

THE INVERTED CLASSROOM: A LOOK AT FLIPPED INSTRUCTION AND THE EFFECT IT HAS ON STUDENTS' ABILITY TO ADDRESS COMPLEX ISSUES

By:

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(Under the Direction of Maria Navarro)

Abstract

The purpose of this study was to evaluate the effectiveness of flipped instruction techniques in a collegiate class setting. We compared student learning between groups who had participated in different learning environments, and assessed differences in their ability to address complex issues. Lessons within the study that were taught utilizing the same educational treatments across the groups served as a measure for making certain the groups were comparable on an academic level. A precursor case study was addressed by the students using different treatments, this precursor case study looked to familiarize students with the process of analyzing a case study. On the final exam a case study was issued. Data analysis indicated that students who encountered the precursor case study in a fully flipped format were able to address more complex issues on the final exam case study. This study revealed that by incorporating flipped instruction techniques, students are able to engage in complex and critical thought.

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Dedication

This thesis is dedicated to my friends and family who have reminded me that we must remember to live as long as we stay alive.

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Chapter 1- Introduction to the Study

Introduction

Nelson Mandela is quoted saying, “Education is the most powerful weapon which you can use to change the world” (“A quote by Nelson Mandela,” n.d.). Mandela was not alone in his belief of the importance of education. The importance of education has been stressed throughout history, and can be found in the theories proposed by Plato, Descartes, and Aristotle. The works of these historical benefactors of education focused on how learners do in fact learn. It was the position of Plato and Descartes that knowledge arises through the mind, and they are accredited with the Latin quote, “Cogito, ergo sum”, with the English translation being “I think, therefore I am” (“Cogito, ergo sum,” 2013). However, the thoughts of Plato and Descartes were refuted by Aristotle. Aristotle believed that education was received through experience and knowledge that was taken in through the use of one’s senses (Schunk, 2012). The list of educational theories is extensive, and includes: structuralism, functionalism, behaviorism, constructivism, etc. The theory that is most applicable to the work done in this study is constructivism. One of the basic fundamentals of constructivism is that knowledge is first produced in the mind of the student (Dabbagh, 2005). It is simple to realize the extent to which education has been researched throughout the past century. One can therefore make the assumption that education is extremely important to understand and implement. The more one understands education, the stronger impact one can have on the techniques used in the education (Schunk, 2012).

Though education has been thoroughly researched, new techniques and theories continue to arise, even within the last 10 years (Giroux, 2012). Flipped classrooms are beginning to become more fashionable among both individual educators and school systems (Thompson, 2016). The flipped model of instruction looks to increase the performance of students by locating more lecture and content revision components outside of class through the use of technology, and having difficult assignments done in class through activities that allow for discussion of the given topic (Clark, 2015). This study will look at the implementation of flipped instruction techniques, and the impact they have on the students' ability to address basic and complex issues in comparison to students who received information in the format of a traditional lesson.

Problem Statement

Universities across the nation are currently looking at ways they can increase student engagement, active learning, preparedness, and critical thinking skills. Preparing students for the workforce is of the utmost importance to most universities (Association of American Colleges and Universities, 2010). A university in South Florida conducted a study that looked at the perceptions of career counselors (Rao, 2015). The counselors believed that the skills gaps that needed to be addressed included communication as a major concern (Rao, 2015). One of the proposed solutions to bridge the perceived skill gap and involve students as active learners is the utilization of flipped classrooms, or flipped classroom methodologies (Hettler, 2015). Through the use of flipped components some scholars assume that students will engage in critical thinking, possibly increasing the value of students' education. While many people accept that "flipping" education could enhance student learning, data-based research about the flipped classroom is still in its infancy and more research is needed. Some criticisms of current scholarship exalting the value of flipped instruction include the following: 1) most assessments

are anecdotal (Enfield, 2013), single-shot case studies (no control or pre-tests); 2) impact is seldom assessed with evaluation of learning, but with student self-reports or ex-post-facto observation-based assessments (Mason, Shuman, & Cook, 2013); 3) when controls are used, these are with nonequivalent student groups (Mason et al., 2013), do not take into account student self-selection, and are with courses that differ much more than in the “flipped” treatment (may use different faculty or have inherently different learning objectives and content), and 4) comparisons in learning and impact do not take into account differences in amount of time and effort outside of class invested by students.

