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Purpose

This paper describes and analyzes how one-shot library instruction sessions for large lecture classes can effectively be "flipped" and can incorporate active learning activities as part of both the online and the face-to-face classroom.

Design/methodology/approach

This case study discusses the challenges of employing flipped classroom methods with large enrollment courses and investigates the use of technology to facilitate the active learning components. Situated in flipped classroom pedagogy literature for both information literacy instruction and large lecture classes, the paper synthesizes practical information through the analysis of design and implementation.

Findings

Lecture classes present unique challenges for utilizing flipped classroom methods but the obstacles can be overcome with a bit of preparation and faculty buy-in, balanced with the proper utilization of technology.

Originality/vale

The paper offers other librarians practical design and implementation information for using flipped classroom methods, specifically for classes with large enrollments, filling a gap in the library literature that presently lacks examples of flipped classroom pedagogy being utilized for information literacy instruction with lecture classes.

A Massively Flipped Class - Designing and implementing active learning information literacy instruction for a large enrollment course.

Introduction

Flipped classroom pedagogy holds great potential for overcoming the limitations of one-shot library instruction sessions and offers students the ability to take ownership of their learning and more fully incorporate new skills and information into their knowledge base. Flipped classroom methods rely on students engaging with instructional content before coming into the classroom, where they then have the opportunity to interact with the material in a hands-on fashion; in this context instructors participate as guides through the exploration process rather than as lecturers (Rivera, 2015). Methods which originated in the secondary school environment are being adapted for higher education as a way to extend the curriculum, personalize learning, and bring hands-on activities into the classroom (Bergmann and Sams, 2012; Bishop and Verleger, 2013; Rivera, 2015). However, secondary school has advantages over higher education when implementing flipped teaching methods. Teachers work with relatively fewer students in smaller classes allowing for more familiarity with each student. Yet, both librarians and higher education professors recognize that active learning techniques enabled by flipped classroom pedagogy have the potential to improve student learning outcomes. When learners are able to construct new knowledge through active engagement with the material by questioning, exploring and experimenting, deeper learning can occur (Allen, 1995).

While other publications report on students' and librarians' perceptions of flipped classroom pedagogy use in the classroom, this case study presents practical design and implementation information for using flipped classroom methods for one-shot information literacy (IL) instruction in a large lecture classroom. Presenting one librarian's experience with flipped classroom techniques, this article describes, synthesizes and analyzes how one-shot IL sessions for large

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lecture classes can effectively be "flipped" and can incorporate active learning activities in both the online and the face-to-face classroom.

Background

Oakland University (OU) Libraries' core values state that: "…we embrace change, staying abreast of new developments in scholarly practice and technology in order to provide services, resources, and learning environments that are timely and relevant for our users" (http://library.oakland.edu/about/mission_values.html). To this end, the librarians have incorporated active learning methods into the robust information literacy instruction program. In 2014-2015, librarians conducted 283 face-to-face instruction sessions which included 112 sections of Writing (WRT) 160, OU's first-year writing course. Subject-related instruction is provided by the twelve liaison librarians that are integrated and embedded throughout the curriculum of their assigned disciplines.

In 2013, three Health Science (HS) professors teaching multiple sections of the same core course, HS 201 - *Health in Personal and Occupational Environments*, approached the HS Librarian about providing information literacy instruction for all sections. Each typically has an enrollment of a hundred or more students, totaling more than 400 students each semester. To understand the HS professors' expectations, the HS Librarian conducted a phone consultation with them to discuss course requirements and student learning outcomes.

Initially, the HS Librarian first conducted library instruction with HS 201 in winter 2014; these sessions were taught in the traditional lecture/demo manner. While the hour-long session in a large lecture hall included a few classroom response system (clicker) questions used at the request of the HS subject faculty as a means to take attendance, there was minimal student interaction. Student feedback after the course varied from complaints about content being repeated from their writing course to requests for more hands-on activities.

The HS Librarian had previous experience using active learning techniques with smaller subject classes and was interested in experimenting with more hands-on activities for a larger lecture class. With a desire to innovate but no previous experience with flipped classroom teaching, at the beginning of the fall 2014 semester the HS Librarian proposed flipping the classroom by using a pre-built online content module delivered via the university's learning management system, Moodle. It was proposed that the module could be integrated into the HS 201 Moodle course at the desired location in the course timeline. Then the librarian's in-class time could then be dedicated to more hands-on active learning activities. All three HS professors were supportive of this new approach.

