Communications in INFORMATION LITERACY

Volume 8, Issue 1, 2014

INVITED COLUMN [PERSPECTIVES]

THE FLIPPED CLASSROOM TEACHING MODEL AND ITS USE FOR INFORMATION LITERACY INSTRUCTION

Sara Arnold-Garza
Towson University

ABSTRACT

The flipped classroom, a teaching method that delivers lecture content to students at home through electronic means and uses class time for practical application activities, may be useful for information literacy instruction. This article describes many of the characteristics of the flipped classroom teaching model, illustrated with examples from current higher education and library instruction literature. Pedagogical benefits of the model are highlighted along with potential challenges to its use.

INTRODUCTION

The flipped classroom is known by various names including the inverted classroom, and more simply, the flip. Origination stories differ, but most credit Jonathan Bergmann and Aaron Sams, high school chemistry teachers from Colorado, who began using recorded lectures in 2006. The flip evolved out of a history of experimentation with the concept of hybrid, or blended learning and problem based learning, using active learning techniques and new technologies to engage students. The flipped classroom has two defining components: moving the lecture outside of class, usually delivered through some electronic means, and moving the practical application assignments, formerly homework, into the classroom (Educause, 2012). There are many other optional components that arguably optimize this structure and provide enhanced learning opportunities to students, creating a wide variation in practice ("Flipped classroom offers," 2011). The lecture format has varied and evolved from slides, audio, podcasts, or narrated presentations, to video casts that may also incorporate animations, screen captures, and other multimedia content. The classroom component is varied as well, with different learning expectations, engagement techniques, levels of student autonomy, and other variability (Sams, 2011). In fact, instructors have taken countless paths to teaching with the flip because the learning context and objectives determine which features are most useful (Bull, Fester, & Kjellerstrom, 2012).

Khan Academy, Coursera, TED talks, and even YouTube are online resources associated with the flipped classroom, providing access to recorded lectures, instructional videos, and sometimes other interactive elements for teaching and learning. In many cases instructors implementing the flip depend on these resources to provide the lecture content (Bull, Ferster, & Kjellstrom, 2012). Sourcing of content from outside may be helpful for those who lack presentation skills, extensive subject knowledge, or need an outside perspective to enrich their course. Scott McLeod, a leader in educational technology and the Director of Innovation for Prairie Lakes Area Education Agency 8 in Iowa, notes that these large educational video sites are innovations that were not created by established education groups but instead came from outside "to fill the vacuum" that educators had left (as cited in Tucker, 2012, p.83), leaving the possibility that as this learning model grows, educators may take back the reigns.

WHY USE THE FLIP?

Instructors of all kinds cite strengths of the flipped model, including efficient use of class time (Cole, 2009), more active learning opportunities for students (Gannod, Berg & Helmick, 2008), increased one-on-one interaction between student and teacher (Lage, Platt, & Treglia, 2000), student responsibility for learning (Overmyer, 2012), and addressing multiple learning styles ("Flipped classroom offers," 2011; Gallagher, 2009; Gannod, et al., 2008). Each of these features has implications for student learning and may be more strongly or weakly demonstrated depending on the specific implementation.

As curriculum requirements grow, instructors are pressured to make more efficient use of class time. In the flipped classroom, students can get the most out of class time by spending it on practical application, not on inactive lecture (Cole, 2009). Lecture content can be provided just as well through electronic means. Perhaps it can even be improved because professors

may be obliged to make video lectures a manageable length. This could have the effect of distilling a topic to the most important points with no extraneous information. Or, they may break a topic into several videos addressing subtopics, a technique known as *chunking*, which could help students access and process a large, interconnected set of ideas more easily. Electronic methods can also take advantage of interactive technologies like online tutorials or quizzes. Sometimes these additional components are employed to reinforce the concepts discussed in the video lecture, other times to ensure that students are actually viewing the lectures before class. This transfer of what has traditionally been passive learning out of the classroom leaves class time to focus on the more engaging elements of teaching and learning. It provides an opportunity to increase meaningful engagement for students without requiring more resources (Schullery, Reck, & Schullery, 2011). The issue of using time differently in this model is associated with many potential improvements: more time to interact and clarify material, more time to explore concepts deeply, and more time for additional learning objectives or practice with active learning (Boucher, Robertson, Wainner & Sanders, 2013).

Active learning is not unique to the flipped classroom model; instructors have used the strategy of incorporating active learning exercises even before Bonwell and Eison published their report on the technique for the Association for the Study of Higher Education (ASHE) in 1991. Learning by doing is a principle that teachers have used to shape classroom experiences in many ways. The flip provides more time for active learning to happen in the classroom setting, and encourages instructors to view incorporation of active learning as a core component of teaching, rather than supplemental to a lecture (Gannod, et al., 2008).

