Flipped Instruction in English Language Teacher Education: A Design-based Study in a Complex, Open-ended Learning Environment

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Abstract

Reports of flipped classrooms across areas in the field of ESL are rare, and those that address the complexities of ESL teacher education, particularly the methods course in which procedural knowledge is privileged over declarative knowledge, are even rarer. This paper uses a design-based research (DBR) approach to explore the flip of an ESL teacher education course for mainstream teachers. This study, focusing on the five members of the design team, seeks to fill several gaps in the literature: the lack of design specifics; data on the use of flipped instruction in teacher education; the need for examination of flipped teacher education contexts. The paper, formatted in the style of DBR, provides suggestions for design steps, data sources, and principles for the design of teacher education courses.

Introduction

Traditionally, much of class time at all levels of education is spent with the teacher explaining concepts through lecture. Students listen and take notes, and then they take those notes home to refer to while working through homework assignments. This system can create passive learners who may struggle through tasks unassisted (Shimamato, 2012), an issue that has been noted in some teacher preparation programs. All students, including teacher education students, need to perceive instruction as useful, stimulating, and providing the best use of classroom time. One way to support this perception for teacher education students may be to focus on resource-rich, student-centered learning, and one interesting and relatively new approach that supports this type of learning is flipped instruction.

In the flipped classroom, instructors (and expert others) provide access to direct instruction resources for students outside of school (Strayer, 2007) so that class time can be spent more on inquiry-based and experiential learning (Berrett, 2012). After accessing direct instruction outside of class, teacher education students can come to class ready to explore, elaborate on the content, and interact with each other in ways that meet their learning needs, instead of just spending seat time. Overall, the flipped instruction model provides a collaborative learning environment in which students can work through course materials with their peers and with the assistance of the instructor without sacrificing direct instruction (Bergman & Sams, 2012; Foertsch, Moses, Strikeweda, & Litzkow, 2002; Kim, Byun, & Lee, 2012; Strayer, 2007). Because of its focus on procedural knowledge and collaboration, this approach seems to show promise as an instructional option for teacher education programs.

Because there are few guidelines for or deep, evidence-based descriptions of successful flipped classrooms, there are gaps in the literature that need to be filled. This paper begins to fill the gap by first briefly reviewing the literature on teacher learning and flipped instruction and then by discussing the design-based framework used for this study. This paper then presents results and discussion of the design and implementation of the focus course and concludes with implications for research and teaching.

Literature

Teacher Learning

The effective use of any instructional strategy depends in great part on understanding how the target population learns. Although Khan (2010) and others appear to support the common public understanding that teaching means in part being able to transmit information to students, the literature on teacher education shows that this informational teaching "cannot suffice as ways of conceptualizing practice in the world of teaching about teaching" (Laughran, 2013, p.15). Instead, effective teachers rely on variably applied literacies rather than reproduction of disciplinary facts (Clarke, 2013). Clearly, disciplinary content is a necessary foundation for teaching (Ball, Thames, & Phelps, 2008), but learning to teach also means supporting the use of such content in teacher-like ways (Feiman-Nemser & Remillard, 1995). In other words, learning to teach means being able to draw on content, task and dispositional knowledge to deal with authentic classroom dilemmas spontaneously, or to use "thinking-in-action" (Schön, 1987). This way of teaching is quite different from passing on a body of knowledge that students would memorize. Similarly, Darling-Hammond (2008) emphasizes that teachers do not only need in-depth knowledge of subject matter, but they also need to be able to understand it flexibly, relating it to everyday life so that they can make it accessible to students with different experiences and interests in different classroom contexts.

These new strategies are not easy to learn or do; they take teachers' time, practice, and repeated exposure to the ideas. It also appears that understanding how to implement learner-centered pedagogical strategies such as problem-solving, flexibility, just-in-time decision making, and a host of other dispositions needed every day in classrooms cannot be taught to teachers through traditional methods (Prince & Felder, 2006), which suggests that lecture alone cannot easily help teacher education students to learn these skills

(McKeon, 1994; Stoddart, Pinal, Latzke, & Canaday, 2002). Furthermore, providing teacher education students with engaging instruction that involves active learning is important, since novice teachers tend to teach based on their experiences as students (Grippin, 1989). Thus, modeled active teaching practices can help pre-service teachers learn and practice them more easily, and these models can also provide hands-on experience with good teaching practices (Loughran & Berry, 2005). Whether learning can occur more effectively through flipped teacher education instruction is a question to be explored.

Flipped Instruction

There are yet no set guidelines for exactly what flipped instruction should look like. Although not a new concept, the movement has recently increased in popularity throughout education, with entire public schools and even districts applying their own versions of flipped instruction (e.g., Flanigan, 2013; see Brinks Lockwood, 2014, for flipping ESL classrooms). Much of the early work in flipped instruction has taken place within disciplines that in the literature are considered to be based mostly on declarative and structural knowledge (Donald, 1983). However, little research has been conducted in complex contexts like teacher education, which are based mainly on relatively open-ended procedural knowledge (see Heintin, 2013, for an example of teacher professional development).

The purpose of flipped instruction is generally to utilize technology to increase opportunities for teacher-student and student-student interaction by changing the dynamic in which information is presented (Baker, 2000). In its most basic form, flipped instruction consists of pre-recorded direct-instruction lecture content which is made available online for students to access at home. Students watch these videos as homework before class and learn the content lecture on their own time, which allows for class time to be spent on other activities such as group projects, labs, and discussions (Bergman & Sams, 2012; Baker, 2000; Kim, Byun, & Lee, 2012; Lage, Platt, & Treglia, 2000). According to the extant literature, a flipped classroom is based on what the research tells us works:

- meaningful activities instead of busy work
- teacher as tutor rather than director
- increased interaction around content
- a focus on learning, not just behaving in a "school" way (e.g., sitting in a chair listening to the teacher)
- immediate feedback for students on process and progress
- making technology integral to learning
- just-in-time instruction.