This case study reveals challenges and lessons learned that arise when facilitating flipped one-shot information literacy instruction for a large health science classroom. The study does not track or analyze student performance or perceptions, but instead adds to the library literature by focusing on the librarian as instructor/facilitator and presents practical design and implementation information for using active learning flipped classroom methods with large enrollment classes.

Literature Review

There is a growing body of literature on the use of flipped classroom pedagogy within higher education. This review focuses on the varying definitions, the use of flipping techniques from different disciplines, reports of research that investigate flipped methods used with large enrollment courses, and librarians conducting flipped one-shot instruction sessions. The literature reveals a variety of definitions for flipped classrooms. A simple definition involves inverting activities that take place within the home and classroom environments (Bergmann and Sams, 2012). The broader definition employs group-based problem-solving class activities paired with a broad range of pre-classroom activities, which may include video lectures, interactive tutorials, practice exercises or quizzes (Bishop and Verleger, 2013). Bergmann and

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Sams (2012), regarded as the inventors of the "flipped classroom," emphasize that freeing up in-class time permits students to engage in active learning activities, which increases student engagement and allows for more tailored feedback from the instructor. Students become "agents of the own learning rather than the object of instruction" (Hamdan *et al.*, 2013, p4). The use of student-centered techniques for in-class activities is the crucial element of flipped classroom pedagogy (Bishop and Verleger, 2013; Hamdan *et al.*, 2013). Bishop and Verleger (2013) conducted a comparison of twenty-four examples of full and partially flipped classrooms selecting only studies that employed pre-class video lectures while excluding studies that did not utilize interactive in-class activities. Many of the studies investigated student performance which showed some positive results, but flipped classroom research needs to utilize control procedures to objectively evaluate student outcomes (Bishop and Verleger, 2013).

Findlay-Thompson and Mombourquette (2014) found no difference in test scores for students in a flipped classroom when compared to traditional methodologies for two introductory business administration classes. Interestingly, the students reported feeling they did better in the flipped classroom but also perceived that they had to do more work for the same result. Perhaps those students who are already motivated and engaged with course content do not recognized that deeper learner has occurred. Students may feel unsettled about the less structured active learning techniques as student-centered course design is less predictable than traditional lecture models (Strayer, 2012). Strayer (2012) questioned whether introductory courses were appropriate for flipped classroom methods assuming students may be less invested in the subject and also noting that students in flipped classrooms tend to become self-aware of their own learning. Strayer (2012) recommends that opportunities be built-in that allow for students to reflect and make the necessary connections with the course material.

Engineering professors are exploring flipped classroom methods in attempt to enhance student performance by incorporating problem solving opportunities into face-to-face class time. Lavelle *et al.* (2013) compared the performance of engineering students in a flipped classroom,

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or inverted class as they chose to call it, with a traditional class. They found no difference between the two methods in student grades, no relationship between student video viewing habits and grades, and surprisingly, a higher fail rate for the flipped classroom students. A similar study of upper-level engineering students conducted by Mason *et al.* (2013) yielded opposite results with the flipped classroom students performing better than, or as well as, the control group. Further, the flipped classroom students progressed faster and covered more course content; yet, they reported spending less time studying out of class than the control. Student feedback suggested the unstructured design of the flipped classroom was stressful and they desired more direction. Students also unanimously agreed that the flipped classroom method was not appropriate for first-year students, supporting Strayer's (2012) concerns. McLaughlin *et al.* (2014) demonstrated improvement in student outcomes for health science students specifically when they have the ability to engage in problem-solving exercises and tasked-based group work in class.

Educators employing flipped classroom pedagogy understand they are placing a greater responsibility for learning on the students (Arnold-Gaza, 2014; Danker, 2015; Heinz and Callender, 2015) and thus far this has produced mixed results on short-term student success.