Increased one-on-one interaction between student and teacher is a by-product of allowing students to engage with concepts, learning materials, and peers in the classroom. By structuring exercises that allow students to manage themselves in small groups or individually, instructors can address questions and problems as students encounter them and check in with individuals and groups around the classroom as students work (Lage, et al., 2000). In fact, Enfield (2013) identifies the support component of classroom application as the specific rationale for using the flip, citing student difficulty with unfamiliar material in homework, and the opportunity that in-class work would provide. Additionally, there is more time for extended classroom discussions and exercises, helping students reach deeper understandings of concepts (Kellogg, 2009). Pierce and Fox argue that "quality, not necessarily the quantity, of student-teacher interaction is a compelling force in improving student performance" (2012, p.4), and the flipped classroom provides this through active learning during class. Lage, et al., (2000) warn, however, that this benefit would not extend to the largest classes without additional teaching assistants.

Another often cited feature of the flip is the change in emphasis from instructor responsibility for student learning to increased student responsibility (Educause, 2012). Students in this model generally have a more active role and ultimate responsibility for their learning (Gallagher, 2009). They must follow through on viewing the lecture; they must engage during class through a variety of methods. In one case, a researcher–instructor was

particularly interested in preparing students who would move on to a more project-focused portion of their curriculum the following semester and would need to be able to direct their own learning in the very near future. He flipped his classroom specifically to help students learn to take more responsibility for their own learning (Laman, Brannon, & Mena, 2012).

This autonomy also means that student learning diversity can be supported. With asynchronous access to lecture material, perhaps in more than one format, students who need time to review information or to pause and process can do so, while students who are ready to move on to the next concept can do so right away. By varying the examples provided in lecture content from those in class activities, instructors can support "transfer of learning to new situations," (Enfield, 2013, p.16), which may be a challenge for some students. In class, learning differences are also supported: students may reflect on the lecture material through questions and discussion with their teacher, by working with their peers to solve problems based on lecture content, by demonstrating or arguing their own solutions to classmates and the teacher, by checking their understandings through in class experimentation and lab work, and by peer tutoring or creation of learning objects (Overmyer, 2012). This kind of interaction helps students fill in each other's knowledge gaps. They are able to "enter into a conversation about a subject at the level they are comfortable with, and by this very conversation they can gradually build their own knowledge about a subject by tying it into what they already understand" (Stebbins, 2012).

In one case, instructors alerted students to their responsibilities at the beginning of the flipped course (Lage, et al., 2000), and others mention the importance of communication to student buy-in (Findlay-Thompson & Mombourquette, 2014). This kind of warning can serve two roles; first, to be sure students understand that this model may demand more from them than a typical lecture, and second, to empower students with the understanding that they control their own learning. The amount of control given to students may vary by circumstance, but at the very least, by sharing learning outcomes, instructors ensure that students understand what they should take away from electronic lectures before applying the skills in class.

Strayer posits that due to this increased responsibility, this model may be less useful for freshman students (2012). He points out that students not yet advanced into their area of specialization may lack genuine interest in the material, making expectations of investment unrealistic. Although it may be true that less mature students can be frustrated by demands for their time and attention, the argument that students in general cannot adapt to this model until they are advanced is not supported by the evidence. Freshmen are usually taking a variety of classes across disciplines which demand a variety of learning methods. Additionally, they will have had high school classes that depended on pre-reading and in-class discussion like literature, English and writing classes. Further, the pioneers of the model were middle school teachers, and the literature about its use in K-12 environments is abundant. Clearly, students of all ages have participated successfully in this type of learning environment. Success seems to depend on factors other than the age or academic level of students.

Due to the increased responsibility for students, a lot of support and clear expectations should be communicated.

Students may respond with confusion or discomfort when they are required to adjust to the model. This is not necessarily a barrier to success (Strayer, 2012). If instructors anticipate this effect and provide the support students need as they experience difficulty, students may work through the change to become more independent, reflective learners. For Bergmann and Sams, this support means telling students what they must be able to do by the end of a unit, providing multiple ways of engaging with the content, allowing for demonstration of learning through a variety of channels, and being fully available to students as they work through the process. Furthermore, the "messiness" of this model provides opportunities for students to overcome their own mistakes and prevents instructors from "saving" them from problems without getting the deeper learning experience (Carpenter & Pease, 2012, p. 38).

Who Is Using the Flip?

Flipped classroom experimentation is happening in many disciplines, and the examples referenced in this review span from engineering to life sciences to business to statistics. These disciplines often depend largely on students understanding underlying principles and theoretical concepts before being able to engage in practical application or problem solving (Gannod, et al., 2008), which is why using the flip is attractive for them. Overmyer observes that the model is useful "where content is usually more technical and linear" (2012, p.46).

Martin notes (as cited in Berrett, 2012) that the humanities have long taught by focusing class time on discussion, since the subject matter lends itself to this model. Although not identical to the flipped classroom, students do complete readings before class, in order to be prepared for engaging in guided discussion with their instructor and peers. The flipped classroom makes this action more intentional by alerting students that they will be expected to know enough when they come to class to engage with each other and the instructor through activity. In class, discussion may allow for the possibility that some students will not participate; in-class activity means everyone will have work to do, and not participating is not an option.

