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Evolution of Various Library Instruction Strategies: Using Student Feedback to Create and Enhance Online Active Learning Assignments

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Abstract

This case study traces the evolution of library assignments for biological science students from paper-based workbooks in a blended (hands-on) workshop to blended learning workshops using online assignments to online active learning modules which are stand-alone without any face-to-face instruction. As the assignments evolved to adapt to online learning by providing supporting materials in the form of PDFs, screen captures and screencasting were embedded into the questions as teaching moments to replace face-to-face instruction. Many aspects of the evolution of the assignments were based on student feedback from evaluations, input from senior lab demonstrators and teaching assistants, and statistical analysis of the students' performance on the assignments. Advantages and disadvantages of paper-based and online assignments are discussed. An important factor for successful online learning may be the ability to get assistance.

Keywords

active learning; evaluation; information literacy; learning perceptions; blended learning

Introduction

Librarians are often asked to teach a multitude of techniques, strategies, and services centered on library resources within a limited time period – usually to a disinterested audience whose members have diverse learning styles (Anderson and May 496). Studies have shown that the most effective instruction is hands-on, relevant to the content of the course, and delivered at the point of need (Kraemer, Lombardo and Lepkowski 339; Jacklin and Pfaff 6; Jacklin and Bordonaro 2). Additionally, for library instruction to succeed endorsement from faculty is critical; when tutorials are optional, students usually choose not to attend (Bailey and Jenkins 16). Experience has shown

that library assignments only have value to students if they are assigned a mark as part of their final grade.

This article explores the evolution of a specific group of information literacy assignments from paper-based library workbooks to an online active learning module. An evaluation of student reactions to various types of instruction strategies was conducted. The evaluations were collected over the course of seven years in five different courses in the biological sciences. The courses were taught to students in the first three years of study of undergraduate biological sciences. The students were instructed in single information literacy sessions that used a workbook in a blended learning workshop, or an online multiple choice assignment in either a blended or online setting. In the blended settings students were given an assignment to complete within a regularly scheduled lab time. The labs were held in a library e-classroom with librarians and sometimes teaching assistants (TA's) available for assistance.

Paper-based Workbook

Librarians have used paper-based assignments since the early days of library instruction. Dudley reported using print workbooks in a college library setting in 1969 (Edwards 100; Gutierrez and Wang 208). By the 1990s, more librarians had incorporated paper-based assignments into their bibliographic instruction (Bailey and Jenkins 13). These workbooks were likely developed as a result of an increase in student populations and a desire to teach as many students as possible. Print workbooks allowed librarians to deliver information literacy instruction in a timely and relevant manner. They were able to develop more detailed exercises that required students to use library catalogues and databases to answer questions, which was more effective than demonstrating these resources in a lecture. In addition, students could advance at their own pace by actively learning, and could reinforce the knowledge acquired in class (Gutierrez and Wang 208; Jacklin and Pfaff 6). Ideally, if the workbooks were used in hands-on workshops, the librarian could observe and interact with students (Getty et al. 357; Jacklin and Pfaff 6). In this type of setting, instruction could be delivered by a combination of presentations and paper-based tip sheets. Students who understood the concepts or who embraced this type of learning could collaborate with their peers to complete the workbook quickly, while students who had not acquired the skills could be helped by librarians or peers (Jacklin and Pfaff 11).

Two factors are necessary to ensure the successful use of paper-based workbooks as a learning tool. A collaborative approach between librarians and academic staff/departments is critical to focus on topics with relevance to the course. Also essential is the support of senior library management so that librarians can acquire appropriate skills and create relevant content (Anderson and May 496; Bailey and Jenkins 19).

Using workbooks, however, can also be challenging: they require significant preparation time, they may be expensive to produce and maintain, and grading the assignments is

time-consuming (Gutierrez and Wang 208). In addition, students may be reluctant to ask for help in front of their peers.

CMS-based Tutorials or E-workbooks

By 1997, online workbooks or tutorials were being discussed in the literature. They normally consisted of quizzes, tutorials or exercises that the students worked through. An ideal online tutorial, according to Gutierrez and Wang, should be interactive, self-instructed, and self-paced (208). The need for using this type of technology was driven by larger class sizes, fewer resources, and also new theories suggesting that university students preferred autonomous learning situations (McDowell 256). Currently, course management systems (CMS) are often used to present such tutorials. This form of delivery is thought to be advantageous for students, capitalizing on their prior familiarity with it for accessing course content (Dale 400). Electronic delivery allows students to work through an assignment at their own pace and on their own time using the screencasts, PDFs, library resources, and instructions provided at the point of need. A more beneficial learning experience for the students is created if librarians put extra effort into creating responses for immediate feedback (Gutierrez and Wang 209; Kraemer 87; MacMillan 46).

CMS-based tutorials or electronic workbooks are also advantageous for librarians:

- They save staff time and resources because computer labs may not be necessary, and the tutorials can be automatically graded.
- Faculty are generally pleased with the added value of library resources within their courses.
- Librarians may embed instructional aids such as PDFs and screencasts into a relevant place in the learning object to help address the different learning styles of students.
- They allow the use of feedback (online evaluations and assessments) and statistical reports to update and modify questions, answers and graphics.
- The CMS software provides various settings which can be adjusted. For instance, students could take a tutorial an unlimited number of times and be assessed on their highest mark (Getty et al. 350-353; Gutierrez and Wang 208; MacMillan 46; Riedel 483).

Despite the many benefits of online workbooks for students and librarians, web based tutorials do have challenges such as:

- Librarians need to learn how to use the CMS software and also the audio, graphic and/or screencasting software that will be used to embed tools into the tutorial.
- Preparing, updating and revising requires significant time, especially screen captures and screencasting.
- Automatic grading is available for multiple choice, true/false answers and short answers (with some effort).
- Feedback from students about how effective the training is may be difficult to obtain.

