Investigating Student Resistance and Student Perceptions of Course Quality and Instructor Performance in a Flipped Information Systems Classroom

Elizabeth White Baker
bakere@uncw.edu

Stephen Hill
hills@uncw.edu

Department of Information Systems and Operations Management
University of North Carolina – Wilmington
Wilmington, NC, 28403, USA

Abstract

The study focuses on the instructor as a stakeholder in implementing the flipped classroom learning approach and ways to lessen professor resistance to flipped classroom adoption. The barrier to professor adoption that concerns potentially lower student evaluations as a result of incorporating the new approach is of particular interest. The investigation shows how inverted classrooms (ICs), incorporating both traditional and e-learning pedagogical elements, impact student perceptions of course quality and instructor teaching effectiveness. Students in an Introduction to Information Systems course were given surveys after a traditional course presentation, once the instructor changed to an IC, and after the instructor had taught the course in an IC environment several times. The results show that there are positive impacts to student perceptions of both course quality and instructor teaching effectiveness when students are taught in an IC. Further investigations into additional factors to encourage the adoption of this pedagogical approach are also provided.

Keywords: Information Systems Education; Student Resistance; Flipped Classroom; Inverted Classroom; Student Perceptions; Pedagogy

1. INTRODUCTION

Developing new and novel pedagogical methods that improve student engagement and student learning outcomes and more effectively teach course materials are a point of focus for educators. This is especially true for those educators in STEM fields where the course material can seem remote and intimidating to students. Historically, information systems (IS) pedagogical research has focused on replacing the traditional classroom structure (synchronous time and place) with completely asynchronous learning approaches (Alavi, Marakas, & Yoo, 2002; Arbaugh & Benbunan-Finch, 2006; Santhanam, Sasidharan, & Webster, 2008). However, an approach that is gaining significant attention is a blended approach, where a course is structured to incorporate both traditional and e-learning elements, leveraging the strengths of each. One of the most significant impacts that using a blended approach can have is to allow the instructor to "flip" the classroom to enhance student engagement. This work adopts the definition of a flipped classroom from Walvoord and Anderson (2011) where the learning

environment is modeled for students to first gain exposure learning (gaining knowledge and comprehension) prior to the synchronous class session and focus on higher level learning with respect to Bloom's taxonomy (Anderson et al., 2001) (e.g., synthesizing, analyzing, problem-solving, etc.) in class. Lage, Platt and Treglia (2000) described a similar approach as the "inverted classroom," or IC. Research demonstrates that several different educational constituencies benefit when employing ICs. With respect to IC effectiveness on student learning outcomes, many studies have been conducted that demonstrate the positive impact of flipped classrooms in delivering material across a wide variety of domain knowledge: undergraduate engineering (Mason, Shuman, & Cook, 2013); undergraduate statistics (Wilson, 2013); graduate physiology (Tune, Sturek, & Basile, 2013); and information systems (Mok, 2014), among others. Yet, in spite of the demonstrated benefits of using an IC, many professors do not take advantage of this pedagogical approach. The move from teacher-centered to student-centered learning will often encounter significant resistance (Keeney-Kennicutt, Gunersel, & Simpson, 2008; Pepper, 2010; Reimann, 2011). Students and professors alike exhibit this resistance to the change in the classroom approach.

One of the factors influencing faculty adoption of research-based instructional strategies, such as ICs, is concern about student resistance (Smith, Cooper, & Lancaster, 2002; Vuorela & Nummenmaa, 2004). Student resistance to inverted classrooms has been well studied in the literature (Cooper, MacGregor, Smith, & Robinson, 2000; Ellis, 2015; Felder & Brent, 1996). Kenney-Kennicutt and Simpson (2008) suggest that this resistance manifests as a result of the shift in thinking about who has responsibilities for what actions and processes in the classroom (Cheung & Huang, 2005; Cuban, 1993; Lee, Cheung, & Chen, 2005). The student anxiety and disorientation over the new expectations of them in the classroom impacts student performance (Akerlind & Trevitt, 1999). Researchers have offered strategies to professors to acknowledge and overcome this resistance, including active listening and response to student concerns (Keeney-Kennicutt et al., 2008), providing explicit guidance on how to meet expectations of the course (Akerlind & Trevitt, 1999) and Silverthorn's (2006) six recommendations for conducting an inverted classroom.