The Flip in Higher Education

The flipped classroom appears to have originated in a middle school environment, and the majority of literature exploring its use is focused on K-12. There are plenty of examples of and interest in its use in higher education, however. In this environment, we hope to prepare students for jobs or make them capable of applying concepts learned in the classroom to real life situations. Flipped classroom pedagogy also prioritizes student ability to apply learned concepts in problem solving. Lage, et al., in one of the earlier and most widely cited articles on flipping the classroom in higher education, transformed their economics teaching with the "inverted classroom" approach, accommodating the classroom diversity instructors are increasingly facing (2000). In many cases, higher education instructors don't seek to build a flipped classroom; they stumble upon it after working to build a more engaging learning experience that takes advantage of the technology currently available, like Dotson and Diaz, who compare their assignment redesign to the "classroom flip" based on a desire to use active learning and technology to extend students' education outside of the classroom (2008, p. 4). Others identify the model as one that meets their pedagogical needs, like

Findlay-Thompson and Mombourquette, who articulate that "application, analysis, and evaluation" skills are the needs satisfied by a flipped course redesign (2014, p.65). Berrett's 2012 exploration points out that for universities, the flipped classroom offers a way to more efficiently provide access to in-demand lecture classes: it takes advantage of improved technologies to ensure student learning outcomes are met, even when resources are scarce due to a grimmer economic environment. Schullery, Reck, & Schullery (2011) strengthen this argument by describing their move from courses relying entirely on lecture in classes of 300 students, to active learning in groups of 24 students for a large introductory business course. The model offers efficiency while also providing an improved platform for engaging students.

Gallagher illustrates how a quest to increase research-based learning can result in flipping the classroom (2007). At the University of California, Berkeley, she helped a team build a new undergraduate research program. Their organic process to build assignments which supported this program resulted in inverted classrooms. Motivated by learner centered design, they put students in control of preparing themselves for class engagement with the assignments.

Library and Information Literacy Instruction

Commonly understood characteristics of information literacy (IL) instruction, like those described by the *ACRL Characteristics of programs of information literacy that illustrate best practices: A guideline* (2012), hereafter ACRL's *Guideline*, frequently match the desired characteristics in a flipped classroom. For instance the planning category provides guidance that is suggestive of the flipped classroom when advising that best practice "accommodates the level of the program, department, and institution; addresses and prioritizes human, technological, and financial resources…; [and] encourages librarian, faculty, and administrator collaboration at the outset" (2012, Category 3, para. 1). A highlight of the flipped classroom is that it provides support at the level required by individuals, and it is flexible within a range to meet the needs of different learners. Classroom engagement activities can allow for this accommodation and provide opportunities for those planning instruction programs to collaborate on outcomes and the paths for getting there.

Lage, et al. (2000) suggested that planning for a flipped classroom requires reflecting on resources available and using them to best suit the unique situation, depending also on possible input and collaboration of a teaching community. Collaboration is more clearly defined by ACRL's *Guideline* as its own category, stating that collaboration "focuses on enhancing student learning… [and] works within the context of the course content…" within an IL program. In the economics discipline context, Lage, et al. (2000) considered the potential contributions of their own colleagues as well as outside sources.

The most fertile ground of ACRL's *Guideline* is Category 7: Pedagogy, which almost perfectly describes a flipped classroom, with emphases on diversity in learners and teachers, use of interactive and progressive activities, use of appropriate technology, connecting skills to real-world needs, and seeing the learner holistically, not just in one learning context. The fact that these best practices for IL instruction align so well with a flipped classroom is a strong argument for its use in library

instruction.

Librarian instructors typically want students to achieve IL learning objectives by understanding information search and use concepts well enough to apply them in their own work. Cole & Kritzer (2009) indicate that having students come to class prepared to employ what they've learned from an electronic lecture is useful for simulating real world activities. Library instruction is generally focused on making sure students are prepared to replicate the search and evaluation processes they take from the lesson. Therefore a simulation environment, which also provides an opportunity for feedback and adjustment, is certainly an efficient way to use the very limited classroom access that librarians have (Cole & Kritzer, 2009). As Smale puts it, "With so much of our library instruction dependent on one-shots…it seems like anything we can do to help students get more out of that single session is worth a try" (2012).

As instructors, librarians generally believe that an ideal IL session is one that provides lots of active learning opportunities and allows students to practice information seeking and use skills in the classroom while the librarian is present to assist with difficulties encountered. Illustrating this, Dotson and Diaz compare their online library assignment to the flip because it offers interactive work "outside of precious classroom time" (2008, p. 4). Additionally, students often come to a library session with a range of knowledge; librarians cannot always determine what level of instruction is best. The advantage noted by Stebbins (2012) of the flipped classroom model is to meet each student at his level and gradually bring all students to a shared level of understanding; this is especially important to one-shot library instruction.