- Students may not have the opportunity to collaborate with their peers.
- Students may not know if help is available, and they may feel uncomfortable contacting someone they don't know.
- Students may have more opportunity to copy answers rather than work through the module (Dale 398-399; Getty et al. 354; Jacklin and Pfaff 12; Kraemer 89-90; Martin 5-8; Mestre 258).

Blended (hybrid) learning versus online only modules

Online tutorials can be delivered or supported in a variety of ways. The more traditional way is to offer an in-class lecture about the module. However, the most effective method may be blended (Driscoll 54) or hybrid learning, in which instructors are available during class or lab time in a hands-on situation where students have access to computers. The instruction may be formal or informal, such as when librarians utilize questions from students to create teaching moments.

Stand-alone online modules are impersonal, and students often don't know how to get assistance beyond the provided materials. Students may also feel uncomfortable contacting someone with whom they are not familiar and then admitting they don't know how to do something. They are often fearful of anything they think might affect their marks. Online modules may be preferable to some students because they can take them multiple times without being marked. Online learning, especially for large classes, could be supported by replacing the in class or hands-on instruction with PDFs, screencasting tutorials, and drop-in clinics (Kavanagh 6; Usova 3; Jacklin and Bordonaro 1).

Background

Until 2004, the science librarian visited second and third year biology classes at Brock University to give traditional seminars on use of the library. Although this type of training was desirable, it was ineffective because it depended on the attention of the students in the class. Three developments occurred in 2004 that created an opportunity for change. First, there was much discussion at Brock University about active learning and computer-assisted learning. Second, there was a rapid increase in the acquisition of electronic resources, particularly e-journals, in the library. Third, there was a rapid growth in the number of undergraduate students attending the university from 6,696 full-time students in 1999 to 12,559 full-time students in 2004.

In 2003, a senior lab demonstrator (SLD) and the biological sciences liaison librarian discussed these issues as well as the information literacy skills that biology students were lacking. The SLD was responsible for designing, organizing and providing laboratory sessions for BIOL 2P92: Animal Form, Function and Diversity. She was a strong supporter of the library, and, with her support and advice, the librarian designed an assignment for a second year biology laboratory session. The assignment was worth two percent of their final grade.

The librarian and the SLD worked closely to develop a list of learning objectives. They agreed that the students should have an opportunity to practice newly acquired research skills by linking instruction to a specific task (Jacklin and Pfaff 6).

The assignment was incorporated into the laboratory curriculum. It ran for one year as a trial. The assignment was presented as a hands-on workshop in an e-classroom where each student had a laptop. Students answered fourteen questions in a print workbook. The librarian gave a brief (one to five minute) presentation before each question and then the students were given time to work through the questions and record their answers. At the end of the lab period, the workbooks were turned in to the librarian for marking. After the workbooks were handed in, the students were asked to complete an evaluation form for the workshop (Jacklin and Pfaff 6).

The workshop was modified based on feedback from the SLD and the student evaluations. Kavanagh points out the importance of student feedback to modify student workshops to keep them relevant and also to identify problems with the instruction or mode of delivery (15-16).

The biological sciences liaison librarian forwarded a summary of the evaluations to both the SLD and the course professor. In the letter sent by the librarian, it was mentioned that an evaluation was done for a fourth year biology class in which several students commented that this information would have been more useful in the first or second year of study. The librarian mentioned that there was evidence in librarianship literature that this type of instruction improves the literature searching skills of students and therefore results in higher quality papers. The SLD agreed to once again embed the library assignment into her lab curriculum and to allocate to it two percent of the students' final marks.

Over the following months, with the input of the SLD, the assignment was updated. The class enrollment was now approximately 112 students, and six workshops were offered. The assignment was completed during the two hour lab time in a hands-on classroom. Candy was distributed during the workshops to encourage students to make comments, ask questions, and discuss results. A total of 73% of the students filled out an anonymous evaluation form, perhaps due in part to the welcoming atmosphere created by the librarian. Some students verbally commented that they would prefer an online assignment because they didn't like to write by hand.

At this point, given the increasingly large classes, the SLD and the librarian transferred this assignment to WebCT, an online CMS then used by Brock University. This allowed the assignment to be automatically marked but required it to be reworked into a series of multiple choice questions and answers. The librarian pursued training on how to use WebCT and on designing effective and meaningful multiple choice questions and answers. It soon became clear that the assignment would require major changes. Instead of filling in boxes or charts by hand, the students would, for example, search a database using some information which was provided and then mark the most appropriate answer from a choice of three to five responses.

The success of this program led to the incorporation of multiple choice learning objects into other second and third year biology courses. Most recently, the learning objects have been incorporated into two first year biology courses. Camtasia software was used to record “teaching moments.” These screencasts were loaded onto Youtube, which allows some statistical analysis. A summary analysis and comparison of student evaluations over several years, levels and presentation styles is presented in the results section.

Methodology

Over the course of seven years, the biological sciences librarian conducted student evaluations to assess and inform her teaching practice. Considering that the skills taught and the evaluation forms were similar while the mode of delivery had evolved from a workbook to an online active learning module, these evaluations were compared with the thought that the results might shed light on effective delivery methods. In comparable studies, Archambault used a multi-year assessment of student evaluations to look at changes in the curriculum and changes in library instruction from blended to online delivery (88), and Searing used a ten year analysis to compare student evaluations of library orientation and information literacy instruction.