Librarians and flipped classrooms

Active learning permits greater ability to personalize the instruction, which accommodates the diverse learning styles of students and meets the needs of many different types of learners (Dabbour, 1997; Lavelle *et al.*, 2013; Youngkin 2014). Librarians have enthusiastically employed active learning techniques in one-shot instruction and are now beginning to experiment with flipping their classroom through the use of recorded lectures, stand-alone instructional tutorials, and embedded lessons in the learning management system (Allen, 2014; Datig and Ruswick, 2013; Heinz and Callendar, 2015; Oling and Sciangula , 2011). Both Allen (2014) and Youngkin (2014) advocate that flipped classroom methods are effective for providing IL instruction. Youngkin (2014) specifically discusses delivering information literacy instruction for health

science and medical courses and cites examples of improved student performance to motivate health science librarians.

Librarians using flipped classroom pedagogy have reported overwhelmingly positive feedback to this approach from both professors and students (Datig and Ruswick, 2013; Pannabecker *et al.*, 2015; Rivera, 2015). Arnold-Garza (2014) evaluated students', librarians' and subject faculty perceptions of flipped classroom instruction sessions finding some indication that students were more engaged during in-class sessions, but no clear evidence about how this might have affected student outcomes. Librarians are using pre-class material to get students up to speed or as a way to gauge their skills before the in-class session, as described by Oling and Sciangula (2011). Flipped classroom methods are being employed during multiple session information literacy classes. Heinz and Callender (2015) utilized student-centered in-class activities when flipping a semester long library course and found students to be more invested in their learning, but test scores yielded no significant difference from their control group. However, Rivera (2015) demonstrated improved student outcomes when using flipped classroom methods for a seven week library competency workshop.

One of the few studies examining flipped classroom methods for a one-shot IL session was done by Brooks (2014) who like others, found no significant difference in student test scores. Yet, students in the flipped classroom used more authoritative sources in their final papers, suggesting these students had a better understanding of the concepts and could apply them in practice. This may suggest that deeper learning has occurred, beyond what is required to answer questions correctly on a multiple choice quiz. Pannabecker *et al.* (2015) also studied student outcomes involving one-shot library instruction for upper-level nutrition students. They found that students achieved higher post-test scores but did not support their findings by reviewing in-class work which may have better supported their claim. Educators using flipped classroom methods express increased personal and student satisfaction; Valenza (2014) cites

these attitudes when advocating for librarians to exploit their content expertise and respected technology skills to assist faculty with flipping their subject classes.

Flipping large enrollment classes

Large enrollments courses (100 or more per section) are most often be found in the Science, Technology, Engineering and Math (STEM) disciplines, particularly the introductory courses. Flipped classroom pedagogy provides a mechanism for bringing active learning to the in-class time of large lecture courses. The methods typically employed follow the more narrow definition of flipped classroom, limiting the "flip" to putting videos online, often lengthy hour long lectures, for students to view before coming to class. Articles pertaining to flipping lecture classes deal with relieving the pressures from high volume curricula (Youngkin, 2014) or addressing issues with educating a large number of students on multiple campuses (McLaughlin *et al.*, 2014). Typically, investigators explore students' acceptance of the new pedagogy (Elliot, 2014) along with any possible implications for student outcomes. Two such examples include the report by Zappe *et al.* (2009) on using flipped methods with engineering students and McLaughlin et al. (2014) on deploying flipped classroom techniques with first-year pharmacology students. Active learning in the pre-classroom activity is limited to the use of pre-tests or problems which are intended to boost compliance rather than engage students in knowledge building and retention (McLaughlin *et al.*, 2014; Zappe *et al.*, 2009). The Zappe *et al.* (2009) study found that, even though student feedback regarding flipped methods was positive, engineering students still desired some traditional lectures. McLaughlin et al. (2014) demonstrated higher attendance and better grades when flipped classroom techniques were employed. Utilizing flipped methods to instill a common vocabulary and fundamental knowledge, Elliot (2014) found that students responded positively to the new pedagogy but did not demonstrate any significant improvement in student grades. Danker (2015) discussed large classes and concluded that utilizing flipping techniques can result in greater student engagement and more focused instruction. However, her study included an enrollment of only 36 students, hardly a large enrollment class.