Use of the Flip by Librarians

The literature shows us that librarians have taken part in the use of the flipped classroom model. Earlier publications by or about librarians in a higher education setting point out their roles of instructional support for the flip: introducing faculty to the concept, providing pedagogical design, and serving as technological support for implementation in the classroom. This is unsurprising, given that librarians have long served as early instructional technology adapters. Podcasting serves as one example, with librarians publishing since the invention of iPods on use of podcasting in teaching and learning (DeVoe, 2006; Graham, 2006). Online learning modules and web tutorials to replace the traditional lecture are another example, and Ladner, Beagle, Steele, & Steele (2004) write about using electronic means to replace lectures for library instruction content in a nursing program as early as 2003.

Joyce Valenza, a blogger for the School Library Journal, asks the question, "Who better?" than librarians to introduce new teaching concepts, select educational content, train teachers, and support student contributions for the traditional classroom. She identifies the librarian as a "trusted tech scout," expert searcher and evaluator, media trainer, and collaborator, qualified to best serve as connector to the flip. Her conclusion makes the strongest point, though. The library is transformed: resources are moving online, and physical library spaces need to transform, too. By flipping the library itself, we use the model to achieve a necessary and fundamental shift for the library to accommodate student needs (2012). The information commons, a physical space change that accompanies a philosophical shift, is an example of this

transformation taking place in libraries. The information commons can play a special role in supporting flipped classrooms by providing access to technology and perhaps encouraging a less "isolating" experience for students working outside of class (Beagle, 2006). In these supportive spaces, technology access and collaborative work are facilitators of student learning.

Gallagher (2009) illustrates the instructional support role identified for librarians. She describes an effort at the University of California, Berkeley, to redesign the curriculum. As part of a group of faculty from across disciplines, she helped build courses and assignments that were meant to promote more inquiry-based learning. What they ended up with was the flipped classroom model; students are exposed to an assignment before class that prepares them for discussion and engagement with new material. A librarian included in the design process can organically integrate IL into learning, and as instructional technology gurus, librarians influence how faculty members teach by setting an example of techniques, like the flip (Stebbins, 2012).

The Association of College and Research Libraries' (ACRL) Keeping Up With… series, which provides trend briefs relevant to libraries and higher education, recently covered the flipped classroom (Benjes-Small and Tucker, 2013), signaling that the technique is on the radar for our field, and there are a growing number of published examples of its use for IL instruction.

In 2009, Miami University was using the flipped classroom in courses across the curriculum. The library was motivated to participate by creating web video tutorials demonstrating the use of their resources (Michel, Hurst, & Revelle, 2009). The business librarian piloted the model with a marketing class and spent class time consulting individually with students to advise them of the best resources for their own projects. Other librarians adapted the model to their own subjects and courses. However, some faculty members were not comfortable with moving to a lab environment. In these cases, abbreviated lectures were still delivered and students were directed to view the video tutorials for more explicit directions on specific resources. The authors state that they plan to assess their efforts and do usability testing. Despite a comprehensive exploration of the environment, web video, pedagogy, and institutional needs, the authors' description provided too few details to replicate their work in a local context. Unknown factors included whether librarians collaborated with faculty to get students to watch video tutorials ahead of time, what resources or concepts were addressed in videos, what students were expected to achieve during class time, or if the students were given any specific guidance.

Rachel Borchardt shares her attempt at using the flipped classroom model to help students in an environmental science course learn about their library, how to find articles, and how to evaluate sources during Episode 39 of the Adventures in Library Instruction Podcast (2012). Borchardt worked with a professor that she perceived as receptive based on their ongoing teaching relationship to assign tutorials as homework before their meeting during the second week of class. Students came to class primed to understand how to navigate the library website, how to search for articles online, and how to apply criteria to evaluate sources. In class, students were split into groups, each of which would investigate one of four assigned sources: Google, Google Scholar, and two subject specific databases. The groups each created bibliographies with

four good sources, and then they were combined into two large groups that narrowed their sources to the six best. The two groups explained why their chosen sources were the best. A winning group was selected by the librarian and professor together; the decision was based on the evaluative criteria provided.

Borchardt's discussion illustrates some idiosyncrasies of library instruction in this model. First, she emphasizes that she had an existing collaborative relationship with the professor for the class and felt proposing the changed format would be welcomed. Further, she highlights the concern many librarians have that getting students to complete work outside of the class is a challenge. Both of these issues make clear that collaborating with faculty is essential to employing the flipped classroom for any course integrated library instruction. In many cases, it will be a one-shot session; this means that the faculty member holds a lot of power in making the flip successful because he/she must ensure that students come to class prepared to engage with the librarian.

Borchardt also required students to apply skills they should have been introduced to in the tutorials. By asking them to work in groups, the librarian ensures that each student can observe nuances as he/she demonstrates what each student picked up (or didn't) from the tutorials. Motivation for students to engage in this sort of exercise could be a challenge since the research topic was assigned and not an authentic need for each student researcher. Group work may be a helpful way to overcome this challenge since students may feel pressure to contribute to the group.