Most of the instruction sessions covered basic learning objectives such as finding books and journal articles and citing them, using keywords appropriately, search techniques such as using Boolean operators and truncation, critical analysis of web pages (such as Wikipedia) versus academic sources, and database selection. In upper level classes, more emphasis was placed on subject specific databases and advanced searching techniques. The learning objectives didn’t change when the assignments moved from paper-based to blended workshops to online learning, although the questions were modified for the online environment. Also, from year to year in the same course, the instructor decided to emphasize different aspects of the assignment based on input from the teaching assistants regarding concerns they had with student information literacy skills.

This case study is an example of a formative evaluation over a multi-year period. Formative evaluations are used by teachers to modify teaching and learning programs with a focus on improving student understanding. Evaluation forms were completed by 1949 students who attended five different biological science courses within seven years. The assignments that students worked on changed from year to year and were different for each course. Each year, the instruction changed in terms of content and delivery. Nevertheless, the learning outcomes did not change.

The evaluation forms consisted of a series of questions which could be answered by ticking the appropriate box plus two open-ended questions (see Appendix A). A certificate of Ethics Clearance for Human Participant Research from the Brock University Research Ethics Board was obtained for these studies. The questions on the evaluation form changed between years and classes. It is important to note that some courses were not taught and/or evaluated every year. Some classes were evaluated

over several years and multiple hands-on workshops. The classes selected for this study were evaluated on at least two occasions.

Unfortunately the marks students received for the assignments for paper-based workbooks (prior to August 2008) are not available. The marks for blended and online instruction were not significantly different, falling within a range of 81% to 97%.

Results

An analysis was done of the evaluations received in five courses over seven years (2004 to 2011). In general, students evaluated the instruction sessions positively regardless of how information literacy was delivered – whether as paper workbook or online in blended or online only learning situations. Students also responded to many of the questions in similar ways despite varying content and teaching strategies.

Students generally had more negative comments on the evaluations the first time a multiple choice assignment was offered. Once the assignments were modified for the next year based on feedback, the responses on the evaluations tended to become more positive.

In total, seventeen series of data were collected from three types of classes: hands-on with paper-based workbooks supplemented with verbal and print instructions (eight series), blended hands-on and online assignments with verbal instructions and PDF's and screencasts (six series), and online only assignments with embedded PDF's and screencasts (three series). Rather than use raw data, percentages were used in the figures. In total, 1970 students submitted evaluations from the five courses which consisted of 108 hands-on sessions. Some students may have submitted more than one evaluation, but, because the evaluations are anonymous, there is no way to account for this possibility. The completed workbooks, blended learning assignments and online only assignments were typically worth from two to three percent of the students' final grade. Students needed to attend the blended learning labs to receive a mark.

The results are observational but do indicate some interesting trends in student reactions to different forms of instruction. For the complete data set for all seven years, response was highest from students taking first year courses as they attended instruction sessions in higher numbers and handed in more evaluations (1166). Students taking second year courses accounted for 552 of the evaluations, and students in third year courses accounted for 231 evaluations (see Figure 1).

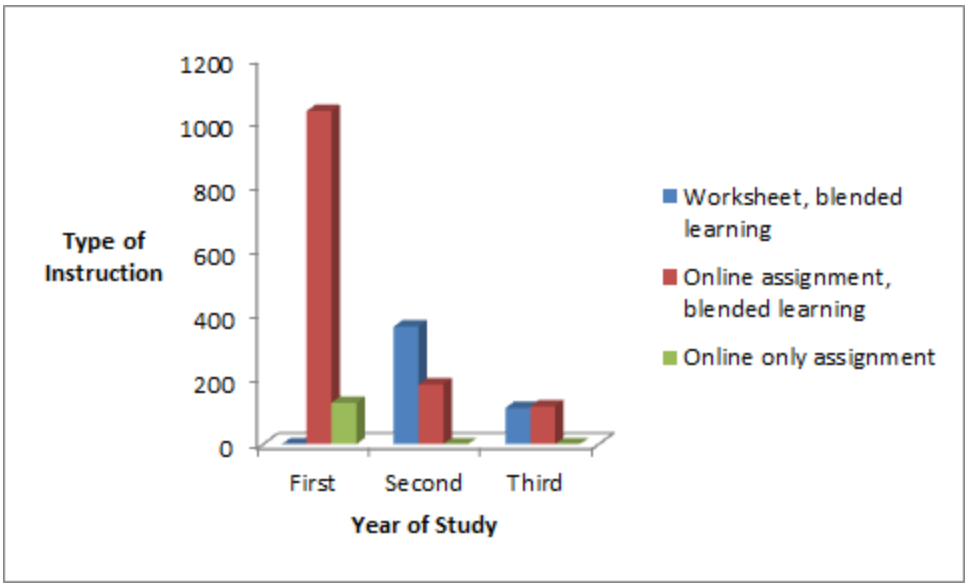

Figure 1. Participants who responded to evaluations by year of study and type of instruction.

The first set of questions on the evaluations was designed to gather specific information from the students. In the figures presented below, librarians wanted to know if the students understood the instructor's goals for the sessions, whether the students felt the information was new, and if the students felt comfortable asking questions.

Students (1966 in total) who responded to the question about whether the main goals of the session were clearly stated indicated that the goals were less clear for online only instruction versus blended learning (Figure 2).