With guidelines for the successful responses to student resistance being provided to professors, it would seem that there would be greater adoption of ICs than currently exists. Yet, considering the entire system of actors involved in teaching and learning, including interactions between administrators, faculty members and students, all points of resistance to the change within the system can contribute to non-adoption. In particular, faculty resistance to ICs remains a significant barrier to flipped classroom adoption and implementation (Christensen Hughes & Mighty, 2010). One metric of student resistance that is a concern to faculty members is course evaluation performance (Gormally, Brickman, Hallar, & Armstrong, 2011; Kearney & Plax, 1992).

This current research builds on the success in ICs of raising student outcomes through addressing student resistance. The work broadens the scope of research to observe potential sources of faculty resistance to adoption of this pedagogical approach. Impact on student evaluation results is a reason that faculty resist implementing the IC approach (Froyd, Borrego, Cutler, Henderson, & Prince, 2013). We set out to find how student evaluations were impacted when employing the IC approach with a professor new to delivering the approach by looking at the impact on student perceptions of course quality and instructor teaching effectiveness, two factors central to the development of compelling classroom experiences for students. Implementing an effective IC leads to potentially better student perceptions of course quality and instructor teaching effectiveness, leading to higher course evaluation scores.

The first research question is "Does flipping the IS/IT classroom improve student perceptions of course quality?" and second, "Does flipping the IS/IT classroom impact student evaluations of the teaching effectiveness of the instructor?" Over the course of three semester-long course periods, student survey data on perceptions of course quality and teaching effectiveness are analyzed to look at the differences between semester T_1, where a traditional lecture delivery method was used to teach an Introduction to IS course; semester T_2, the initial flipped classroom delivery of the same material; and semester T_3, the second flipped classroom delivery for the same course. This study uses quantitative methods to analyze student survey data from these three delivery timeframes.

2. LITERATURE REVIEW

Following recommendations from Urbaczewski (2013) on future research on flipped classrooms in information systems and Prince et al. (2013) on future research into professor's perceptions of the flipped classroom, this study addresses a gap in the literature related to student perceptions of the flipped classroom environment, in particular, introductory IS course student perceptions of the course quality and instructor teaching effectiveness. These perceptions have the potential to influence various stakeholders in higher education content delivery practices, in particular implementation of ICs by professors.

Stakeholder analysis of resistance to flipped classrooms in information systems
The three stakeholders identified in this study are students taking IS courses, IS instructors delivering courses, and higher education administrators responsible for managing the enrollments and staffing of these courses. Each of these constituencies could have significant motivation to employ flipped classroom techniques and to do so effectively. For example, if student perceptions of course quality and teaching effectiveness are positive and the value received in a flipped classroom is greater to students than in other learning formats, then why not teach all courses in this manner?

Several reasons might explain the reticence of instructors to adopt flipped classroom pedagogy. Resistance may arise in the relationship between the instructor and the administration. Henderson and Dancy (2007) find that faculty decisions are influenced by peer support, department climate, and institutional structures and policies. Although this administration contribution to IC adoption resistance is not in the scope of this paper, it is worth noting that a desire to increase the number of majors in IS and preparing those majors for future work environments (Granger, Dick, Luftman, Van Slyke, & Watson, 2007; Koch, Van Slyke, Watson, Wells, & Wilson, 2010) makes administrative support of faculty to develop compelling classroom experiences an imperative for IS administrators and instructors globally.

One reason for instructor resistance to using ICs comes from the lack of instructor familiarity with the particular pedagogies involved in active learning. For an IS instructor this familiarity with pedagogy can be a significant impediment to implementing this form of teaching, as it is not a classroom style that many have been a student in or taught previously. Lecturing is more familiar and more refined for most IS educators, thus it is the predominant pedagogy. Not all teaching environments have course development resources available to assist instructors in creating the new course material delivery experience an IC requires.