More recently, other librarians have gone online to share their own experimentation, including Christina Steffy, a Pennsylvania librarian writing on her state association's blog (2013), and Kimberly Miller, documenting her first year as a librarian at ACRLog (Miller, 2013a & 2013b). Steffy provides her rationale for the flipped lesson with nursing, emphasizing the limited time she gets with the students and their inconsistent backgrounds in IL concepts. She describes in-class activities meant to engage students and allow for multiple solutions; this echoes the argument that this model supports learning differences. Miller acknowledges the need for a collaborative relationship with faculty and for students to have more class time developing complex understandings of IL concepts, not just the mechanics of a Boolean search. Although students may not always complete the assigned pre-work, Miller points out that small groups can alleviate the knowledge gap among students. Additionally, despite initial disorientation, she and the students seemed to enjoy and make the most of class time with the change.

Datig and Ruswick share the activities used at Mary Baldwin College to flip IL instruction in their recent article (2013). The change was motivated by a wish to use more active learning techniques and was eased with the use of existing video tutorials created by the library. One activity described students choosing between text- or video-based preparations on an individual basis, illustrating the flipped format's ability to meet different learning needs. All of the in-class activities depended on students working in small groups to complete a task, such as finding and choosing an appropriate website source, determining the type and nature of a source, and conducting database searches, then sharing their results with the larger group. Overall the feedback was positive from students, librarians, and faculty. The authors note that longer term

assessment would provide better information about student learning outcomes. They also suggested implementing methods to check if the students had completed pre-class work. One of the more interesting observations, not investigated as part of the project, was the change in perspective required by the librarian: "running a flipped classroom means developing a whole new skill set and way of being in the classroom" (Datig & Ruswick, 2013, p. 257).

An especially detailed exploration of the inverted classroom for IL instruction comes from the legal research realm. Lemmer (2013) redesigned a master's level, semester long legal research course specifically tailored to meet the needs of international students. The pedagogical needs of the discipline and the learner group were well matched with a flipped model. Namely, students coming from other countries, with different legal contexts, and entering a professional field that demands a comfort with the use of technology and practical experience before employment are well served by the lab environment this course provided. Lemmer had the benefit of creating an entire course, and therefore building trust and appropriate expectations with the students participating. In this context, she found that assigning pre-reading and online instruction before weekly labs in which student teams collaborated on research hypotheticals successfully supported her goals of teaching problem solving, fostering collaboration, supporting different learning styles, and integrating assessment over the course of the experience. Students completed course evaluations not exclusively focused on the flipped format, but positive nonetheless. The instructor concluded from her own observations that the change in format is an improvement, and she advocates for change across the field of legal education.

Challenges of Using the Flip in Library Instruction

There are differences between library instruction and semester long classes at the university that present challenges to implementing the flipped classroom model. Primarily these challenges are logistical: how do you assign pre-work to a class you haven't visited yet? This will require early coordination with the teaching faculty member to provide the assignment to students. Further, even if assigned, students may not actually do the pre-assignment if no grade is given. Clearly, a good working relationship has to be in place between the librarian and the instructor to ensure the logistics are handled easily. Additionally, if the class is taught in the typical lecture mode on a regular basis, students may have difficulty adjusting to this different model for a single class, or just a few class periods. Librarians frequently have difficulty getting students to engage, since they may be meeting for the first time, so expecting this higher level of trust and openness from students may not be realistic.

Elaborating on Scott McLeod's urging of teachers to "Start making!" (as cited in Tucker, 2012, p. 83), Katie Gimbar argues against using videos created by others. Instead, she says instructors who create customized videos for their classes will be most effective because they understand their audience best, and learners have an established bond and trust with their own teacher (as cited in Valenza, 2012). Academic librarians have a practice of sharing materials, as evidenced by sites like the Animated Tutorial Sharing Project (ANTS), the Peer-Reviewed Instructional Materials Online (PRIMO) database, the Multimedia Educational Resource for

Learning and Online Teaching (MERLOT), and the Cooperative Library Instruction Project (CLIP), which are all dedicated to storage and exchange of resources like tutorials and handouts for library instruction. The time and effort required to create these learning objects makes reuse and adaptation desirable, but perhaps it comes at a cost for customized learning. Librarians may argue that in typical one-shot sessions, the bond and trust referred to by Gimbar is simply not present anyway, so there is nothing being sacrificed by the use of others' materials. At the very least, efforts to customize assignment instructions with an introduction to the librarian using local logos and institution-specific language can be helpful for providing a context to students.

Criticisms of the Flipped Classroom Model

As with any pedagogical theory, the flipped classroom is not without criticism. One challenge raised by researchers and instructors is use of the model as an excuse to continue bad teaching or implementation without reflection. The time shift used to transfer work also causes problems for some teachers who may value spontaneity during lecture. It can also be argued that a larger time investment is required, at least initially, for implementing the flipped classroom.