Additionally, the students were performing arts majors and likely to be accustomed to more interactive in-class activities. White *et al.* (2015) addressed some complex issues related to the unique environment of medical school education such as: the inability of medical educators to mandate class attendance or give credit for participation, and instructors' limited understanding of the course due to the fact that they may teach only a few sessions in the curriculum each semester. Many of these challenges mirror those encountered by librarian instructors.

Multiple authors throughout the literature emphasize the need to relinquish control, embrace unpredictable in-class sessions and devote greater prep-time for flipped classroom methodology (Datig and Ruswick, 2013; Hamdan *et al.*, 2013; Heinz and Callender, 2015). However, much of the literature simply describes students passively watching pre-class video content or explores student and instructor perceptions. It does not address class size or practical implementation considerations in any depth. This article presents methodology for adding active learning to the pre-class work and the in-class session, taking into consideration the limitations presented by the large number of students in lecture classes.

Design Process

The Health Sciences 201 class satisfies the general education requirement in the natural science and technology knowledge exploration area. The HS professors teaching the course believe strongly that all students at this level should have basic core competencies for conducting research in the health sciences. The course syllabus and objectives include two major points that aligned well with the Association of College and Research Libraries (ACRL) Information Literacy Standards for Higher Education current at the time.[1]

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[1] The ACRL *Information Literacy Standards for Higher Education* (2000) were replaced by the *Framework for Information Literacy for Higher Education* (2015*)* in February 2015.

- *Objective two: Demonstrate how to evaluate sources of information in health science or technology by guided discovery of the differences between information of differing quality from refereed and non-refereed sources, scholarly and public.*

- *Objective five. Via the above objectives, develop and enhance the cross-cutting capacities of information literacy and critical thinking skills (become a critical consumer and user of the informed literature in presenting laboratory results, conclusions, and the evaluation and discussion of the relevance of findings); and, develop effective communication skills in laboratory report submissions.*

The course objectives were the foundation for designing the one-shot library session and the flipped-classroom instructional material.

The online instructional module for the campus learning management system was developed to build upon the basic information literacy skills introduced to students in the WRT 160 library instruction sessions. The lessons were created, not to match specific assignments, but to develop competencies under the assumption that IL instruction is scaffolded through the HS program.

The library partners with the Department of Writing and Rhetoric to offer course-integrated information literacy instruction to every section of WRT 160. Depending on which term (fall or winter) and when in the semester the HS session was scheduled, the number of students who had already completed their mandatory WRT library session would vary significantly. The content for the HS 201 library research session should not repeat what was presented in the WRT 160 library session; yet, it needed to accommodate those students who had not yet completed the WRT course.

The instruction for the online module comprised of seven lessons beginning with a basic discussion of information types and ending with the more advanced concepts of understanding peer-review and searching subject databases. To address the possible discrepancy of students' prior library experience, some basic concepts were included in the online lessons such as finding full-text from discovery tool results but was delivered more as a review. Additionally,

certain techniques, such as the use of quotation mark were re-emphasized in the live face-to-face session.

These seven chosen topics were based on the course learning outcomes and would have been covered in the lecture portion of a traditional instruction session:

1. Types of literature - popular, trade, news, peer-review journals

2. Why you should use each type, what evidence can be found

3. Evaluating sources - including websites

4. Searching with Library OneSearch (the library's discovery tool)

5. Refining results, emailing citations and citing sources (using the library's discovery tool)

6. Subject databases - What they are, where to find them, when to use

7. Peer-review - what is peer-review, distinguishing peer review from scholarly articles

Moving these topics to the online module enabled the HS Librarian to enhance the lessons with greater depth and provided students the opportunity to better explore the topics as they moved at their own pace through the lessons. The online modules were designed to support active learning and engagement with the content through the broad definition of flipped classroom (Bishop and Verleger, 2013), with the additional goal of preparing students for the face-to-face activities. Lessons employed a variety of activities and typically involved a short narrative, a video tutorial, a task completion using of a tool or practicing a skill, and concluded with a review quiz question. Figure One depicts the use of a Prezi tutorial as an assigned task with a review question for the "What is peer-review" lesson.

Figure 1: Online lesson - What is peer-review?

A social software application was utilized to enrich the students' online experience. It permitted students to post their work so that other students could view their responses, creating a group classroom environment. The bulletin board platform Padlet was chosen because it could be embedded inside the Moodle lesson and enabled students to "report" back in a social space about a task they performed. Figure Two depicts an exercise in which students were asked to perform a search task using the library's discovery tool and post answers related to their work.