Second, the types of course preparation that a professor performs for an IC is significantly different than what that instructor would perform if teaching courses in a more traditional, lecture-based manner. Preparing a lecture for students requires a different skill set than preparing active-learning exercises around each learning objective in the course and developing the materials to ensure that students have familiarity with the vocabulary and basic skills before engaging in the active-learning activities in an IC. Instructors who have already adopted the IC (in the field of pharmacy) have found that developing and administering a flipped course took over 125% more time than teaching it in a traditional lecture format (McLaughlin et al., 2014). In an introductory economics course, the time to plan and create the asynchronous content was twice what the typical preparation time had been for the course with a traditional delivery (Lage et al., 2000). Such a significant time investment might be discouraging to those who fear that their teaching might end up being perceived as less effective as a result of adopting this approach (Herreid & Schiller, 2013).

Prior research has suggested that the flipped classroom approach might not be the best structure for an introductory course (Strayer, 2012). Most students in the course may not have a deep interest in the subject, making more in-depth engagement with the material something students see as an unnecessary effort, leading to a rise in student resistance. Students in a flipped introductory statistics course reported being less satisfied with the way they were prepared for the tasks they were given than students in a traditional lecture structure (Strayer, 2012).

Other potential reasons for the lack of active-learning pedagogy adoption revolve around role changes and perceptions of the instructor in the classroom and the impact this has on student evaluation of instruction. In an IC environment instructors move from the traditional role of lecturing as demonstrated knowledge toward learning facilitators in their presentation of the active learning activities (King, 1993; Rutherfoord & Rutherfoord, 2013). Although empowering to students to take the initiative for learning into their own hands, it may not be the student's expectation of what a typical instructor should be doing. Students might not perceive this

facilitation as "teaching" as they have come to know it through the many years of education that they have already experienced. Students can perceive the instructor as being less of an expert because the student has to 'learn the material on their own, without the professor's help' (Findlay-Thompson & Mombourquette, 2014). Instead of the student being more enthusiastic about being actively engaged in the classroom, the student begins to question the instructor's expertise and work product by perceiving the instructor as unwilling to help the student learn and pushing the work on to the students to have to 'teach themselves,' leading to a decrease in student satisfaction (Berrett, 2012; Missildine, Fountain, Summers, & Gosselin, 2013; Strayer, 2012). In many universities where student evaluations of classroom teaching are the primary method of teaching capability assessment for instructors, the negative student perceptions of an IC and the subsequent decrease in evaluation scores could put the performance assessment of an instructor in serious jeopardy.

3. METHOD

The course for this study was an undergraduate level Introduction to Information Systems course. This course was the core IS course for all business administration majors at a university in the southeastern United States. The same instructor taught the course each semester, and the same course material (text and content) was used across a three year period. The traditional model of the course delivered prior to the T_1 survey administration (n=92) consisted of lecture only to deliver the course content. Daily accountability included multiple-choice daily quizzes covering material from the prior lecture, randomly administered throughout the course, and attendance accounting for 10% of the overall grade. A hands-on project using Microsoft Excel and a final exam completed the graded content of the course. The IC model of the course delivered in semesters T_2 (n=53) and T_3 (n=52) consisted of in-class mini-case discussions on the topics that were lectured on video. Prior to the class discussion, students were to watch the videos and submit "daily questions" where they constructed practice exam questions based on the material that they learned. These daily questions were graded on a 3 point scale, with those that scored in the highest category put into a question pool to be used during the midterm and final exams. Knowing that their questions could potentially be on the exam meant that the students offered thoughtful questions without making the questions excessively difficult. Attendance was counted as 10% of the overall grade in the course

to ensure that students attended the in-class sessions and did not simply submit their daily questions and skip the class discussions with no penalty. A hands-on project using Microsoft Excel completed the graded content of the course. The students who took the course were between 20 and 23 years of age and of equal gender proportions in each survey period.

Anonymous end of course surveys submitted by the students were used to collect the data. The survey instrument used in T_1, the traditional lecture presentation of the course, is presented in the Appendix. The items in this instrument are a subset of the SEEQ (Students' Evaluations of Educational Quality), an instrument used to obtain student feedback on teaching quality and effectiveness (H. W. Marsh, 1982). Statistical tests on the instrument repeated over 13 years have shown that SEEQ is both valid and reliable (H. Marsh & Hocevar, 1991; H. Marsh & Roche, 1997). The survey instrument questions used in T_2 and T_3, the flipped classroom semesters are presented in the Appendix and are adapted from the University of California Berkeley student course evaluation instrument (Stark & Freishtat, 2014). This change was prompted by the instructor's college administration group and the decision to change instrument items. The analytical challenge associated with the change in the format of the survey instrument between semesters T_1 and T_2 is addressed in the next section of this article.