This seemingly simple model, if not evaluated and implemented with care and tailoring, may only be a continuation of a broken teaching model. As pointed out by Ash (2012, para. 5), video lectures are just "a high-tech version of an antiquated instructional method." This argument depends on the belief advocated by many others that lectures are not an engaging learning vehicle and by finding a new way to deliver them, we don't actually change the dynamic (Nielsen, 2012; Bull, Ferster, & Kjellstrom, 2012). In response to this, some instructors have changed their implementation to what is called the mastery model, putting off direct instruction in the traditional sense until students can no longer depend on discovery through activity. Students are given all the tools they need to achieve objectives and are given freedom to choose among those tools. Quizzes and other assessment will eventually ensure equity of knowledge (Ash, 2012). Other instructors advocate for an enhanced pre-class experience, like using the software created at University of Arizona, Guide on the Side, to provide instruction and interactive components to students as they work through tasks before coming to class (Becker, 2013). We are cautioned to understand that even when trying new techniques, an instructor is only successful if he/she truly analyzes the whole learning experience and uses the technique within that experience not as a shortcut to skip a real analysis (Ash, 2012).

Jonathan Bergmann notes that by reviewing lecture content at home, students cannot get immediate answers to their questions (as cited in *Flipped classroom offers*…, 2011), as often happens in the traditional classroom. He asks students to keep notes and begins class with a Q&A session, but instructors might employ other remedies like online discussion boards and blog posts, interactive tutorials or quizzes, and journaling in order to help students record their spontaneous reactions and questions to new information. A flipped class in cost estimating for industrial engineering students (Kellogg, 2009) provides a very high level of support for the lecture at home: built-in examples from the online text allow students to enter data that is corrected by the module. Students can test their own understandings immediately, and they are

given corrective feedback through the interactive text. Additionally, short quizzes at the end of the readings must be completed before class; this ensures that the reading is completed, and it helps the students become aware of their comprehension level of the material.

The more complex or sophisticated the lecture tools and learning objects are, though, the more time is required of instructors. This aspect of implementing the flipped classroom is addressed by many who have tried to use the flip (Gannod, et al., 2008; Lage, et al., 2000; Michel, Hurst, & Revelle, 2009). In addition to creating lectures and in-class exercises or materials, instructors may need to learn new technology skills to create video lectures (Educause, 2012). However, instructors can expect the time invested in creating materials for the flipped classroom to be reduced after the first implementation, because reuse and adaptation will mitigate time investment in future classes. It is not just the creation of electronic lectures that can be time consuming, though. Even in the case of Laman, et al. (2012), where the pre-class "lecture" was composed of readings, detailed planning was required to plot the progress of learning expectations and make them clear to students, to create appropriate assignments that ensured readings were completed, and to plan ways of engaging a full class of 42 students.

The self-paced nature of the flipped model has been touted as a benefit for those using it but it has also been described as a disadvantage for some students. Although many students will love the opportunity to work through material more quickly or take time reviewing information at a slower pace, some students will not be capable of managing their own work and time (Ash, 2012). Although written as a blanket statement, Strayer's concern detailed above regarding a younger student's ability to succeed in the flipped classroom is not supported by evidence; his point that students may benefit from deadlines and support provided by instructors is useful indeed. Nielsen suggests that schools are not really ready to embrace self-paced learning (2012). Even instructors who are comfortable with this idea will be limited to their own classroom environment unless entire school systems overhaul their promotion systems and base them purely on student learning progress and achievement, an unlikely scenario. This view is reinforced by Evans (2011) who believes that the level of trust administrators must give instructors in order to embrace this much innovation across the curriculum would be a "huge cultural shift." Instructors in higher education certainly have more freedom in their classroom than K-12 teachers, but a disruptive change may still provoke scrutiny.

Inequities in students' home lives can also cause a barrier for the flipped model. Technology needed for viewing or interacting with lecture material may not be available in every student's home (Nielsen, 2012). It should be noted that Bergmann and Sams report this has not been a problem in their classroom where students who may not have reliable internet access were given CD-ROMs to use. This barrier is also less of a concern in a higher education context where computers are available for on-campus use throughout the day and sometimes late at night. Students in college generally expect to depend on campus technology to complete at least some of their work. Certainly, if every course at an institution were flipped, resources to support this model would have to be taken into account. Another kind of inequity may actually be mitigated with the use of the flipped model:

parental involvement and education level. Students completing homework will have different levels of help available to them from parents who may or may not have the time or knowledge to be a support for their child. Students tackling these assignments in the classroom will all have a chance to get face-to-face help directly from their instructor (Ash, 2012).