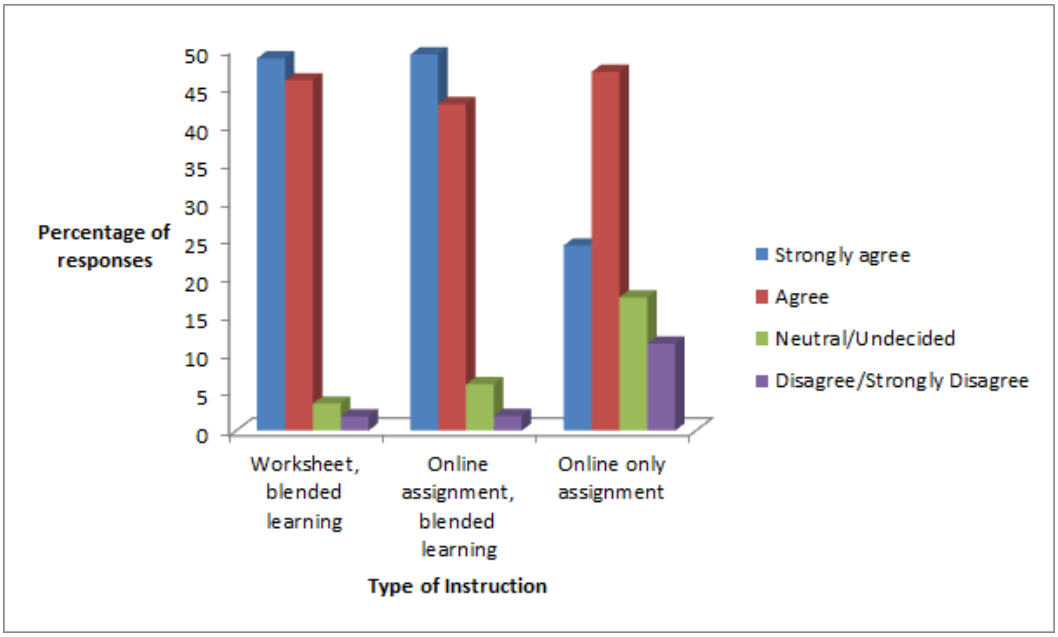

Figure 2. Responses to the question "Main goals of this session were clearly stated by the library instructor" by type of instruction and percentage of responses.

Student evaluations conducted between 2004 and 2006 indicated that some students preferred to learn library skills online rather than attending a hands-on workshop. Students preferred online instruction because they could work at their own pace, in small groups or with partners, and at the time of their choosing. Figure 3 indicates there is some evidence that even though the students (1970 in total) were learning similar skills, they felt the information was new to them if it was taught in a hands-on (blended) classroom with the assignment online versus a workbook. This indicates the importance of adapting to students' technological preferences.

Librarians' classroom experience confirmed that the students were more enthusiastic about blended online active learning than paper-based or lecture style learning strategies. The evaluations and personal comments from students indicated that they liked the active learning but also appreciated being able to ask questions or discuss information face-to-face with their peers/TA's/librarians. This was demonstrated when the students gave each other high fives and commented in a positive way at the end of a session. On the evaluations and in conversations with the students, they frequently mentioned the collaborative nature of the workshop. Here are a few comments from the evaluations "The TA/librarian help was useful, and being able to work in a group environment was too"; "I liked the time available to ask questions"; "I liked the hands-on way of teaching us how to look for the right journals/articles." The students' enthusiasm was motivation for the instructors and TA's too.

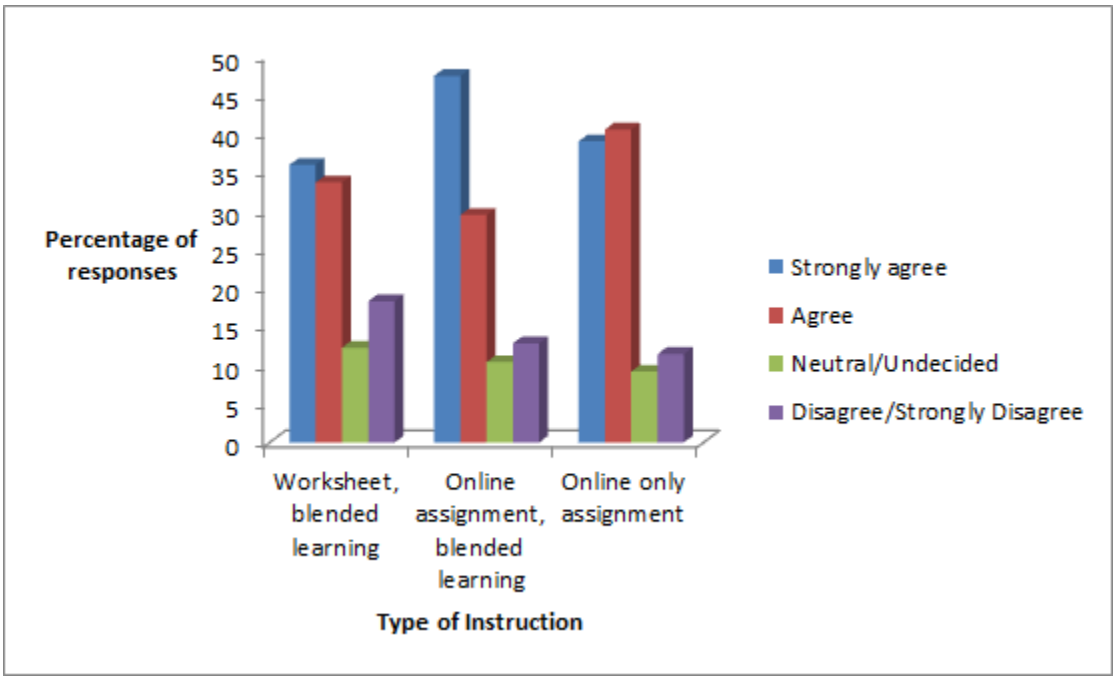

Figure 3. Responses to the question "The material presented in the session was new to me." By type of instruction and percentage of responses.