In addition, in flipped classrooms, students have more time to spend with the content presentation (e.g., a PowerPoint presentation, a screencast, a book, or a podcast), and they can rewind and/or reread if they want to access the content again or speed through what they already understand. This type of student control can have a positive effect on learning as it frees up class time for students to explore the ideas in hands-on ways that align with their needs and abilities.

Elements of Flipped Instruction

Although mostly anecdotal, reports on flipped classrooms lead to a list of elements that generally characterize a flipped approach. These elements are described below.

Digital lectures. The use of instructional videos is a key element in the makeup of flipped instruction. These videos can be created by the teacher, students, or someone hired to make them, or they may be found online and used with little or no modification as appropriate. In a flipped approach, the videos are typically made available to students online for easy access outside of class.

Course management system (CMS). Some instructors use a CMS to assist in the management of educational courses for students. CMSs can be used to store course syllabi, present course announcements, manage student email, provide online discussion, support online submission of assignments, and host teacher- and student-posted videos. CMSs have proven to be an important aspect of some, but not all, flipped classrooms (Strayer, 2007).

Textbooks and outside texts. In some classrooms, the textbook is one of several resources provided to the students to meet the course objectives. The textbook typically complements the videos and is intended to be used alongside the videos and other resources for out-of-class preparation (see, for example, Bergmann & Sams, 2012). In other classrooms, the instructional videos replace textbooks completely (see, for example, Foertsch, Moses, Strikeweda, & Litzkow, 2002; Lage, Platt, & Treglia, 2000; Strayer, 2007).

Group discussions and group work. Teachers who require students to bring lecture-related questions to class often began class with a discussion of those questions (Bergmann & Sams, 2012), designed to clear up any confusion or misconceptions that may have come from the using the videos and/or resources. Another common task during class time in many flipped classrooms is group work and/or lab activities. These tasks provide opportunities for collaborative learning and problem-solving (Shimamoto, 2012; Strayer, 2007), as students share perspectives and gain insights that they might otherwise be unable to obtain on their own.

Mini-lessons. Mini-lessons can be based on student-generated questions and group discussion. If enough students have the same question after interacting with class resources, the teacher may briefly reteach that particular aspect of the lecture (Bergmann & Sams, 2012; Lage, Platt, & Treglia, 2000; Strayer, 2007).

Differentiated pacing and timing. In some flipped classrooms, students work at their own pace, so not all students are working on the same task at any given time. For instance, teachers may group students based on the task that they are currently working on, which allows students to have peer support while giving them the freedom to work at their own pace. This technique allows teachers to more effectively address student needs, as students in a particular group may be struggling with similar concepts from a given lesson (Bergmann & Sams, 2012).

Studies of Flipped Instruction

At present, the few studies conducted on flipped instruction consist mainly of self-report data; however, these findings provide a foundation for future exploration. In general, studies have shown that students gave favorable marks to the implementation of the

flipped model in their classrooms (Bergman & Sams, 2012; Foertsch, et al, 2002; Strayer, 2007; Kim, Byun, & Lee, 2012; Lage, Platt, & Treglia, 2000; Mazur, 1991). Students claimed to have appreciated the extra attention they received from their instructor and peers, and they also valued the ability to review lectures and view them at a time and place of their choosing (Bergman & Sams, 2012; Foertsch, et al, 2002; Kim, Byun, & Lee, 2012; Lage, Platt, & Treglia, 2000; Strayer, 2007). Those students who struggled with the flipped model found that they needed to be much more independent in their learning (Foertsch, et al, 2002; Lage, Platt, and Treglia, 2000; Strayer, 2007) and noted that the dramatic change between teaching models proved to be a difficult adjustment (Strayer, 2007). Nevertheless, more systematic study is required in a variety of contexts to understand the relationship of these perceptions to aspects of the learning environment and to theoretical models of instruction.

In the context of flipped teacher education, anecdotal and informally gathered data presented in the literature (e.g., in blogs, online teacher discussion, video, teaching practice web sites) suggests that, when done well, flipping instruction can lead to:

- better and more effective learning;
- improved grades due to more student-centered learning opportunities;
- increased student engagement and concurrent decreased classroom disruptions;
- increase in test scores from greater focus on understanding;
- alignment of student needs and school resources.

Certainly other instructional techniques are built on many of the same principles as flipping and have achieved success in the hands of competent instructors. Different in the flipped strategy is that teacher education students can have control over the content delivery that they do not normally have in traditional classrooms; the flipped classroom, instead, focuses on every student mastering the course content. In teacher education, it is absolutely crucial for every student master the skills and dispositions of teaching. However, like any type of instruction, flipped instruction can be done well, or it can fail miserably (Strayer, 2007). We do not yet know how the elements of flipped instruction can and should be implemented in different classrooms, as we noted above, because teacher education can be viewed as more complex and less concrete than some other disciplines.