Assessing the Flipped Classroom

Assessment of the flipped classroom model is addressed by some researchers, although most of the articles reviewed here use methods that do not directly measure student learning as a result of the flip. Some measure learning indirectly, through instructor and student perceptions of learning. Some measure associated factors, like student engagement, which could be an indicator for learning. Very few of the reviewed articles outlined a method for assessment that used student performance on quizzes, exams, or final course grades (Laman, et al., 2012; Pierce & Fox, 2012; Boucher, et al., 2013, Findlay-Thompson & Mombourquette, 2014). Laman's engineering course was taught for many semesters before implementing the flip, providing ample grade data for comparison. In addition to measuring student performance, this implementation also measured student perceptions with a mid-semester survey and an end of semester focus group, providing the most comprehensive assessment strategy of all reviewed articles. Notably, for those reporting on student outcomes, Findlay-Thompson and Mombourquette's business course did not find grade improvements despite student reports that they felt they performed better (2014).

Librarians continue to experiment with assessment of classroom learning and teaching, but they are still developing how best to demonstrate the value of their class visits. This is an unsettled matter, and introducing a new teaching model to measure against the old may be difficult if consistent assessment is not already in place. Although ACRL's *Guideline* document asserts that best practice requires program level evaluation and direct measurement of student learning outcomes, this is still an area of needed growth for academic libraries. The flipped classroom may complicate an already murky assessment outlook, or it may offer new opportunities for integrating assessment into technology tools and out of class experiences.

Conclusion

The flipped classroom, which has grown in popularity across teaching venues and age levels, may offer some distinct benefits for IL instruction. The features of this model include a focus on efficient use of class time which accommodates different learners, engages with problem-based learning, increases student-teacher interaction, and allows students to take responsibility for learning so that they may transfer these skills to other contexts. These features lend themselves to library instruction which requires learners to understand basic processes which they can apply to research scenarios, to engage critical thinking and problem solving skills that can be learned best through experience.

Current literature provides some limited insight into librarian experimentation with the flipped classroom. The challenge of assessing IL outcomes may hinder many from conducting formal research on library instruction interventions, including the flipped classroom. Even with just a few

examples to follow, librarians should feel reassured that use of the ACRL document *Characteristics of programs of information literacy that illustrate best practices: A guideline* will provide adequate support for planning teaching strategies, regardless of the model. More documentation of experimentation with the flipped classroom model will clarify many of the benefits and drawbacks for IL instruction and it could also provide insight into differences among teaching environments and scenarios. For instance, perhaps the flip is best employed in one-shot sessions or with particular IL learning outcomes. These nuances will eventually be illuminated through continued teaching, research, and publication.

REFERENCES

ACRL Information Literacy Best Practices Committee (2012). Characteristics of programs of information literacy that illustrate best practices: A guideline. *College & Research Libraries News, 73*(6), 355-359. Retrieved from http://crln.acrl.org/content/73/6/355.full.pdf+html

Ash, K. (2012). Educators view 'flipped' model with a more critical eye. *Education Week, 32*(2), S6.

Beagle, D. (2006). *The information commons handbook*. New York, NY: Neal-Schuman.

Becker, B. W. (2013). Start flipping out with guide on the side. *Behavioral and Social Sciences Librarian, 32*(4), 257-260. doi: 10.1080/01639269.2013.838879

Benjes-Small, C. & Tucker, K. (2013, July). *Keeping up with flipped classrooms*. Retrieved from http://www.ala.org/acrl/publications/keeping_up_with/flipped_classrooms

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. Alexandria, VA: International Society for Technology in Education; ASCD.

Berrett, D. (2012). How 'flipping' the classroom can improve the traditional lecture. *Chronicle of Higher Education, 58* (25), A16.

Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom*. Washington, DC: George Washington University.

Borchardt, R. (2012). *Adventures in library instruction podcast. Episode 39: Back to school with bibliometrics and manga.* Retrieved from http://adlibinstruction.blogspot.com/2012/08/episode-39-back-to-school-with.html

Boucher, B., Robertson, E., Wainner, R. & Sanders, B. (2013). "Flipping" Texas State University's physical therapist musculoskeletal curriculum: Implementation of a hybrid learning model. *Journal of Physical Therapy Education, 27* (3), 72-77.

Bull, G., Ferster, B., & Kjellstrom, W. (2012). Inventing the flipped classroom. *Learning & Leading with Technology, 40*(1), 10-11. Retrieved from http://www.learningandleading-digital.com/learning_leading/201208?pg=12#pg12

Carpenter, J. P. & Jennifer S. (2012). Sharing the learning. *Phi Delta Kappan, 94* (2), 36-41.

Cole, J. E., & Kritzer, J. B. (2009). Strategies for success: Teaching an online course. *Rural Special Education Quarterly, 28*(4), 36-40.

Datig, I., & Ruswick, C. (2013). Four quick flips: Activities for the information literacy classroom. *College & Research Libraries News, 74*(5), 249-257. Retrieved from http://crln.acrl.org/

DeVoe, K. (2006). Innovations affecting us - podcasting, course casting, and the library. *Against the Grain, 18*(1), 78-79, 85.