For each semester when data were collected, student responses from multiple sections taught by the same instructor were aggregated. In semester T_1, n = 92 students enrolled in four sections, and the primary course pedagogical method was in-class lecture. In T_2, the semester directly following the pilot semester, n = 53 students enrolled in two sections, and the primary course pedagogical method was the flipped classroom. In semester T_3, n = 52 students enrolled in two sections, and the primary method remained the flipped classroom. The semester T_3 surveys were administered three semesters after semester T_2. Doing so allowed for further qualitative observation when the pedagogy had been deployed by the instructor in this course setting several times.

4. RESULTS AND ANALYSIS

The semester T_1 student evaluation survey instrument used five questions that were designed to measure teacher effectiveness and three questions to measure course quality. The instrument changed between semesters T_1 and T_2

with the new instrument being used for semesters T_2 and T_3. The new instrument consolidated the measurements of teacher effectiveness and course quality into single questions. Therefore, an initial data analysis challenge was to ensure that valid comparisons between the semester T_1 survey results and the survey results from semesters T_2 and T_3 could be made.

Question	Factor 1 loading	Factor 2 loading
Given the nature of this particular course, the in-class activities (e.g. lectures, discussions, exercises, etc.) seemed appropriate and helped facilitate my learning in this course.	0.65	
Given the nature of this particular course, the outside assignments (e.g. problem sets, projects, case write-ups, etc.) seemed appropriate and helped facilitate my learning of the subject matter.	0.82	
The instructor explained key concepts clearly and thoroughly.	0.80	
The instructor adequately solicited and appropriately responded to student questions and comments.	0.84	
The instructor provided helpful guidance and feedback on course assignments.	0.88	
In comparison to other courses in this school, this course was intellectually challenging.		0.57
In comparison to other courses in this school, the difficulty of this course was:		0.88
In comparison to other courses in this school, the overall workload of this course was:		0.69

Table I: Factor Loadings by Question for Semester T_1 (Loading Significance Cutoff = 0.5)

The data analysis began with a factor analysis of the semester T_1 survey question results to determine if the questions loaded appropriately on factors for instructor teaching effectiveness and course quality. It was anticipated that the five instructor teaching effectiveness questions would load onto one factor and the three course quality questions would load onto a different factor. The scree plot for the factor analysis indicated that two factors were sufficient to explain most of the variation in the survey results. Table 1 shows the significant factor loadings for each question on

the two factors from a factor analysis with direct oblimin rotation. A factor loading significance cutoff of 0.5 was used. As indicated in Table 1, the first five questions load significantly on to the first factor and the last three questions load significantly on to the second factor. The first factor relates to instructor teaching effectiveness. The second factor relates to the quality of the course.

The questions from semester T_1 with the highest loadings on each factor were then identified and used as surrogates for instructor teaching effectiveness and course quality for comparison with the responses from the T_2 and T_3 instruments. For the instructor teaching effectiveness factor, the survey question "The instructor provided helpful guidance and feedback on course assignments" had the highest loading. The survey question "In comparison to other courses in the business school, the difficulty of this course was:" had the highest loading on the course quality factor.

Figures 1 and 2 show the distributions and means of student responses to the teacher effectiveness and course quality questions (for semesters T_2 and T_3), respectively. The results are presented across the three semesters T_1, T_2, and T_3. The surrogate questions, as identified by highest loadings on each factor, are used for semester T_1. As noted previously, T_1 was a semester with the course taught in a traditional manner with the T_2 and T_3 courses taught using a flipped classroom.
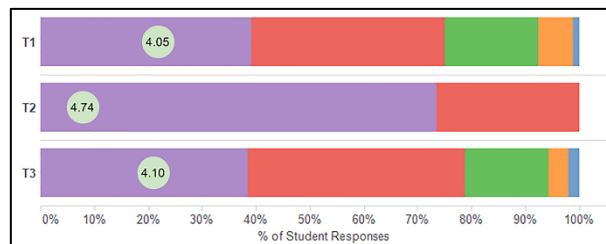