Method

The exploratory study described below provides data on the design and implementation of a flipped teacher education classroom. It seeks to fill several gaps in the literature, such as the lack of design specifics, the need for data on the use of flipped instruction in teacher education, and the necessity for examination on teacher education contexts. The research team attempted to follow the extant flipped literature as closely as possible to test this application in teacher education classrooms. To examine this implementation, the study applied a design-based methodology to examine the process and the underlying reasoning for it and to explain changes and adaptations to the course that may support other designers in their process. The following questions guided the study:

- How do teacher education students react to a change in the format of their instruction? How do they perceive and use the additional resources, including peers?
- How do students and research team members perceive the implementation of flipped instruction in teacher education? What principles are important to them?

Design-based Research

Design-based research, commonly known as either design research, design experiment, or development research (van den Akker, 1999), is a systematic research methodology that provides a holistic view of the study of teaching and learning since it focuses on both learning theories and the development of instructional materials and strategies that are rooted in messy education settings (Brown, 1992; Collins, 1992; Design-Based Research Collective, 2003). Design-based research not only deals with practical issues in education, but also seeks to increase the impact of research through iterative testing and the refinement process of the effectiveness and sustainability of design principles and relevant theories (Anderson & Shattuck, 2012; Barab & Squire, 2004; Kelly, 2004; Parker, 2011).

Although there are variations among design-based approaches, Anderson and Shattuck's (2012) analysis of design-based research proposes that good design-based research follows the following eight criteria and:

1. is situated in a real educational context;
2. is focused on the design and testing of a significant intervention;
3. uses mixed methods;
4. involves multiple iterations;
5. involves a collaborative partnership between researchers and practitioners;
6. evolves design principles;
7. differentiates from action research;
8. has a practical impact on practice (p. 17-18).

This study follows these criteria as closely as possible through the process described by Reeves (2006), which includes four interconnected phases: 1) analysis and exploration of a problem and creation of preliminary research questions (Herrington, Reeves, & Oliver, 2010); 2) development of solutions using existing design principles and technological innovations; 3) implementation and evaluation in iterative cycles, including "continuous cycles of design, enactment, analysis, and redesign" (Design-Based Research Collective, 2003, p. 5), and; 4) reflection to produce design principles that can be shared for further refinement by other practitioners and researchers.

Context

This study took place in the College of Education of a major university in the rural northwestern United States, and it was approved (exempted) by the institution's review board. The two sections of the teacher education course being described, *Introduction to ESL (English as a Second Language)*, each met once per week for 2.5 hours during the fall 2012 and spring 2013 semesters. The focal context for the course was a class wiki, on

which detailed information about the course, assignments, tasks, resources, and dates was posted, as were discussion questions and student products such as lesson plans.

Participants

The research/design team in this study included two researchers (one of whom also served as the instructor of record for the course and will thus be called "researcher/instructor" in the rest of this paper). The first researcher was an expert in language learning and technology and also had some design experience; this researcher participated mainly in the discussion of the overall goals of the course being redesigned and also worked on the design. The researcher/instructor was also well-versed in the technology, teaching methodology, and task engagement literatures and supervised the design process. Three education doctoral students (one of whom was the teaching assistant for the course) and one post-doc completed the six-member research/practice team. The primary responsibilities for two of the doctoral students and the post-doc were to participate in course material development and perform classroom observations. The doctoral students and the post-doc all had been language teachers previously, had experience with a variety of technologies, and all were studying in the Language, Literacy, and Technology program. In general, the interdisciplinary team held positive views of flipped instruction as a strategy to create a resource rich, student-centered learning environment, and the team was very motivated to implement it with teach pre-service teachers.

In addition, 106 teacher education students – 100 female and 6 male students (referred to as "students" or "participants" for the rest of this paper) – who were taking the *Introduction to ESL* course in their last semester of their teacher education degree program served as participants over two semesters. Although some students in the course had immigrant parents (e.g., Hispanic, Vietnamese, or Chinese), all of them spoke English as their first language.

Data Sources and Analysis

Data sources included both numerical and self-report measures to meet the requirements of design research and provide enough information for the team to make reasonable decisions. During both semesters of the course under investigation, the research/design team collected existing course documents (e.g., both online and hard copies of syllabi, wiki pages, and assignments), logs from the video site, student input including midterm course evaluations and intermittent course review questions, team meeting and field notes, classroom observations made by members of the design team, and student comments and questions, along with notes from the literature and available resources for flipped instruction. The research team initially met several times per week and emailed in between; notes were taken during these interactions.

In addition, five of the team members attended all of the course sessions, which included two members as instructors and three as observers and participants. Students in the course were not told the specific purpose of the observations, but it was suggested that because all three observers were international students and participating in some of the course activities, they were learning to be better teachers. In order to gauge student perceptions of and reactions to the instruction and resultant changes in their responsibilities, the researcher/instructor created a midterm course evaluation, added a

review "quiz" question about their use of class resources to a content review "quiz," and included questions about perceptions of the tasks in the Moodle and as part of the reflections for the fieldwork. Student reactions were also gauged by class observations and impromptu conversations with individual students. In addition, one of the team members/ observers was also the facilitator for the Chinese Moodle portion of the course, which is described below. Initially the observations were logged using a format in which the observers noted teacher/student talk time, classroom interaction patterns, and any student comments related to the instructional style of the class. After the first three course sessions, the logs were not used because the data were consistent across sessions. Therefore, after the third class, the observers recorded their own comments and students' comments and questions about tasks and classroom events that could be changed to support greater interaction. These observations were then discussed with the research team.