Dotson, D. S., & Diaz, K. R. (2008). Discipline-specific library instruction for millennial students. *MERLOT Journal of Online Learning and Teaching, 4*(4), 560-13. Retrieved from http://jolt.merlot.org/vol4no4/dotson_1208.pdf

Educause. (2012). *7 things you should know about flipped classrooms.* Retrieved from http://net.educause.edu/ir/library/pdf/ELI7081.pdf

Enfield, J. (2013). Looking at the impact of the flipped classroom model of instruction on undergraduate multimedia students at CSUN. *TechTrends: Linking Research & Practice to Improve Learning, 57*(6), 14-27. doi: 10.1007/s11528-013-0698-1

Evans, D. (2011, October 28). Turning lessons upside down. *Times Educational Supplement,* p.4.

Findlay-Thompson, S. & Mombourquette, P. (2014). Evaluation of a flipped classroom in an undergraduate business course. *Business Education & Accreditation, 6*(1), 63-71.

Flipped classroom offers new learning path. (2011). *Electronic Education Report, 18* (23), 1-3. Retrieved from http://www.electroniceducationreport.com

Gallagher, K. (2009). *LOEX Conference Proceedings 2007: From guest lecturer to assignment consultant: Exploring a new role for the teaching librarian.* Ypsilanti, MI: Eastern Michigan University. Retrieved from http://commons.emich.edu/cgi/viewcontent.cgi?article=1008&context=loexconf2007

Gannod, G. C., Burge, J. E., & Helmick, M. T. (2008). *Proceedings of the 30th International Conference on Software Engineering: Using the inverted classroom to teach software engineering.* New York, NY: ACM.

Graham, K. (2006). TechMatters: Invasion of the podcasters. *LOEX Quarterly, 32*(4), 4, 11.

Kellogg, S. (2009). *Proceedings - Frontiers in Education Conference*: *Developing online materials to facilitate an inverted classroom approach.* Piscataway, NJ: IEEE Press.

Ladner, B., Beagle, D., Steele, J. R., & Steele, L. (2004). Rethinking online instruction: From content transmission to cognitive immersion. *Reference & User Services Quarterly, 43*(4), 329-337.

Lage, M. J., Platt, G. J., & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *Journal of Economic Education, 31*(1), 30-43.

Laman, J. A., Brannon, M. L., & Mena, I. B. (2012). *Classroom flip in a senior-level engineering course and comparison to previous version*. Paper presented at the American Society for Engineering Education Annual Conference, San Antonio, TX. Retrieved from http://www.asee.org/public/conferences/8/papers/4028/view

Lemmer, C. A. (2013). A view from the flip side: Using the "inverted classroom" to enhance the legal information literacy of the

international LL. M. student. *Law Library Journal, 105*(4), 461-491. Retrieved from http://www.aallnet.org

Michel, J., Hurst, S., & Revelle, A. (2009). Vodcasting, iTunes U, and faculty collaboration. *Electronic Journal of Academic and Special Librarianship, 10* (1). Retrieved form http://southernlibrarianship.icaap.org/

Miller, K. (2013a). Flipping out: Preflip planning. Retrieved from http://acrlog.org/2013/02/25/flipping-out-preflip-planning/

Miller, K. (2013b). Flipping out: Reflections upon landing. Retrieved from http://acrlog.org/2013/03/28/flipping-out-reflections-upon-landing/

Nielsen, L. (2012). Five reasons I'm not flipping over the flipped classroom. *Technology & Learning, 32*(10), 46-46.

Overmyer, J. (2012, September). Flipped classrooms 101. *Principal,* 46-47.

Pierce, R., & Fox, J. (2012). Vodcasts and active-learning exercises in a "flipped classroom" model of a renal pharmacotherapy module. *American Journal of Pharmaceutical Education, 76* (10), 1-5.

Sams, A. (2011, October 5). There is no such thing as THE flipped class [Web log post]. Retrieved from http://chemicalsams.blogspot.com/2011/10/there-is-no-such-thing-as-flipped-class.html

Schullery, N., Reck, R. & Schullery S. (2011). Toward solving the high enrollment, low engagement dilemma: A case study in introductory business. *International Journal of Business, Humanities and Technology, 1* (2), 1-2, 9.

Smale, M. (2012, April 30). Can we flip the library classroom? [Web log Post]. Retrieved from http://acrlog.org/2012/04/30/can-we-flip-the-library-classroom/

Stebbins, L. (2012). Reviews and analysis of special reports. *The Journal of Academic Librarianship, 38*(3), 183-185. doi: 10.1016/j.acalib.2012.03.013

Strayer, J. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. *Learning Environments Research, 15*(2), 171-193. doi: 10.1007/s10984-012-9108-4

Steffy, C. (2013. October 7). The flipped classroom in an information literacy session [Web log post]. Retrieved from http://crdpala.org/2013/10/07/the-flipped-classroom-in-an-information-literacy-session/

Tucker, B. (2012). The flipped classroom. *Education Next, 12*(1), 82. Retrieved from http://educationnext.org/the-flipped-classroom/

Valenza, J. (2012. August 14). The flipping librarian [Web log post]. Retrieved from http://blog.schoollibraryjournal.com/neverendingsearch/2012/08/14/the-flipping-librarian/