Purpose of the Study

The purpose of this study was to evaluate the effectiveness of flipped instruction techniques in a collegiate class setting. To this end, the researchers compared student learning between groups who had participated in different learning environments, and assessed differences in the ability of students to address basic and complex issues when analyzing a case study. There were three Groups. In Group A, students analyzed a case study through a traditional lesson (no pre-class or post-class components) with an in-class activity. In Group B the case study was presented through a traditional lesson (no pre-class or post-class components) with an in-class interactive lecture, and in Group C, the students analyzed the case study through a lesson with all the components of a flipped classroom. This will help gain broader knowledge of how students learn, and how we can implement different pedagogical methodologies to aid in the enhancement of learning and critical thinking. Specifically, it will help interested practitioners better design curriculum that involves flipped components and flipped classrooms.

Research Questions

To accomplish the purpose, the following research questions were identified:

Research Question #1: What are the demographics of the study participants? Are students from the different Groups similar academically?

After completing a lesson that addressed a case study using different teaching and learning strategies in each treatment Group (A: traditional, with in-class activity; B: traditional, with in-class interactive lecture; and C: flipped, with all components of flipped classrooms), what were the differences between groups regarding the following abilities:

Research Question #2: What were the differences in the ability of students to address basic issues in a case study when comparing between treatment groups?

Research Question #3: What were the differences in the ability of students to make connections and address complex issues in a case study when comparing between treatment groups?

Assumptions

The following assumptions were in place during this study:

- All students in the classes that were flipped adhered to the academic honor code that is established by the University of Georgia.
- Students participating in the study had no previous biases about flipped classrooms before the study.

Definitions of Key Terms

Flipped Classroom: In a flipped classroom, students receive information outside of class in the form of assigned readings, online lectures, or online presentations. When the students come to class, they are expected to have taken responsibility for the information, then participate in in-class discussions and group activities. Students then engage in a structured post-class reflection.

Social Cognitive Theory: Social cognitive theory stresses that much of human learning occurs in a social environment, and that people learn, acquire knowledge, rules, skills, strategies, beliefs, and attitudes by observing others (Schunk, 2012).

Constructivism: Constructivism requires that teaching methods utilize higher order learning techniques and challenge the knowledge of the students so they can construct new knowledge. Constructivism also focuses on the idea that people build their own knowledge and understanding by reflection. Because there is currently a shift in education techniques away from environmental influences to human factors, constructivism is becoming more and more relevant (Schunk, 2012).

Limitations/Delimitations

One of the major limitations of this study was the selection of lessons and corresponding data that was to be used to compare the different treatments. While there were many instances of lessons where the teaching methods and formats (traditional and flipped) were different in each group, not all lessons had tests that evaluated uniquely the learning that could be attributed to that specific lesson. The lesson chosen for the study, the case study lesson, was different from the rest of the lessons, and had content and processes that were unique enough that the learning of the student could be more directly linked to the experiences in the lesson.

An additional limitation was that the instruments (grading rubric, and tests conducted) and the organization of data in different constructs were all created and analyzed by the researchers. Thus, while the researchers assumed that their categories were a representation of students' ability to analyze basic and complex issues respectively, there was not evidence supporting that assumption.

This was a quasi-experimental study, and the Groups were not equivalent. While the researcher compared the academic ability of students using two lessons/tests, the Loess Plateau and the Excellent Development lessons, there is no evidence that these tests accurately compare student academic ability, preparation for the class, or readiness for case studies like the ones used in the research.