Fig. 1. Student Response Means and Distributions for Instructor Teaching Effectiveness (5 Point Likert Scale, 5 = Extremely Effective to 1 = Not at All Effective)
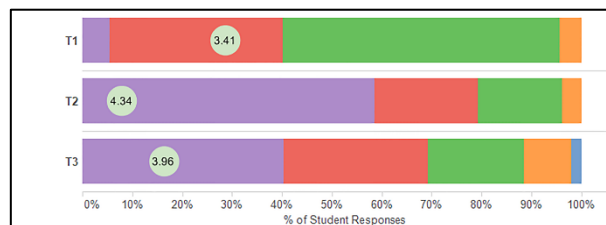

Fig. 2. Student Response Means and Distributions for Course Quality (5 Point Likert

Scale, 5 = Extremely Worthwhile to 1 = Not at All Worthwhile)

The means and distributions of student survey responses in Fig. 1 and 2 clearly change from T_1 to T_2 and from T_2 to T_3. For the instructor teaching effectiveness measure, nearly 80% of the responses in T_1 were positive (Strongly Agree (5) or Agree (4)). Less than 10% of responses were negative (Disagree (2) or Strongly Disagree (1)). In T_2, 100% of the responses were positive. The proportion of positive responses returned to nearly 80% in T_3 with negative responses accounting for less 10% of all responses. For the course quality measure, the number of positive responses increased from approximately 40% of responses to nearly 80% of responses from T_1 to T_2. Negative responses for these two periods remained below 5%. There was a drop-off in positive responses from T_2 to T_3, to approximately 70%; however, the drop-off was not nearly as severe as that experienced for the teaching effectiveness measure. Negative responses increased to slightly more than 10%.

Question	T_1 vs. T_2	T_1 vs. T_3	T_2 vs. T_3
Teacher Effectiveness	Yes (p<0.01)	No (p=0.47)	Yes (p<0.01)
Course Quality	Yes (p<0.01)	Yes (p<0.01)	No (p=0.32)

TABLE II: Summary of Fisher's Exact Tests ("Yes" indicates significant difference)

Fisher's Exact Test (Agresti, 1992) was used to compare the distributions of student responses for instructor teaching effectiveness and course quality questions across semesters T_1, T_2, and T_3. The questions from T_1 with the greatest factor loadings for each factor were used as described above. Table 2 shows the results of Fisher's Exact Test. All tested pairings of semesters were found to be significant with the exception of T_1 and T_3 for teacher effectiveness and T_2 and T_3 for course quality. To test robustness, Fisher's Exact Test was re-run with each question from T_1 that significantly loaded (loading above significance cutoff of 0.5) on each factor substituted for the questions with the best loading. This test of robustness produced results that aligned with those displayed in Table 2.

5. DISCUSSION

The survey results show that engaging students in a flipped classroom initially improved the students' perception of course quality. The course experience was perhaps no longer merely a matter of memorizing information and regurgitating it for a course grade; now the student became intentionally engaged in the material as successful participation in the learning activities necessitated it. Students begin to interact with the material and might see it as more relevant to their personal learning. Thus, as long as the active learning exercises of interest to students are presented and the students participate, this level of student engagement with the material will occur and lessen student resistance to the IC environment.

As with the student perceptions of course quality, an initial improvement in perceptions of teaching effectiveness was followed by a drop-off from semester T_2 to semester T_3. Whereas the nature of the personalized engagement in a flipped classroom lends itself to changing student perceptions of how worthwhile a course is, the preparation and approach with which the instructor facilitates the flipped classroom can have an effect on student perceptions in either a positive or negative direction. In this research at T_2, more attention was paid to the details of creating the flipped classroom/active learning environment, and student evaluations of the instructor went up over the lecture delivery method. At T_3, when the student evaluation scores of the instructor were equivalent to T_1 (and lower than at T_2), the instructor, having taught the material with the IC approach multiple times at this point, did not dedicate sufficient attention to getting the course environment correct. The student perceptions of the teacher's effectiveness reflect that the IC can be an improvement over the traditional lecture delivery method. It might take several semesters of preparing an IC to have it become as second nature as the lecture method is for that instructor. Although this might lead to an instructor's hesitance to adopt a flipped classroom, sufficient awareness of this effect would likely lessen its probability of occurring.