"I felt comfortable asking questions when I needed help" was asked in online only or blended online assignment teaching situations. The data was drawn from three years (2008–2011), and 1331 evaluations were analyzed. The majority who answered were

first year students, although all three years of study levels were represented. There was a vast difference in how students responded to this question. For the students in the blended online teaching situations, 91.5% agreed or strongly agreed that they felt more comfortable asking questions when they needed help, as opposed to the online only assignment where only 52.9% of the students agreed or strongly agreed that they felt comfortable asking questions (see Figure 4).

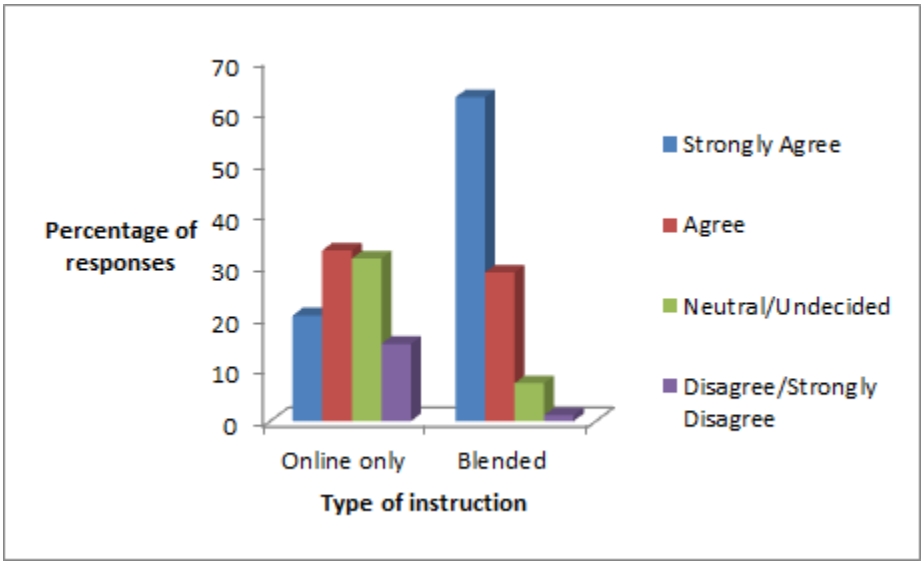

Figure 4. Responses to the question “I felt comfortable asking questions when I needed help” by type of instruction and percentage of responses.

For the next set of questions we wanted to discover students’ preferences for working alone, in pairs, or in groups. We were trying to ascertain how students actually worked to complete a blended classroom or online assignment and how they would prefer to work, which is presented in the next set of figures.

Figure 5 shows results grouped by type of instruction. Most of the students were in first year courses, but all three years of study were represented (1225 evaluations in total). In all of these classes students were allowed to work together; however, first year students were especially encouraged to work in pairs or groups.

As we can see from the figure below, when they were in a blended learning classroom most students (74%) reported working with one or more peers. However, for the online only assignments most students report working on their own (73%). Some worked in pairs (22%), and a few worked in groups (6%).

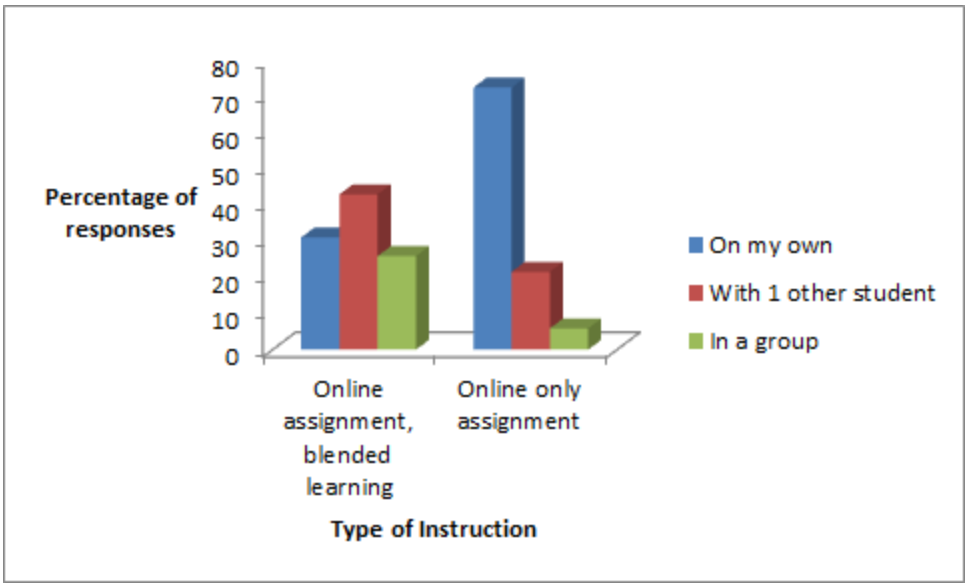

Figure 5. How students reported working in blended learning workshops, by type of instruction and percentage of students.

Figure 5 reports how students actually worked whereas Figure 6 (below) reports on student preference in blended learning workshops and online only assignments based on 1262 evaluations collected from 2008 to 2011. Of the students attending blended learning classes, 46.8% preferred working with one other student and 29.6% preferred to work on their own. For the online only assignments, 60.8% of the students preferred to work on their own, and 27.5% preferred to work with one other student.

