteer per step).

- a. Go to Google.com.
- b. Search “human rights.”
- c. Look for ways to focus, narrow, or broaden this topic. If nothing is found just type in additional keyword used in library database search.
- d. Try to limit results to peer-reviewed articles written after 2000.

- e. Try to email one of these peer-reviewed articles to yourself in APA citation format.

Recap

- Reiterate the learning outcomes.
- Using the invisible web—library databases accessed on the library website—can make researching faster, cheaper, and more effective.
- Transition to the next portion of your session.

C. Using scholarly encyclopedias to explore, narrow, and find further readings on a topic

(Total time: 15-20 minutes)

Expected Learning Outcomes

Students will be able to

- effectively use online scholarly encyclopedias as excellent starting point for researching a topic;
- in an encyclopedia entry, identify key and minor themes, figures, and terms related to their topic;
- locate a bibliography/further readings section and choose sources to investigate.

Explain the role scholarly encyclopedias play at the start of a research project

Refer to students' familiarity with Wikipedia. Ask them about its usefulness and limitations in daily life versus in the context of college-level research.

- Explain differences between Wikipedia and subscription-based scholarly encyclopedias.
- On the library website, demonstrate locating and accessing the Gale Virtual Reference Library (GVRL).

Working with an encyclopedia entry

1. Search GVRL for a topic relevant to the course's theme.
2. Open an entry and, using the interactive whiteboard display, perform a close reading. As you read, use the highlighter to mark key themes, figures, and terms. Circle subheadings (if any) to indicate possible subtopics to explore further.
3. Set up the other IWB as a whiteboard. Write down the words and phrases highlighted in the encyclopedia entry. Explain how they may be used as keywords in the next stage of the research process.
4. Identify the entry's bibliography or further readings section. Explain the function of this section.

5. On the interactive board, highlight one or two sources. Ask students to determine if they are books, book chapters, or articles.
6. Move to the whiteboard and open a new blank page. Model an effective way of keeping notes while researching: copy the chosen references so that you can search the library collections later.

Practice: Pair-work

1. Hand out a worksheet to each pair. Each worksheet describes a topic related to the class's theme. Students are asked to

- search GVRL for entries pertinent to the topic;
- choose one encyclopedia entry;
- conduct a close reading in order to identify key themes, figures, and terms to be used as keywords in their subsequent searches;
- locate the bibliography section and select one or two sources to explore.

2. Student presentations

Call upon a group or ask volunteers to demonstrate on the whiteboard how they use an encyclopedia entry to identify keywords and one to two potential references on their topic.

Recap

- Ask the presenting group to sum up the usefulness of working with a scholarly encyclopedia.
- Transition to the next portion of the session—searching collections for references found in encyclopedia entry's bibliography.

Appendix 2: IWBs Questionnaires

A. Questionnaire sent to John Jay Teaching Librarians

1. Have you received any training on how to use the interactive whiteboards?
Yes
No
2. Do you feel comfortable using interactive whiteboard features?
Yes
No
Somewhat
3. What features do you use?
Clicking and selecting items
Annotating and drawing objects
Hide and reveal
Color, shading, and highlighting
Lecture capture/slide capture
Other (please specify)
4. Describe any interactive whiteboard enabled activities you use to engage students.
5. In the future would you attend training on how to use the interactive whiteboards?
Online
In-person
6. Please provide further comments about your opinion of and experience with the interactive whiteboards.

B. Questionnaire sent to Instruction Coordinators across CUNY

1. Please indicate your institution type:
Community College
Senior College
Graduate level institution
2. Does your library have interactive whiteboards (or sometimes referred to as SMART Boards) for library instruction?
Yes
No
3. Have librarians on your campus received any training on how to use the interactive whiteboards?

Yes

No

4. If you answered yes to question #3, how did they receive training?

In-person

Online

Self-instruction

Other

5. What features are mostly used by librarians on your campus?

Writeable board/whiteboard

Clicking and selecting items

Annotating and drawing objects

Hide and reveal

Color, shading, and highlighting

Lecture capture/slide capture

Other (please specify)

6. Describe any interactive whiteboard-enabled activities that librarians on your campus use to engage students.

7. In future would you attend training on how to use the interactive whiteboards?

In-person

Online

8. Please provide further comments about your opinion of and experience with the interactive whiteboards.