The results show that introducing a flipped classroom approach into an introductory, non-major course can be beneficial in terms of student perceptions of the course and of the instructor.

6. FUTURE RESEARCH

Future research involves more investigation from the higher education administrator's stakeholder viewpoint. Most of the current research from this stakeholder perspective has been conducted in the K-12 educational setting, leaving a gap in research focused on higher education specifically. The administrator perspective and any movement

that exists to support ICs becomes paramount to any individual instructor's success with the approach. There also needs to be support for the IC in the organizational culture for pedagogical change to be effective. Otherwise, students will find the courses of the lone flipped classroom instructor jarring and potentially force the instructor to engage in the inevitable discussion about why he or she is the "only one" who "forces" students to learn this way. Answering questions about how implementation of this pedagogical model will impact the number of majors in the discipline or enrollment impacts on student-teacher ratios and teaching efficiency will provide administrators with additional data with which they can decide the level of support for ICs and active learning that their learning environment might support currently or in the future.

Continuing work investigates the adoption of the flipped classroom approach as a matter of "technology adoption" among faculty, as the challenges and benefits to adopting the model and its heavy dependence on technology are similar to those faced by users deciding whether or not to adopt a new technology for their work. Morris (2013) found in his study of flipped classroom adoption in higher education that administrators needed to address the following roadblocks: culture change; time needed to implement the change; buy-in at the community and executive level; technology challenges; professional development needs and student perceptions. These mirror the challenges faced by executives when trying to get their employees to adopt new technologies in the workplace. By applying the UTAUT model (Venkatesh, Morris, Davis, & Davis, 2003) to investigate motivations behind adoption, researchers can look to get closer to understanding what factors can be used to encourage adoption of the flipped classroom model. The factors that influence behavioral intention to use the model and use behavior are explained by four factors: performance expectancy; effort expectancy; social influence and facilitating conditions. Morris' (2013) findings of reasons for adoption or planned adoption of flipped classroom models can be mapped to one of the four factors in the UTAUT model, and subsequently analyze additional data to determine if the model is supported in this context. This will provide further insight into the administrator's stakeholder view and potential actions an administrator could take to encourage the adoption of active learning technologies in his or her institutions.

7. CONCLUSION

The results of this quantitative study demonstrate that implementing the flipped classroom approach can positively impact student perceptions of course quality and teacher effectiveness. Ultimately, IC implementation can have a positive impact on course enrollments and increase interest in information systems among potential majors. Identifying the challenges and practices necessary to overcome those challenges helps encourage all higher education stakeholders, including students, instructors and administrators, to adopt this pedagogical approach.

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Appendices and Annexures

APPENDIX A

SURVEY ITEMS FOR T_1 SURVEY ADMINISTRATION

Question Item
1.   Given the nature of this particular course, the in-class activities (e.g. lectures, discussions, exercises, etc.) seemed appropriate and helped facilitate my learning in this course. (1=strongly disagree; 5=strongly agree)
2.   Given the nature of this particular course, the outside assignments (e.g. problem sets, projects, case write-ups, etc.) seemed appropriate and helped facilitate my learning of the subject matter. (1=strongly disagree; 5=strongly agree)
3.   The instructor explained key concepts clearly and thoroughly. (1=strongly disagree; 5=strongly agree)
4.   The instructor adequately solicited and appropriately responded to student questions and comments. (1=strongly disagree; 5=strongly agree)
5.   The instructor provided helpful guidance and feedback on course assignments. (1=strongly disagree; 5=strongly agree)
6.   In comparison to other courses in the business school, this course was intellectually challenging. (1=strongly disagree; 5=strongly agree)
7.   In comparison to other courses in the business school, the difficulty of this course was: (1=extremely easy; 5=extremely difficult)
8.   In comparison to other courses in the business school, the overall workload of this course was: (1=extremely light; 5=extremely heavy)

APPENDIX B

SURVEY ITEMS FOR T_2 AND T_3 SURVEY ADMINISTRATION

Question Item
1.   Considering both the limitations and possibilities of the subject matter and course, how would you rate the overall teaching effectiveness of this instructor? (1=not at all effective; 5=extremely effective)
2.   Focusing now on the course content, how worthwhile was this course in comparison with others you have taken at this University? (1=not at all worthwhile; 5=extremely worthwhile)