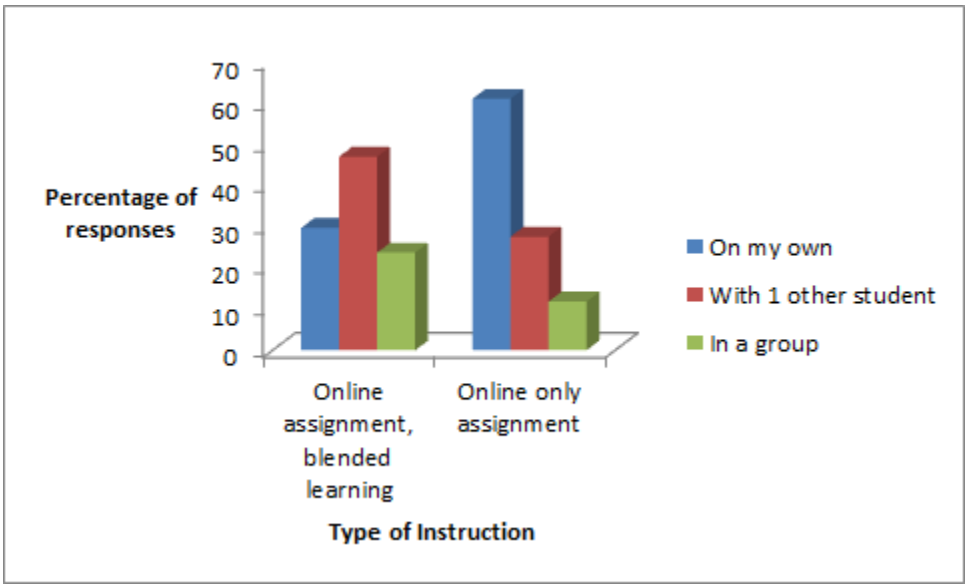

Figure 6. How students preferred to work in blended learning workshops, by type of instruction and percentage of responses.

Two open-ended questions on the student evaluations provided some interesting results. Figure 7 presents an assessment of 1672 evaluations from students in all three

years of study, receiving various methods of instruction. The majority of responses (70.6 %) were from a first year course delivered through blended learning in 2009 and 2010.

The responses for “What did you find the most useful in the session today?” varied depending on the mode of instruction. Students using paper worksheets in a blended learning environment indicated that they liked learning about Refworks (48.5%), searching databases (13.2%), and citing information (13.2%). Students using an online assignment in a blended learning environment liked learning about searching databases (21.9%), the library website/resources (15.8%), and finding scholarly articles (13.6%). Students in an online only learning environment mentioned learning to search databases (17.0%), to use the library website/resources (14.8%) and to cite information.

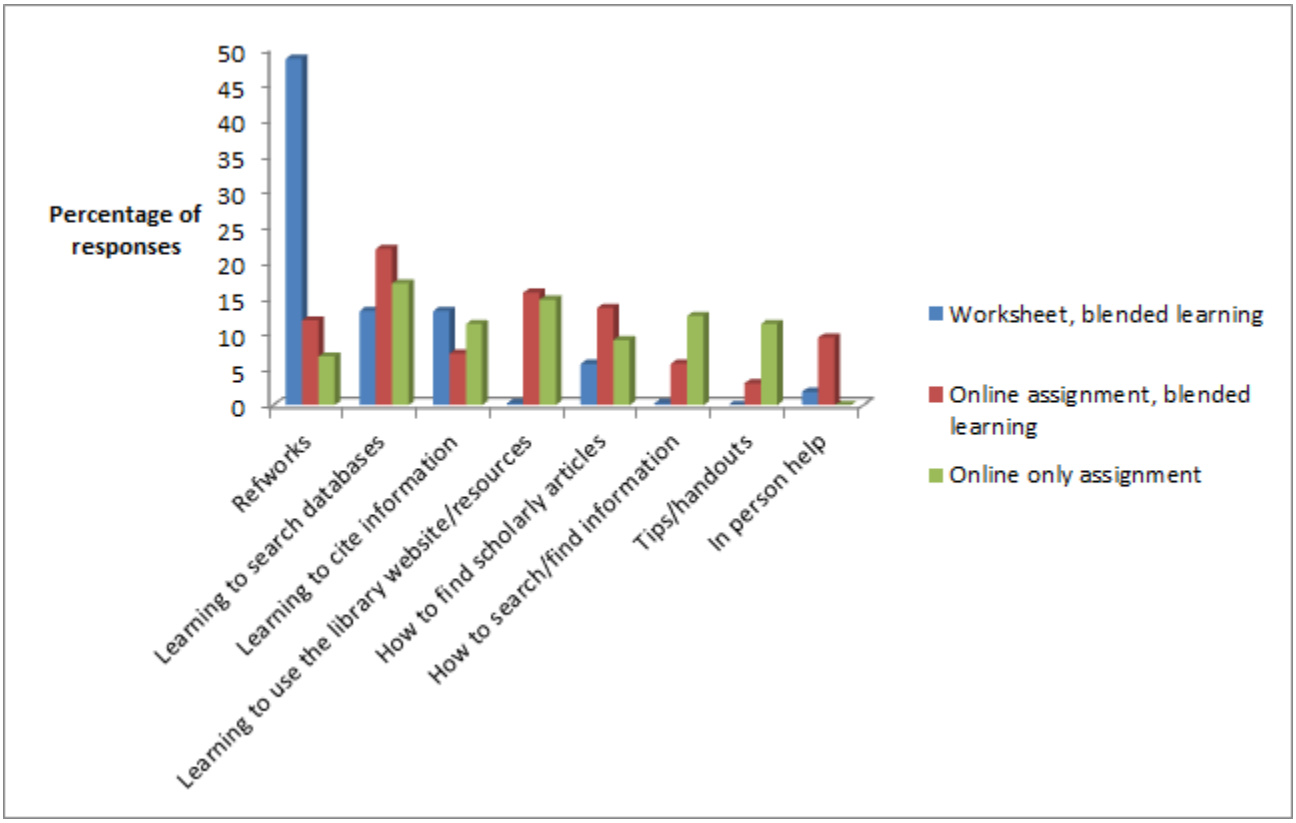

Figure 7. Frequency of responses to the open-ended question “What did you find the most useful in the session today?” by type of instruction.