For the purposes of data analysis, every class session was seen as an iteration of the research design because of the standardized structure of assignments, instruction, and interactions. In addition, the second semester of the flipped version of the course was also seen as an iteration of the overall idea. The researchers conducted analysis on the qualitative and anecdotal data (e.g., observations, documents, evaluations, among others.), following coding guidelines adapted from Boeije (2010); coding included reading through all of the data to determine categories of changes, and then grouping design decisions according to category. Data from all sources that applied to that category (codes) were listed under that category to provide support for the changes made. The occurrences of specific codes were counted to add numerical support to the account. Numerical data, such as the number of times students watched the course videos, were recorded and totaled. Plausibility was enhanced by member-checking with the team and rechecking notes and other data sources. The central patterns linked to the important aspects of flipped learning (as noted in the literature review) and other salient and frequent aspects noted in the data were used to construct the narrative below.

Narrative

The results and discussion are presented below in the four categories described by Reeves (2006). These four steps represent the almost weekly iterations of design changes and incorporate the major design decisions, changes, and challenges encountered throughout this process.

Problem

The Introduction to ESL course is a 10-week required course that has been taught every semester for eight years to pre-service mainstream teachers in the teacher education program. The purpose of the course is to help prepare teachers to serve the needs of English language learners (ELLs) in mainstream classrooms, providing ELLs with ways to access content and achieve goals in both language and content. Although the course had been fairly effective in meeting these goals based on student evaluations and random follow-up from students as they became teachers, the faculty in the ELL program were often concerned about the lack of interaction between the pre-service teachers and actual ELLs and their families. In addition, because the great majority of the teacher education

students in the program had white, middle-class, Christian backgrounds, faculty were also apprehensive about the lack of exposure and experience of the teacher education students with diversity in general. A variety of informal changes to the course each semester were implemented to address these issues, but both faculty and students felt that more could be done. These shared concerns led to three goals for the redesign:

- Involve teacher education students more in situations with ELLs

- Support greater understanding of the components of learning that affect ELLs

- Be more effective in engaging teacher education students in class

Obstacles to instituting such change included lack of sufficient time in class to address other direct learning goals, problems with scheduling visits to K-12 classrooms in the small local school district or visitors to the class, difficulties in having students collaborate outside of class because of their tight schedules, and other administrative issues. As a result of these challenges, we decided to implement a new model for class structure and content.

A review of the limited literature on flipped instruction by the researchers initiated both interest and skepticism, as well as an application for a small university-based grant to implement this approach in the ESL methods class. The funding allowed the project team to be compiled and the design process to begin. The design team first came to a very general understanding of flipped instruction by reading the extant literature. In trying to explicate our approach, we found that the difference between a regular blended classroom and a flipped classroom was a difference between format and content. For example, while flipped learning uses the format of a blended approach by incorporating aspects of e-learning, flipped learning is more specifically structured in that it requires that most direct instruction be completed by students outside of class. For what we perceived to be ease of implementation, we decided to focus on "traditional" flipping (i.e., moving the whole class along at the same pace) rather than "mastery" (i.e., allowing individual students to move through the course materials at their own pace) (Bergmann & Sams, 2012). Based on the research questions noted previously, the design team worked to develop design solutions that would address all of the goals and questions for the class; this is the goal of design-based research.

Development of Solutions

Through an integration of the data, team members' knowledge and experiences, references to the literature, exploration of the existing course, and available resources, the team sought to address the research questions.

Involving students with ELLs. First, the two researchers discussed ways in which the course could be structured to allow students to have field experiences around ELLs. Previous student complaints about the length of each class, scheduled for 4.5 seat hours in one sitting per week, supported the researchers' desire to break up the time and provide students with effective situated experiences rather than lecture and discussion in class with application for homework. They agreed that if direct instruction could be moved outside of the class time, one hour of seat time per week could be dedicated to fieldwork. The researchers discussed the types of fieldwork that were both available and useful, in addition to the limitations given the rural location of the university.

An additional thought was that students needed choices, not only to help them find something engaging for them but also in order to provide tasks that would fit in with their other coursework, their time in other locations during university breaks, and so on. The result was a set of nine tasks created and edited by the researchers, three in each category of community, parents, and students. Tasks included activities such as observing a local K-12 classroom that included ELLs, attending a culture-based activity at the university, and visiting, observing, and/or visiting churches, stores, and restaurants where a majority of minority-language learners might be found. Students were asked to choose one task to accomplish in each category and turn in a description (i.e., text, video, slides, or another format) and reflection on the due date. By moving the direct instruction out of class for the flip, time was made to incorporate this fieldwork as part of "class" time.

A second part of the course was a Chinese for Teachers online Moodle that was integrated into the Introduction to ESL course to provide teacher education students with insight into how their future ELLs might feel facing a new language and content in school situations. The course consisted of a series of online modules that presented direct instruction in Chinese language and culture through English and Chinese and included readings, writing exercises, and some videos. Much of the content was in English, but participants still struggled with learning an unfamiliar, and what they perceived as difficult, language. This struggle was clearly expressed by many students in the Moodle discussion in the previous iteration of the course. For example, one student that wrote what others echoed:

> It is very easy to look at the word and know what it is supposed to sound like but it very rarely comes out the way that I want it to. I can never quite determine if I am adding emphasis to the wrong parts of the words or not. Listening back I never know if what I am saying makes sense or hold some unknown emotion. The tones are very difficult for this native English speaker to say the least.

Students were expected to spend approximately an hour per week outside of class completing the reading, writing, and culture activities, and participating in online discussions that linked their Chinese learning to concepts in the rest of the ESL course; in fact, in the end of the semester evaluation, students reported spending from 30 minutes to two hours on their work, depending on the unit. This assignment started during the third week of class and lasted for seven weeks. Time "off" from the total class seat time was provided for this activity so that it could be done outside of class; flipping the whole class allowed us to integrate this new aspect.