Figure 2: Online lesson – Required task using Padlet bulletin board with librarian's example

This tool was also used during the in-class activities as a means for student groups to post their work in real-time for class discussion. By introducing the tool in the online module it was expected that the face-to-face activities would proceed more smoothly. Additionally, the HS Librarian could not access to the module once it was imported into the HS 201 online course sections. Using an external technology enabled the HS Librarian to see what students posted in the online lessons, since the Padlet board was connected to the librarian's personal account.

As mentioned, each of the seven topics areas included a "practice quiz" question at the end, intended as a means of review rather than assessment. Each question displayed feedback to students about their chosen answer. Either their choice was confirmed and additional information was presented or the correct answer was provided with an explanation. The online module was expected to take about 45 minutes to complete. Each HS professor assigned the module as homework prior to the HS Librarian's face-to-face session and awarded students extra-credit for completing the module. Student completion of the module was recorded by each professor but student performance on tasks was not tracked.

Face-to-face sessions

The face-to-face sessions were scheduled to last about an hour and fifteen minutes. Building on subjects covered in the online lessons, brief lectures framed the activities and provided for transitions between topics. The session typically began with an introduction by the HS professor. The HS Librarian started by demonstrating how to find the library course guide and then asked the students to answer a clicker question. This mechanism allowed for the HS Librarian to gauge students' completion of a prior library session as well as take attendance.

What would have been a lengthy presentation in a traditional classroom was reduced to a brief discussion of the topics covered in the online module. Clicker questions were integrated throughout and a brief demonstration set up the in-class activities. Table One shows an example of an in-class activity, in which students are given 15 – 20 minutes to complete a task and then were asked to post their answers to the class Padlet bulletin board.

Pick 1 database from the HS list or any subject list related to HS and investigate more information about the databases.

Answer these questions for one database:
1. Name of database
2. Conduct a search for a health topic - if you aren't sure of a topic use: sleep AND stress
3. Now use subject or topic links to find related subject/topic.
4. Were you able to refine your search with subheadings/topics? Name one.

Table 1: Investigating databases in-class activity

In large lecture classes, technology tools can help with some of the hurdles of facilitating group classroom activities. However, it is necessary to find a technology option that permits users access without the need for them to create accounts and is also quick to learn. Another consideration is student privacy as mandated by the Family Education and Rights in Privacy Act (FERPA); any external technology needs to protect students' privacy and safeguard FERPA-protected information (Rodriguez, 2011).

Implementation

The library research module for Moodle enabled the HS Librarian to flip the course and to ensure that all the students had been exposed to the same concepts prior to the face-to-face session. The online lessons were designed to match the HS 201 course learning objectives. Flipping a course of this size presented several challenges for both the online portion and the face-to-face instruction, some of which apply to any size course and some of which are more unique to large courses. The online portion exposed difficulties related to how to incorporate meaningful active-learning activities and how to record student completion of the ungraded online lessons. The in-class instruction sessions presented challenges associated with facilitating active-learning and group activities within a lecture hall and how to best utilize technology to overcome some of the hurdles.

  For the online instruction, the issue with how to record student completion of the lesson activities presented a huge obstacle. The three HS professors teaching the different sections shared the same syllabus and grading rubric. Therefore, the imported module could not disrupt the gradebook. The HS Librarian developed the online module as an ungraded activity and faculty encountered no issues with importing the module into their course sections. However, students were to receive extra credit for completing the lessons, but because the lessons were ungraded the module did not display in the gradebook. Therefore, faculty required students to print out the last page of the module and submit this hard copy as proof of completion. With each section having an enrollment of more than 100 students, hand-grading became tedious. An automated method within Moodle of recording a "Y" for completed or "N" for not completed was implemented in the third semester. Still, there were technical glitches with this execution and students were unaware of whether their grades had been recorded. This resulted in a lot of additional time spent by one faculty member negotiating with the Moodle administrators, and all the faculty reassuring students that their grades had, in fact, been recorded.

