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# The experience of three flipped classrooms in an urban university: an exploration of design principles

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ABSTRACT

As a response to the call for technology enhanced, student-centered learning environments, the flipped classroom approach has drawn much attention from both the research and practice communities. Despite over fifteen years of flipped classroom implementation, design principles have been minimally elaborated upon in relation to diverse disciplinary contexts. Focusing on this gap, we engaged in a mixed methods study that examined three instances of the flipped classroom across unique disciplines and to extract specific design principles. Three instructors and 115 students enrolled in three separate classes in fall 2012 participated in the study. Building upon the Revised Community of Inquiry Framework, we developed a flipped classroom design framework and identified nine design principles.



## 1. Introduction

Over the past decades higher education standards have emphasized the potential value of student-centered learning environments in which students are actively engaged in higher-order tasks and taking charge of their own learning (Hannafin, Hill, & Land, 1997; Means, 1994; Shea et al., 2012). Student-centered learning environments necessitate applying more active learning strategies to classroom teaching that, for example, involve student presentations, small group problem solving, self and peer evaluation, and group discussions (Zappe, Leicht, Messner, Litzinger, & Lee, 2009). Yet creating such environments remains a challenge. Teachers are not necessarily prepared to apply new pedagogies or to support the expanded roles and responsibilities associated with student-centered learning. This is evidenced by challenges encountered in designing and supporting student-centered learning (Brush & Saye, 2000; Hannafin et al., 1997). For example, teachers often have difficulties managing their finite classroom time and limited number of face-to-face classroom meetings to achieve an effective balance between lectures and active learning strategies (Strayer, 2012). Instructors who are implementing student-centered learning would benefit from a set of teaching strategies and tools to ease the tension among these activities.

Flipped classroom models have attempted to address these challenges by allocating more class time for active learning approaches and by leveraging accessibility to advanced technologies to support a blended learning approach. A typical flipped classroom approach provides students with access to online video lectures prior to in-class sessions so that students are prepared to participate in more interactive and higher-order activities such as problem solving, discussions, and debates. (Baker, 2000; Bergmann, Overmyer, & Wilie, 2012; Davies, Dean, & Ball, 2013; Foertsch, Moses, Strikwerda, & Litzkow, 2002; Fulton, 2012; Hughes, 2012; Lage, Platt, & Treglia, 2000; Talbert, 2012; Zappe et al., 2009). Students benefit from the outside classroom events because they can allocate their time and pace their online learning to meet their individual levels of comprehension. In face-to-face classroom sessions, students have the opportunity to become more active and interactive through group activities rather than passively listening to lectures. Teachers in turn are able to commit more in-class time to monitoring student performance and providing adaptive and instant feedback to an individual or group of students (Fulton, 2012; Herreid & Schiller, 2013; Hughes, 2012).

Strayer (2012) posits that "the regular and systematic use of interactive technology" (p. 172) makes flipped classroom models unique, countering a critique that flipped classroom models are not new because teachers have always relied upon readings, and computer-assisted instructions to prepare students for in-class activities. We argue here that the 'systematic use' of technologies is influenced by the design of the flipped classroom instance. The design limitations of previous flipped classroom studies are listed below.

### 1.1. Limitations found in previous studies of the flipped classroom approach

The design of flipped classrooms has often been limited to the concept of replacing in-class instruction with videos and using class time for homework. In contrast, we define the 'flipped classroom' as an

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open approach that facilitates interaction between students and teachers, and differentiated learning (Bergmann et al., 2012; Keefe, 2007; Lage et al., 2000; Tomlinson, 2003) by means of flipping conventional events both inside and outside of the classroom and supporting them with digital technologies (Hughes, 2012). A notable pioneer of the flipped approach, Lage et al. (2000), did not limit "flipping" to lectures and homework, stating:

> Inverting the classroom means that events that have traditionally taken place inside the classroom now take place outside the classroom and vice versa. The use of learning technologies, particularly multimedia, provide new opportunities for students to learn, opportunities that are not possible with other media. (p. 32).

Research is needed on what aspects of flipped classroom implementations explicitly benefit teaching and learning. Zappe et al. (2009) experimented with a flipped undergraduate engineering class, concluding that students perceived the course as having a positive impact on their learning. Herreid and Schiller (2013) reported the benefits of flipped classrooms based on the results of a large-scale survey administered to STEM case study teachers who used flipping methods. However, these reports fall short of an explicit accounting of what features of the flipped classroom yielded benefits for learners and instructors. Another recently conducted experiment (Davies et al., 2013; Strayer, 2012) indicated that there was no significant difference in student performance between flipped classrooms and traditional classrooms. Strayer (2012) reported that students perceived a significantly lower level of structural support to facilitate student conduct during flipped events, warning that this perceived lack of support might lead to lower engagement. We posit here that this possibility (a perceived dearth of support prior to and during a flipped event) does not indicate that the flipped classroom approach is of low value to teaching and learning. Rather, we make the argument that it is necessary to explicitly define the values connected with flipped classroom models.