A final proposed solution to better increase students' exposure to ELLs was to encourage international and ELL students from across the university, including doctoral students from the research team, to attend the on-site class and share their insights during interactive mini-lessons on language teaching strategies that the students in the class were required to present. Twice during the semester, several K-8 students also attended and participated in the mini-lessons. In the end-of-course evaluations and informal feedback received throughout both semesters, participants commented that having ELLs in the class was very helpful and interesting, particularly because the format of the course allowed the participants to interact with the ELLs rather than just hypothesize about them. In other words, flipping the direct instruction outside of the class created more opportunities for interaction and authentic application during class time.

Overall, the design team believed that these changes, particularly the introduction of field work, would help to meet the course goals and provide more exposure to ELLs in ESL contexts. These changes were made possible by flipping the course instruction.

Greater understanding of concepts. Following the flipped literature, the team decided to produce a series of videos that would simplify and exemplify the course text's main ideas. *Corel VideoStudio Pro X4* was chosen as the central design technology based on its ease of use, flexibility, and ability to integrate easily with Screencast.com, a Web-based video storage platform. The team expected that the videos would help students determine the main ideas of the text and serve as a central resource for students who have visual and/or audio learning preferences. A list of possible topics was drawn up by the researchers, and a format for the videos was created by the researcher/instructor based on the technology chosen. Both the list and format changed many times before being finalized, and changes depended both on the technologies available and accessible for students and the desire to make the videos 5-8 minutes long, following recommendations in the flipped literature (actual videos ranged from 5-14 minutes, and each lesson contained between two and four videos). Four of the project team members created videos, which this also affected how the videos were constructed. For instance, one of the team members included pop culture references and created an informal voiceover, while other members' videos sounded more formal and academic. Because the design team aimed to both assess whether students watched the videos and what they understood from them, one to three short comprehension quiz questions were added to each video; the videos were then posted to the free version of Screencast (screencast.com) so that the quizzes could be taken online. Screencast would record students' answers and scores. Figure1 shows a screenshot of some of the quizzes in the Screencast folder.
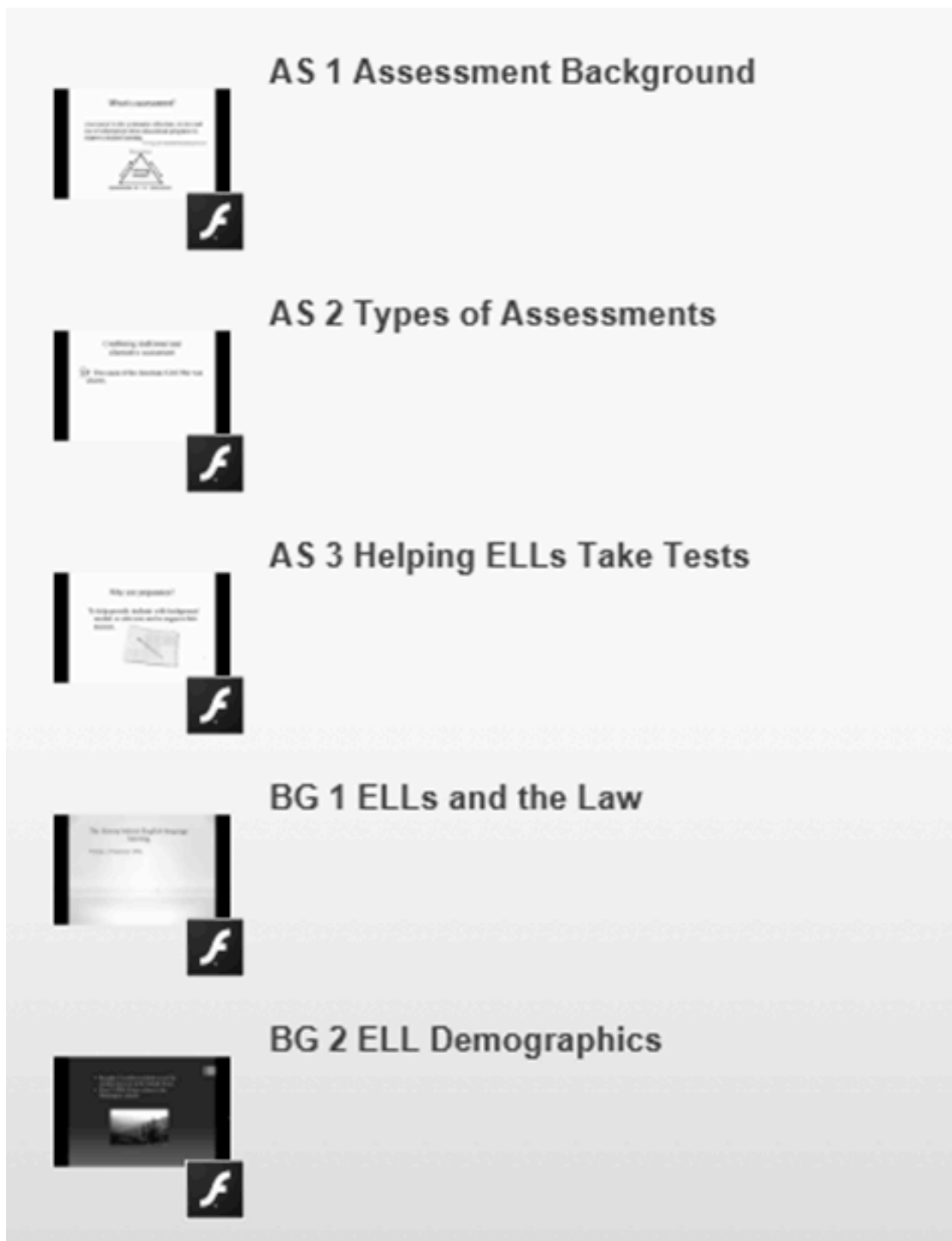
Figure 1. Some of the quizzes in Screencast.