Responses for the open-ended question “If you could change one thing to make this session better for you, what would it be?” were collected from all types of instruction and multiple years from 962 student evaluations. Many of the responses (37.5 %) were from a first year blended learning course in 2009 and 2010.

Students using paper worksheets in a blended learning environment indicated that they wouldn’t change anything (48.0%), they needed more time (25.8%), and it was good (4.4%). Students using an online assignment in a blended learning environment wouldn’t change anything (42.2%), thought it was good (19.4%), and wanted clearer

instructions (13.4%). Students in an online only learning environment wouldn't change anything (35.5%), wanted clearer instructions (28.0%), and wanted more instruction including examples (11.8%).

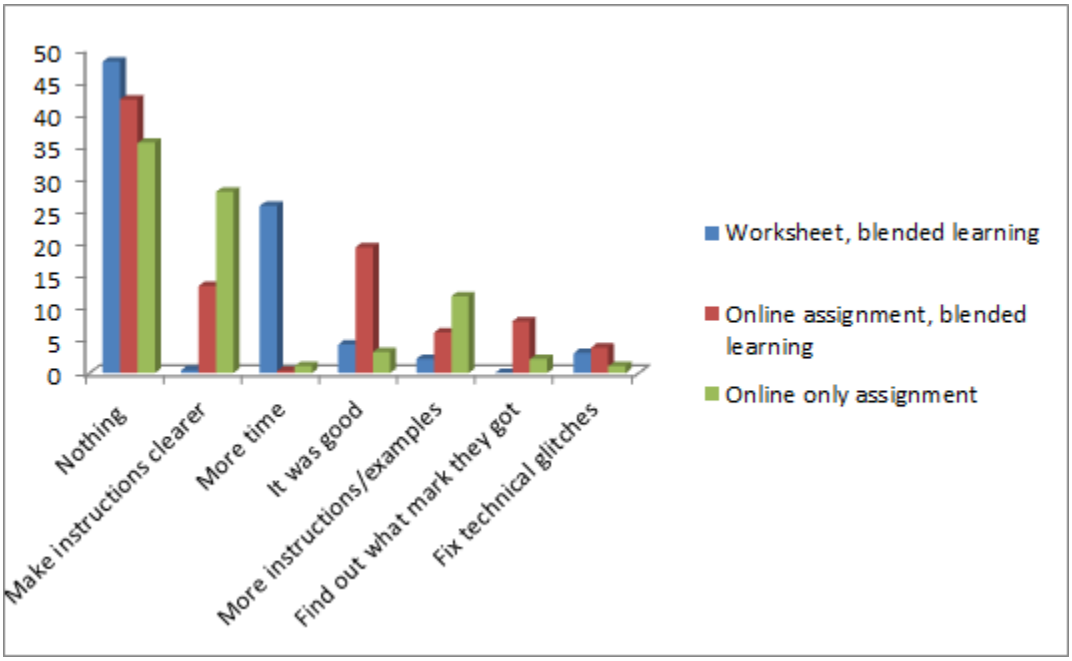

Figure 8. Frequency of responses to the open ended question "If you could change one thing to make this session better for you, what would it be?"

Discussion

Results from this analysis show some reactions that students have to information literacy instruction.

In most cases, students seem to prefer online assignments presented in an active learning setting where they can work with peers and discuss or ask questions of their TA's or librarians.

The results show that online assignments without the active learning setting can be problematic, especially for first year students. There is a tendency for students to not understand the goals of the exercise. The students may not have the opportunity to work with their peers on the assignment, which greatly enhances the learning experience.

Students clearly felt very comfortable asking questions in a blended learning situation (91.5%) as opposed to online only assignment (52.9%). This reflects the librarians' experience in the classroom and online. Many of the email questions received from students working on the online only assignments are sent late at night, and this may be a factor in connecting with them at the point of need. Students frequently emailed the biological sciences librarian who often received more than 200 emails from a large first

year course. Students who sent emails were often looking for elementary information such as the due date for the assignment. In some cases students assumed the librarian was the instructor or TA for the course. In a few cases students asked specific questions about the assignment. Statistics from the use of Youtube videos can also be collected. In the first year that screencasting videos were used in an online only assignment, the videos were viewed 1,000 times. In the following year the number of views increased to 8,000 because more videos were created to replace aging PDF's, and some topics were split into two videos. The videos were also repurposed on the Biological Sciences Library Research Guides.

Students reported a preference for working with one other student in blended learning situations as opposed to working on their own if the assignment was online without any class time. Students who were working on online only situations indicated that they worked on their own more but would have preferred the choice of working with one other student. Some students noted on the evaluation form that they wished that the instructor had paired them with someone, suggesting some students felt uncomfortable finding a partner on their own or that opportunities may not be available for students to pair up on assignments when online. Assigning students to work in pairs may facilitate a more cooperative learning situation.

It was interesting to see what skills the students liked learning about in the various types of instruction sessions. The popularity of the RefWorks (a bibliographic management system) instruction may have been the result of the students' desire for this kind of tool. Since that time, many databases now offer a citation creation button making the need for this kind of tool less urgent. It was encouraging that the students actually liked learning how to search effectively and learning to cite information. The responses from the question 'what would you change?' were very useful in terms of modifying future assignments. For instance, comments about more time being needed provided incentive to move from paper workbooks to online assignments. The students were also able to express their frustration about the lack of detail in instructions which we had initially made as brief as possible because we thought students didn't like to spend their time reading them. These comments led to the use of screencasts. Students also indicated their main motivation for working through the assignment – marks, and their desire to see their final mark immediately. This decision was always made in consultation with the SLD who preferred not to release the marks until after the due date. However, the SLD's all preferred an assignment that the students could complete successfully. When using online systems, technical glitches are inevitable, especially in the blended workshops. As an instructor, being able to troubleshoot and make decisions on the spot is a valuable skill.