In the large lecture hall, facilitating active-learning activities with more than one hundred students at a time presents several challenges: how to put students in groups; how to ensure that students accomplish the activity (would all students have access to a computer); how to engage students and get them to participate in the activities; and how to facilitate communication with students and provide feedback on exercises in such as large room.

Each HS professor informed students ahead of time to bring their laptops or mobile devices. In all sections the HS professor introduced the HS Librarian and spoke to the importance of the online module and the librarian-led in-class session, demonstrating support for the flipped classroom methods. The classroom activities were orchestrated by having students work in groups gathering around at least one student who had a laptop, tablet or smartphone. The seating arrangement allowed for the groups to work with their peers within their vicinity. Groups were instructed to pick a group name and encouraged to be creative. Students tended to form groups of three to five people.

Clicker questions were included in a PowerPoint slide and worked well for getting a general feel for the sections' previous library experience. Answers to the questions revealed that students' knowledge of the library resources tended to vary according to the semester in which they were enrolled in the HS course. The number of students that indicated they already participated in a library instruction session changed significantly between fall and winter semesters and also changed in relation to the timing at which the library session occurred in the subject course in the current semester.

Initially the face-to-face sessions included three in-class group activities. For each activity, students had about 10-15 minutes to work on the exercise and then were asked to post their answers to a Padlet specifically created for their class session. An example of what the students were expected to post was already displayed on the Padlet bulletin board. The HS Librarian monitored Padlet while the students worked and then called on selected groups to report back to the class. Based on the students' posts and comments made by the groups

reporting to the class, the librarian followed-up with a brief discussion to clarify concepts. For example, it was common during the searching exercise for groups to categorize encyclopedias as a peer-reviewed source, so the HS Librarian followed up with an explanation.

One challenge arose related to the computer display options. The lecture hall had three huge projection screens located at the front of the classroom, but there was no way to split the display. As a result, the same image appears on all the screens. The instructions for the activities were displayed on the PowerPoint along with the Padlet URL where the students were to post their work. The HS Librarian had to switch back and forth between the PowerPoint and the live Padlet throughout the activity because students requested to be able to review the directions on the PowerPoint slide as they were working. To address this issue, the Padlet URL was written on the white board at the front of the room and directions for the activities were posted on the Padlet bulletin board. However, once students started to post to the Padlet board, the directions moved down in the feed and students could no longer see them without scrolling down so they went unnoticed.

Even though the Padlet bulletin board tool had been used successfully when conducting in-class activities for other smaller subject classes, it presented some challenges when deployed for a large enrollment course. This tool was chosen because it was easy to use and was the only online tool that would allow for an unlimited number of users to post to a bulletin board without creating accounts or logging-in. With each class section having two or three in-class activities, each session required two or three separate Padlet bulletin boards with unique URLs. Managing multiple Padlet boards and the corresponding URLs for each section was tedious. In the feedback for the online module, students reported issues with posting to the board, so steps were taken during the in-class session to further explain and demonstrate how to post their responses. The issues with posting were exacerbated in the face-to-face session because of the large number of student groups all posting at the same time. Each time a new

post was made the screen appeared to flash, sometimes quite rapidly. In addition, the manner in which the board displayed the postings created a bit of confusion.

During the first semester using flipped classroom methods, the selected display design option in Padlet was "free form" which was the default setting. This permitted students to post comments anywhere on the board. With so many groups posting at once, the display became quite chaotic. The way in which students interacted with the bulletin board created some problems as the activities they were completing required multiple answers. They tended to start a post with the group name, then go and work on the first question and come back to the post with their answer. When they returned to the bulletin board between answers they were unable to locate their original post. Even after the HS Librarian changed the display setting option to "stream," so that posts would appear in sequence one-on-top of each other and scroll down in a predictable manner, students still struggled with losing their posts. They continued to add information in stages even after being instructed to wait until they had all the required content before they began their post.

All three in-class activities followed the same format and it quickly became clear that student engagement dropped off by the second activity. Thus, the HS Librarian revised the remaining sessions to include only two group activities. This had the added benefit of allowing more time for the two activities and for follow-up discussion of topics depending on student needs. The multiple course sections had similar energetic student participation in the group activities. However, students' enthusiasm with reporting back to the class when called on by the librarian varied by section, which appeared to correspond to the HS professor's level of enthusiasm for the in-class activities and engagement with classroom management aspects of the session.