The video logs data show that students used the videos in the ways expected and for the reasons outlined. In the first semester, 16 of 55 student participants used only the videos to understand course content, stating in the question added to the reading quiz (see data sources) that they were "visual" learners. Six of the participants chose to use the textbook

alone, noting that they liked to highlight text and felt that the text was more thorough than the videos. The rest of the participants used both the videos and the text, but most added that they watched the videos first and then skimmed the text to answer any questions or reinforce the video concepts.

Engagement. For the out-of-class course tasks noted above, we tried to create conditions common in the engagement literature (e.g., Dornyei, 2002; Meltzer & Hamman, 2005). These tasks were connected to student needs and interests, providing information in ways that students would find authentic while ensuring that students had the skills to meet the challenges of the tasks. For the in-class portion of the course, the flipped literature indicates that a discussion, followed by student-controlled interaction around tasks, would help to engage students by allowing them to work at their own pace, receive feedback when needed, and consult with peers and the teacher for just-in-time support (Berrett, 2012; Fulton, 2010). Accordingly, we initially asked students to post one question per week about the class content to the course wiki; these questions would then be discussed in class using different groupings. In addition, during each class period two teams of students demonstrated a teaching strategy from the required teaching strategies book to the class so that their peers could understand the strategy in a semi-authentic context. The other central activity in the in-class portion included working alone or in groups on the lesson plans that were the main deliverable for the course. One student understood this format as "teaching ourselves," although the instructor provided individualized feedback and suggestions during the lesson-building period of each class.

Student reactions. The data provided a variety of perceptions of and reactions to the flipped instructional format, but several patterns were clearly evident. These reactions are integrated into the next section on implementation and evaluation.

Implementation and Evaluation

Problems with the flipped design fell into the categories of technical, process, and content challenges, and were sometimes related to each other. Some of the challenges arose because there were no choices in some of the technologies or in how they were supported (or not) by the university. Other challenges were a consequence of compromises among team members with differing opinions and outlooks. Because there was no one with experience in flipped instruction technologies and strategies at the university at the time of the study, the research team drew closely from the literature on flipped teaching. In spite of the successes, there were non-catastrophic difficulties that had to be worked out, which are described below.

Technical difficulties. In a course that relies heavily on technology and learning outside of class, any glitches can sideline a task and disengage students. The design of the technology pieces was specifically meant to provide all of the resources in the course wiki, where students might easily find them. Nevertheless, students commented during class that they needed more links in different places so wherever they found themselves on the wiki they could navigate to where they wanted to be. The lack of links also included the Moodle, which initially was accessible only from the main wiki page of the course. After considering student comments, links to Moodle were added in every unit's schedule on the wiki so students could reach all materials from the schedule page where the assignments were

posted (as in Figure 2 above). Other technical issues were based on individual students' technology access. Some of them did not have microphones to record their pronunciation of the Chinese characters, and others could not post to the Moodle. Adding information to the wiki about preferred browsers (i.e., Chrome and Firefox) and making computer peripherals such as headphones available in class and for checkout solved most of these types of limitations.

One very problematic technical issue was that the volume on some of the videos we created was too low when played on certain devices; in addition, the quizzes did not always work, and the Screencast site was found to be very unreliable. For the second half of the first iteration of the course and in subsequent iterations, students were excused from doing the quizzes and some students accessed the videos from the course YouTube site from which the quizzes would not run. No solution was found for the differences in sound quality, and the design team decided to look into it more closely after the 2nd semester iteration of the course completed.

In addition, the ability of the wiki platform to collect student data was limited. It was clear when students posted a document (students posted from 1-16 documents on their wiki pages) or a comment to the discussion, but the wiki could not tell the design team how long each student spent on any one section or item in the wiki. This information could help the team understand better which aspects were problematic and which were successful; the next implementation of the course will take place in the Canvas platform without university support to enable the team to gather such data.

Task process. Process issues occurred when insufficient instructions were provided or students could not or would not try to figure out how to do certain tasks. The team considered this problem extensively in the initial design phase and was very explicit about providing instructions for each task, assignment, and exercise in the wiki. However, the data show that students did not always read the instructions where they were supposed to, and the implementation showed us that sound design includes help wherever students say they need it, not just where the design team thinks they should have it. For example, the wiki organization was thought out carefully, including links to resources, videos, and homework. However, the initial schedule, made to show "For Today" and "For Tomorrow" in the same line, was confusing to students. Our attempt to make academic connections for students by linking today's learning with the next day's (Egbert & Ernst-Slavit, 2010) did not work well for many students because it was not how they were used to seeing syllabi. After the first two iterations, students asked to have a clearer format even though the design team felt that clear labels had been used and everything was in a linear table format that made sense. In order to be responsive to students' needs (Meltzer & Hamman, 2004), we changed all information to list everything for "Today" in one line, indicating both work that should be done prior to class and work that would be done in class, as shown in Figure 2 above. Students were appreciative not only of the new format but of the responsiveness to their needs.

Content. Most of the issues were around content, and students were unsure where to find it and what to do with it. In all, students viewed the wiki 3,025 times, or an average of 55 times each during the ten-week course session.