Few studies detail the design principles of the flipped classroom, and we found no scientific articles that detailed the flipped classroom design principles in our literature review. Many studies discussed what benefits can be expected from flipping the class (Davies et al., 2013; Foertsch et al., 2002; Fulton, 2012; Gannod, Burge, & Helmick, 2008), but fell short of defining and building design principles for the flipped classroom. Bergmann and Sams (2012) suggested a list of design considerations such as 'time to learn new software' and 'support from administration.' However, their guidance was limited to technological elements. Later, Bergmann et al. (2012) listed what characterized the flipped classroom (e.g., "a means to increase interaction and personalized contact time between students and teachers") contrasting these elements to misleading manifestations of what are 'Not Flipped Classrooms.' Their proposal of what defines the flipped classroom suggests many potential discussions of what can be added to a list of design principles for the flipped classroom. This study aims to define design principles for the flipped classroom and those principles posited here build directly upon the first four design principles suggested by Brame (n.d.) at the Vanderbilt University's Center for Teaching: Provide an opportunity for students to gain first exposure prior to class; provide an incentive for students to prepare for class; provide a mechanism to assess student understanding; and provide in-class activities that focus on higher-level cognitive activities.

### *1.2. Analytic framework: the revised community of inquiry (RCOI)*

This study deploys the theory-driven analytic framework — Revised Community of Inquiry (RCOI) (Garrison, Anderson, & Archer, 1999; Shea & Bidjerano, 2010; Shea et al., 2012; Swan, Matthews, Bogle, Boles, & Day, 2012) – by first investigating the impact of the flipped classroom approach on three participating classrooms as a means of eliciting a model that is able to guide the elaboration of design principles. This framework posits that knowledge building results from the collaborative interaction between active students and teachers particularly in online/blended learning environments (Shea & Bidjerano, 2010; Shea et al., 2012). The RCOI framework theorizes four elements that contribute to a successful learning environment: Cognitive Presence, Social Presence, Teaching Presence, and Learner Presence (see Table 1). Fig. 1 illustrates that the four RCOI components are featured in the student-centered learning environment.

### *1.3. Goals and research questions of the current study*

This study is based on a pilot project conducted at the University of Southern California (USC) located in urban Los Angeles, with three undergraduate flipped classroom instances. Each instance was explored in terms of the unique interpretation of "flipping a class" made by each instructor, their respective flipping strategies, and how the instructors used technologies to facilitate flipped classroom events according to their unique interpretations. Building on the RCOI framework, this study aimed to investigate participants' perceived values of the flipped classrooms with respect to the RCOI components and to elaborate a design framework from which design principles for the flipped classrooms could be specified. The following research questions guided the study:

- How do the instructors interpret and apply 'flipping' to their classrooms?
- What are the students' perceptions of the value of the flipped classroom?
- What are suggestions for the design of the flipped classrooms?

## 2. Research context: three flipped classrooms

USC is a large research institution with an enrollment of over 40,000 students. Since 2010 the university has transitioned from a commuter campus to a residential campus with extensive housing and corresponding facilities. Borne out of a desire to reconcile the needs of undergraduate residential learners who seek value in face-to-face classroom learning experiences with the convenience and efficiency of online instruction, the flipped classroom project was initiated in pursuit of providing better learning environments in which students can be more engaged, active, and responsible for their learning. Over the period of the fall 2012 semester, three classes, one each in engineering (ENG), social studies (SOC), and humanities (HUM) participated in the project. The project rendered useful data on discipline-specific flipped classroom applications including course events, feasible instructional technologies, and the internal support resource allocations required, which could give rise to design principles for the flipped classroom.

Each participating class was carefully selected and a mentor-protégé relationship established amongst the participating instructors whereby seasoned 'flipped classroom' instructors were paired with the instructors who were newcomers to 'flipping a class.' In addition to mentorship, a learning technology service unit provided technology and instructional design support. Participating instructors had brief consultations with their respective support person(s), followed by nine project meetings as well as frequent email communications and some telephone support through the semester.

The three participating instructors designed their flipped classroom events in light of their individual contexts and purposes for flipping classrooms, which resulted in widely different forms of flipping across three disciplines. Table 2 describes the dimensions of the flipped classroom approach with accompanying details for each classroom implementation.