Revisions and Lessons Learned

Each semester students were presented with a feedback survey at the end of the online module and another survey after the face-to-face session. Questions inquired about students' perception of the usefulness of the course content and the presentation of the material. They also had the opportunity to comment on continued to be confusing and were given the opportunity to suggest ways the online module and in-class activities could be improved. These open-ended comments provided direction on how to revise the content and insight into how the technology was functioning. When reviewing the timestamp for the online feedback, there was evidence that students completed the online content well past the date the instruction took place, probably to get extra credit points assigned by the faculty member.

The majority of students found the information in the online module to be helpful and well-organized. Some students noted that they already had participated in a library instruction session. Students wanted more help with advanced information literacy skills such as better understanding of subject databases and more in-depth information about peer-review. Additionally, many students asked for more videos and Prezi-type presentations and less reading. Some students struggled with posting to the Padlet bulletin board or had trouble viewing some embedded video content. Students also complained that practice quiz questions were too easy. After reviewing comments, the online lessons were enhanced to provide greater depth for advanced information literacy concepts and the text was edited for clarity.

Overall, students found the face-to-face sessions to be highly valuable. The in-class activities were revised based on the HS Librarian's perception of student engagement and students' comments regarding their desire for more in-depth coverage of topics and their request that more time be allotted for the in-class group work. As a result, only two activities were scheduled for the face-to-face sessions starting winter 2015. In addition, adjustments were made to the Padlet design in an attempt to address some of the issues regarding display and use of the online bulletin board tool. A librarian colleague who was invited to observe a face-to-face session and provide an informal written review of the instruction gave extremely positive

feedback of the teaching methodology and design of the activities, considering the limitation of working with such a large number of students in an auditorium classroom. The colleague was able to provide useful comments on minor issues based on observed problems. For example, the slides and text in the live demos were sometimes hard to read from the back of the classroom, so it was suggested that the computer screen be zoomed in to compensate. The observer also witnessed some students experiencing challenges using Padlet on their different devices, especially in relation to the flashing screen when a new post was added. To overcome the limitation of not being able to split the projection screen to show two different activities, some ideas were proposed to assist students in following along with the instructions, such as posting an online handout or the entire PowerPoint presentation in their course. Another possible adjustment was to conduct the in-class post-and-response activities using the Moodle forums or a Google document. Students might be more familiar with either of these technologies and they may function with fewer glitches.

No formal assessment was conducted with the three HS professors teaching the course. Each informally commented to the HS Librarian about their strong endorsement of the online content and the value of the face-to-face sessions. All have indicated their desire to continue with the information literacy sessions utilizing the flipped classroom design and, being further convinced of the value of the pre-class content, have agreed to connect the online module to the gradebook by awarding points for student completion. Though it may seem obvious, it is not always possible to negotiate a place in the gradebook for the library lessons ahead of time. Once professors become familiar with the online content and witness the "flip" in action, their attitudes tend to change. Ensuring an automated method of grading is the most effective with large classes and further helps to motivate students to complete the online lessons. Another consideration is that the HS Librarian to be added as a teacher or teaching assistant for the course which might help eliminate any technical issues with integrating the content. This would also make it possible to review student completion prior to the in-class session and would allow

for more tailored instruction and activity preparation to occur based on students' success with tasks and quiz questions.

Utilizing flipped classroom pedagogy demands a great deal of preparation both in developing the material for the online lessons and in crafting the in-class activities. Subject faculty and students are asked to extend the amount of time allotted to IL material, since students will be completing pre-class work. This requires a strong commitment from faculty to value the added content in their course and communicate its importance to their students.

Flipped classrooms employ active learning techniques which require both the instructor and the students to remain flexible as they engage in the activities. The face-to-face session, originally thought to be well orchestrated group learning activities proved to require more fluidity based on the discovered gaps in students' knowledge. The librarian needs to resist lecturing even when the students present a lack of understanding, which may be partially due to the timing of the instructional session in the semester. Adjusting the flow of the activities based on students' in-class work can drastically change with each section based-on the make-up of the students enrolled.