Questions. Following the flipped literature that says to post questions for group discussion led by the teacher, we asked students to post their questions or comments from that week's course material to the wiki for discussion in class. At first we just asked students to post about the current unit. We wanted to know their issues with the main topic, but they posted about administrative issues, assignment questions, and strategy demonstrations. To help students focus on the unit topic, we then gave students instructions to post about what they did not understand after trying outside of class to meet the posted learning objectives for the unit. We wanted them to be more focused on the main issues so that less time would have to be spent weeding through questions about topics that were addressed in other places. Students then posted a question for everyone to discuss, but there were still too many questions to answer in a discussion, which were often similar to each other. To try to solve this issue, the instructor summed up the most common questions and presented the resulting question summaries to students in different group configurations: full class discussion, in smaller groups, or in pairs and then groups. This system helped the question process to be more student-centered because students had more opportunities to contribute in small groups and they could also use resources of their choice either on or off of their computers to answer the questions.

According to the course midterm and final evaluations after the first semester iteration, a number of the students felt that posting questions was busy work because sometimes they did not have a question but were required to post one. In the second semester iteration of the course this task was redesigned, for example, by asking students to bring questions to class and starting class with small group discussions in which students could control the contents. We found that adding more time for course discussion in the flipped classroom engaged students in the content more effectively.

Wiki contents. The wiki served as the main organizational feature of the course and the forum for all course content, including handouts used during in-class tasks, student questions, and anything other materials that could be posted in digital form. We had originally posted as many resources as possible and explained in class what they were and how to find them. However, students who used multiple wikis for the other five classes they were taking often forgot where to find things or got lost in the wiki. To help students find what they needed, we posted the links or materials for each task in multiple places. For example, in addition to a separate section for links to the Chinese language Moodle and related documents, we made links to the Moodle everywhere it was mentioned on the syllabus and schedule. In addition, we added handouts reminding students of tasks we taught in class, such as how to make a new wiki page and how to post their fieldwork. We found that because not everyone listens to everything in class (and sometimes we did not have time to explain something during class time), some students missed important ideas. Therefore, we included new information on the front page of the wiki in red in an Announcements section so students would know where to go to find what they missed. Students noted that they appreciated us making the wiki easier to navigate and more transparent to them. One student said she "loved the wiki" because it was so organized, unlike in her other classes.

Instructional goals. The flipped literature suggests that instructors post the course goals in conjunction with other posted information so that students know what to do. At first we

posted general goals to the wiki for each unit (e.g., *Chapter 4: Learn about learning objectives*). The students in this class are typically very pragmatically oriented because it is their last semester of coursework and they are anxious to graduate; they are interested in knowing exactly what to do and how to do it. When students commented that the goals were too general, we changed the wiki to include specific objectives for each week, the last of which was "create…," which addressed the activity we were to do in class. However, in a teacher education class where there is often not one right way to do anything, the instructions and goals on the wiki and the information in what the design team saw as quite specific videos were apparently still too abstract for students without more in-class explanation. In fact, in one of the sections with 23 students, 20 of them commented on the mid-term class evaluation that they needed more instruction, more specific directions, and more lecture. We attributed this in part to their cultural backgrounds and experience with learning through lectures; the department chair he agreed that the students were conditioned to learn from lecture and not used to new ideas or having to find out information for themselves. We saw this difference as problematic, particularly in a teacher education program, and this made us more determined to support students in doing something they saw as "new." We tried to accommodate students within the flipped model in weeks five through ten by providing an in-class overview of the next week's objectives and examples of how they could be met. At the end of the course, 20 of the total participating students still commented that they needed more lecture.

Resources. In keeping with the flipped literature that indicates that students should be able to access whatever they need for their learning, we posted lists of Web-based and print resources for each course unit. At first we posted as many resources as we could find in a single list attached to the schedule page, including the videos we had made. However, along with the too-general goals, students did not know what to read or watch from these long lists or where the vital information was. In response to their confusion, we added the video under the objective that it addressed and cut the resource lists down to the most essential information. By Week 5 of the course, students felt comfortable with this system and were able to navigate the resources more successfully. In final course evaluations, several students mentioned in the open-ended comments section that "we were just not used to it in the beginning" and as the course "went on it became much better."

Reflection to Produce Design Principles

According to the data, some of the ideas from the flipped literature made a difference to student participants' perceptions of the course. First, the fieldwork was appreciated as an "essential" part of their learning to work in diverse communities. Although some of the students did not reflect as deeply as we had hoped on their field experiences, course documents showed that they appeared to learn something new about themselves and their community. These experiences could only happen because of the redesign of the course. Second, the logs show that roughly 87% of the participants watched the optional videos and provided an answer to a written question that they were useful in understanding the course concepts. Although video use was lower for those videos addressing concepts that were not directly graded and video use declined over the course of the semester, the instructors felt that participants understood the ideas far more quickly than in previous semesters. Finally, the addition of the Chinese Moodle helped students clearly and

concisely express their ideas about what it felt like to be a language learner and how this experience would help them not only to remember how it felt, but also to apply the concepts learned in class to help ameliorate some of the issues. In these ways, the flip was successful in reaching the goals of the redesign. However, there were problems that we will address in the next implementation of the course based on the principles below.

Address student backgrounds. Although we had general information about the student population that the course was to address and the state- and program-defined goals for the course, we did not have enough background information at the start of the course to design based on the characteristics of these specific participants. Providing choices thus was an important principle that we only partly met. Furthermore, we certainly learned during this study that the arrangement of information cannot always follow other suggested designs profitably; what works in one disciplinary area, particularly one that has a majority of "right" and "wrong" answers, will not necessarily work in a more complex disciplinary environment such as teacher education. Design may take into consideration the general overviews provided in the literature, but specific disciplinary and student needs must also be considered.