Conclusion

First year students at universities struggle with time management and disorganized work habits. This study indicates the need for detailed and precise instructions for each assignment, particularly if only available online without instruction, so that students can more easily understand and complete such assignments.

Gauging the best way to teach information literacy skills to university students is complex. Many teaching assistants see the need for library instruction in first year courses because students lack information literacy skills. This feedback, plus feedback from upper level students, suggests that there is a need for librarians to embed library instruction in first year courses and therefore to work with faculty to achieve this goal.

Given the increasing enrollments at universities and the decrease in available staff and teaching spaces, teaching library skills in a blended teaching or online environment seem to be good solutions (Usova 3). For large first year classes it may be impossible to find appropriate space and staff to provide blended learning situations, so in these cases teaching online may be the only alternative. To provide the optimum learning situation, careful attention must be paid to relevant subject content, active and online learning theories, and feedback from students. By doing so, online learning modules can be effectively designed to replace or supplement face-to-face instruction or hands-on learning for information literacy. Anderson and May reported that the style of instruction has no impact on the retention of information literacy skills by students (498). However, a more recent study by Mery et al. reports that a well-designed online tutorial for information literacy can be more effective than either a lecture or help from a TA (375).

The discrepancy among studies about the most effective way to teach information literacy skills is due to a multitude of factors, including diverse student learning styles, the amount of collaboration with faculty/staff, and whether students receive credit for taking the sessions. Online learning may not address the various learning styles of students or may not be appropriate for all styles of teaching. The learning styles of students tend to vary according to their field of study (Jones, Reichard and Mokhtari 372), adding another complication. For instance, their study indicates that science students may show a preference for active learning (368-369).

The information gleaned from this study can be used by librarians to make informed decisions about instruction programs. It appears that students want as much assistance as possible, whether that assistance is in person from a librarian, teaching assistant or peer, or from supporting materials. Students indicated that they require thorough and detailed instructions and examples when working through online tutorials. This feedback is a good reminder for librarians who, with our knowledge of information resources, may take for granted that our instructions are simple and clear.

One of the biggest challenges for instruction librarians is to make online modules more engaging and personable, whether online or as a face-to-face alternative, in the form of office hours or drop-in clinics (Jacklin and Bordonaro 1). Evaluations showed that students are not comfortable asking questions via an online tutorial. This could be because students may not know how to go about getting help if no one is physically present during the exercise. For example, students may not know if they should contact the librarian via chat, email or phone. Also, students may be working on assignments outside of a librarian’s regular working hours when they can’t get immediate help.

Gutierrez and Wang reported that students felt they learn better from a human instructor than from an online tutorial (209). It is critical for librarians to explore strategies for increasing the comfort level of students who are participating in online instruction sessions. Perhaps requesting class time from the professor or creating a video for online courses to introduce the librarian could help ease the anxiety of first year students. In either case, having the professor provide contact information for the librarian is valuable. Kop, Fournier and Mak, reporting on a study with MOOCs (massive open online courses), mention that online learners are engaged if they feel comfortable, trusted, valued and can interact with other learners and instructors (88). Strategies for assisting students are needed, especially for those students who are working on the online library assignments in the evenings or on weekends. Librarians also need to develop creative ways for encouraging students to work in pairs or groups in online and blended environments. Chickering and Gamson (5) discuss the importance of collaborative learning as an important factor for deep learning. One common strategy is to design instruction such that students work in pairs or in groups.

Another challenge for online tutorials will be to get feedback. Students seem to be reluctant to answer online evaluations, unlike students in a blended learning environment.

There are some positive outcomes from these evaluations. Students appear to embrace learning basic information literacy skills in an active learning situation. They also like having help available in a just-in-time context, and they embraced co-operative learning by wanting to learn with their peers.

Modifying supporting materials to respond to student needs can be done by taking advantage of the statistical analysis tools available in course management systems, which can be used to target questions with which students had problems and improve online teaching moments via screencasts, PDFs, or other support materials.

There are many areas of research that still need to be explored. Further research into whether or not students' marks benefit from online, blended, or face-to-face information literacy instruction would be interesting and beneficial. Also, further study into learning styles and gender differences will be important in all styles of teaching, as will innovation in creating a welcoming atmosphere for students. Another area of exploration is the potential value of multiple choice questions embedded with PDF's and screen capture videos as an active learning tool based on active learning theories.

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Appendix A - Example of an Evaluation form used to access blended print-based sessions

Library Instruction Session Evaluation
BIOL 2P92 Library Lab

Please fill in this form in order to help the library instructor evaluate how successful this session was and determine what improvements can be made. Your input is a critical part of this process and a thorough response will be very useful.
1. The results of this survey will be compiled and analysis for possible publication. Check this box if you consent to having your survey used in this manner?
Forms submitted without this box checked will not be used for research purposes.

2. Indicate the degree to which you agree or disagree with each statement.

Statement:	Strongly Agree	Agree	Neutral/ Undecided	Disagree	Strongly Disagree
The main goals of this session were clearly stated by the library instructor.					
The material presented in the session was new to me.					
The information I learned in this session will help me look for information.					
The amount of material covered was suited to the time allotted.					
I felt comfortable asking questions when I needed help					

3. The level of instruction was:

Too difficult	About right	Too elementary

4. During this lab I worked:

On my own	With one other student	In a group

5. I usually prefer to work:

On my own	With one other student	In a group

6 What did you find the most useful in the session today?

7. If you could change one thing to make this session better for you, what would it be?