In large lecture classes, technology tools can assist with managing group work and assess students' understanding, allowing for tweaking of content on-the-fly. Student comments suggested that they respond positively to the use of classroom response systems. Future revisions will attempt to better integrate clicker questions throughout the in-class sessions to gauge compliance of pre-class work, incorporate quick, feedback questions that can improve participation and measure students' comprehension. The instructor in a flipped classroom is facilitating a learning experience, acting as a guide. Ultimately, the choice to engage falls on the students who can easily "hide" in the crowd of a lecture hall. Utilizing group work, posting completed work in real time, and having students report back when called on by the librarian all act as motivating methods for student engagement. Incorporating on-the-fly clicker questions or

polls throughout the in-class activities may be another method for getting student feedback with group work and possibly tracking student participation.

The literature discussing educators' use of flipped methods speaks to the professor's ability to connect more with students and student learning (Bergamm and Sams, 2012; Hamdan *et al.*, 2013). In a lecture hall this remains a challenge. Walking around the room and checking-in with groups during exercises, incorporating more mechanisms for individuals students to ask questions such as on-the-fly polling and anonymous question posting may help to added more personal attention to these large classes.

Next steps

The new ACRL *Framework for Information Literacy for Higher Education* (2015) was recently completed and published. OU Libraries embarked on a yearlong learning community exploring the new framework and these new guidelines will be incorporated into revisions of the information literacy content for the HS course. The automated grading issue should be resolved now that the HS professors have agreed to incentivize the completion of the online module by allowing students to obtain points in the gradebook. Additionally, if the HS Librarian is added as a TA for the course students' responses and success with the online lessons could be reviewed prior to the face-to-face session. For the in-class activities, addressing the functionality of technology tools on different devices and the desire to track student participation have inspired plans to substitute a Moodle forum for the web-based Padlet bulletin board.

The intention of the information literacy instruction is for scaffolded instruction to occur throughout the curriculum moving towards a more embedded approach. The HS 201 course is the first-time HS students have a session with a librarian as part of their major. Further information literacy instruction is provided for 400 level courses. As demonstrated in the literature, reviewing pre and post-test scores or student course grades from one flipped instruction session has failed to provide a definitive answer about whether deeper learning is

taking place. Investigating more long-term retention and application of skills and knowledge may be a better measurement. With this in mind, the goal is to work with subject faculty throughout the Health Science curriculum to evaluate and further develop students' skills as they reach upper-level courses.

Areas for Further Research

Research studies will continue to explore students' perceptions of flipped classroom techniques and any correlation to academic achievement to flipped classroom methods. However, most librarians have little, if any, involvement in student grades and limited opportunity to build rapport with students or affect the overall classroom environment. One area to explore is investigating students' information literacy skills as they proceed through their major course of study and the relationship between flipped classroom methods and deeper learning. Librarians could also extend the literature on active learning techniques for information literacy instruction and further explore the use of technology to facilitate the active learning components of flipped classrooms.

Conclusions

The success of implementing flipped classroom pedagogy relies heavily on the commitment of subject faculty and their level of engagement with the process. Open communication between subject faculty and liaison librarians about course objectives and expectations for the library sessions is essential for developing relevant content and active learning activities. Subject faculty are obliged to import the module (or content) into their course, assign students to complete it at the appropriate time, provide incentives, introduce the face-to-face session and make the connection with their regular course content. Highly engaged subject faculty will also emphasize the importance of the online lessons and the in-class session to the students, help facilitate the in-class active learning exercises by participating in the discussions and be

engaged with addressing any classroom management issues. The biggest hurdle for librarians may be to avoid lecturing during face-to-face sessions. The discussion will no longer be driven by what we think students should know but instead will arise from the gaps emerging in the students' knowledge which will be unique in each class session.

Employing active learning pedagogy for information literacy sessions is not new, but integrating into the subject courses to provide pre-session instruction in their classroom space, specifically the learning management system, may be a leap for some faculty members. The challenge may lay in moving faculty perceptions of what a library session should look like paired with each member's comfort level in working with the online learning management system. Professors teaching large lecture classes are typically more engaged with the learning management systems out of necessity for managing the large student enrollment. Lecture classes present unique challenges for utilizing flipped classroom methods but the obstacles are not so great that they cannot be overcome with a bit of preparation and faculty buy-in, balanced with the proper utilization of technology.

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