A variety of video types, additional in-class activities, and some of the other suggestions addressed below will help the course better meet the needs of individual participants. For example, we understand that there is no one-size-fits-all video type any more than there is one best method of teaching. We will take these ideas into consideration as we proceed with the next iteration of course design.

Consider discipline-specific needs. The actual design of this course was more complicated than we anticipated, in part because as pre-service mainstream teachers studying ESL rather than ESL teachers, the teacher education students were working on creating lesson plans in different disciplinary areas as part of their required work for this course. They sometimes could not figure out how the general information about ESL lesson components could be applied in their focus area. For example, students developing math lessons that were effective for ELLs had more trouble creating language objectives than those creating language arts lessons, particularly if the examples in the videos or in other resources were in one area rather than another. We need to add examples but do not want students to copy them exactly or be limited in their creativity; this is an issue that we are still working on and need to address both in-class and in the videos.

Build in flexibility. Another principle for this teacher education context is that design has to allow for changes made at the students' request. A responsive classroom should be a model in teacher education in any case, but using a technology that allows easy change is essential in supporting student needs. In our case, wiki use allowed us to include fewer and more organized resources, present clear objectives rather than general goals, provide different examples and videos as students requested them, and interact with students as needed. Most importantly, wiki use allowed us to provide students with a variety of choices in materials, timing, and pacing, and such choices are part of an engaging classroom environment (Meltzer & Hamman, 2004).

Provide opportunities for instructional variety. Student course evaluations showed that students actually wanted more direct instruction, as they felt that their peers did not have

enough experience to help them and they wanted to hear what the "teacher" wanted. This may reflect that fact that students were not used to working, or did not want to work, as independently as we expected and that the change was uncomfortable for them in some ways. This interpretation was verified in discussions with the department chair, leading us to assert that any redesign has to either be based in what students know or have done or more scaffolded with instruction and practice. The change to providing more specific information in class both at the end of the previous lesson and beginning of the current one about what to do and how products should look was well-received and did not change the idea of flipping. McLaughlin et al. (2014) found this same idea of presenting small bits of information, which they called "micro-lectures," to be very helpful for their students.

Determine an effective tracking method. Another important principle is that the design must include ways to evaluate important aspects. Because we were attempting to follow the literature on flipped instruction, we needed to know whether the videos we made were supporting learning. However, problems with the Screencast site performance made us unable to keep track of who actually completed the videos and who did not. We were able to uncover how many views each video had, but no record exists of which videos were watched by whom for how long. This important data could help inform not only the success of the flip, but also how we might redesign the videos for maximum effect. Finally, from our experiences and the data, we can suggest principles that are not necessarily new to course design but in this context were crucial:

- Use a range of technologies that provides the greatest and most reliable access-suggest the use of Chrome and Firefox or Safari so students can access the site with whatever technology they have, and include a technology FAQ as problems roll in;

- Provide access to complete instructions (simple for some, more thorough for others) in different modes;

- If students are expected to spend more time outside of class, then less class time is necessary (of course this would be more difficult to implement in some settings);

- Vary video modes – some students wanted to see faces, others like the narrated PowerPoint;

- Even the best organization might need things posted more than once. Wherever a handout or site or idea is mentioned, it should have an access point.

Conclusion

We had originally tried to follow the ideas in the literature as closely as possible to design our flip; because there are no exact steps or design ideas, much of our ideas came from our own interpretations of the literature. However, flipped instruction as outlined in much of the literature -where students simply watch video lectures outside of class and complete activities in class- did not fit the students or context of the ELL teacher education course very well. In one part, this could be because teacher education is a complex, open-ended field in which there are no exact answers, formulas, or strategies, and static lectures which many flipped experiences center on. Teacher education is a process-based rather than fact-based field, and the nature of the field makes a difference in how much and to what extent videos can teach and what experiences students need, demonstrated in this study by the

number of students using both the videos and textbook for content learning. In another part this may be because students were already used to the types of in-class activities and considered some of the videos to be boring and ineffective, especially when they did not work correctly.

The success of the flip may also depend on where students are in their program, their previous experiences, and how flipped instruction is described and supported. In other words, in order for flipped instruction to be effective, it must be considerate of context rather than applied as a set entity; this is evidenced by the number of changes the research team made to the course throughout both semesters. Future studies will include the use of student outcome data, formal measures of student engagement, and interviews and/or focus groups to obtain an even deeper understanding not only of how students perceive the instruction and what principle guide/ should guide it, but also of the impact of this process on teacher education student achievement.

As we conduct additional iterations of the course informed by this and other data, we may become more confident that flipped instruction can work well for our teacher education courses if attention is paid to the principles mentioned above and if faculty can commit the time and effort it takes to observe closely. Because we had a large team working on a single class, we could divide up the design tasks in ways that did not overburden any one member; teachers who work alone may do well to have a clear plan for design in place before starting in order to ease the time burden. Finally, as McLaughlin et al. (2014) comment, "the actual practice of off-loading content and engaging in active learning in the classroom is far more important than the specific methods we used" (p. 6). In other words, although moving the majority of content instruction outside of the class and adding additional resources supported the goals for the class, the design principles that we explored can help us to develop and to understand, without the rather ambiguous "flipped" label, an even more resource-rich, student-centered approach to teacher education classrooms in general.

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