This study was limited to students at The University of Georgia (UGA), who self selected to be in the class (ALDR/AFST/LACS 3820 Reflections on Fighting Hunger). Meaning, the findings in this study are not generalizable across all institutions, and only represent the students in the course studied, influenced by the current situation at UGA. This study does not analyze the familiarity the students have concerning flipped classrooms, which could affect their response to the different elements of the process (e.g., pre-class assignments and assessments).

Chapter 2 – Theoretical Framework and Literature Review

Theoretical Framework

The theory that provided a framework and base for this study was proposed by Piaget and Vygotsky – Constructivism. Piaget compares the idea of thought process to operations within the mind.

First of all, an operation is an action that can be internalized; that is, it can be carried out in thought as well as executed materially. Second, it is a reversible action; that is, it can take place in one direction or in the opposite direction The third characteristic of an operation is that it always supposes some conservation, some invariant. It is of course a transformation, since it is an action, but it is a transformation that does not transform everything at once, or else there would be no possibility of reversibility The fourth characteristic is that no operation exists alone. Every operation is related to a system of operations, or to a total structure as we call it. (Piaget, 1970, pp. 21–22)

According to Schunk (2012), constructivism “underlies the emphasis on the integrated curriculum in which students study a topic from multiple perspectives” (p. 231). One of the basic fundamentals of constructivism is that knowledge is first produced in the mind of the student (Dabbagh, 2005). This idea of knowledge arising from the mind is where we begin to see constructivism’s relation to flipped classrooms. It is the goal of instructors who utilize flipped instruction techniques for students to receive the information before class and begin to make their own understanding of the material, and begin to make connections to other lessons throughout the semester.

Constructivism assumes that individuals are active learners. Active learners are those individuals that take responsibility for their learning, and actively seek out information (Levintova & Mueller, 2015). Not only are active learners interested in bettering their own education, the process by which they learn information is very involved; it often times involves

reading, writing, problem solving, and class discussion. This is in opposition of passive learners, who prefer passive-learning techniques, which usually involve traditional lecture-based classes. Passive learners generally receive information better in a note-taking environment as opposed to an engaged learning environment (Chrastil & Warren, 2015).

This study can be outlined using constructivism as the basis of flipped instruction, or teaching methods that involve flipped components, as it looks to inspire connection-making and critical thinking among students. This building upon knowledge and making connections is not just important for individual lessons, but for cross curriculum understanding and information retention. In this study, many flipped components required the students to work in groups to either discuss certain topics, or to come up with solutions to problems they had been given. This group work, and social interaction among the students in the study alludes to a theory under the umbrella of constructivism, and that is social constructivism. Russian psychologist Lev Vygotsky is accredited with being the father of social constructivism. Vygotsky believed that knowledge and information was acquired through interactions with other people (Vygotsky, 1978). As cited by King (2015), Prasad (2005) asserts that social constructivism “rests on the belief that objects and events have no intrinsic meaning apart from those assigned to them by individuals in the course of everyday social interactions” (p. 21). This meaning that having the students interact and discuss what they are learning in class, in theory, should allow them to further conceptualize the information and be able to retain what they study. What must be realized when using constructivism as a framework is that it should be seen as a theory that involves multiple facets (Juvova, Chudy, Neumeister, Plischke, Kvintova, 2015). Yoders (2014) asserts that “currently, there is no single Constructivism theory of learning. Instead, many forms of Constructivism are found in literature” (p. 12).

Review Of The Literature

As students begin to engage in an ever-changing world of technology, it is important for their learning environments to change and evolve with them. “Changes in student demographics, the economic climate, and Internet technologies have made the contemporary educational environment different than it was even just a decade ago” (Rotellar & Cain, 2016, p. 1). Due to advancements in technology, a recent trend of flipped classrooms has emerged in the field of education. A flipped classroom (or inverted classroom) is one where students are given information before class and then expected to take responsibility for the given information, come prepared to class, and participate in organized in-class activities to reinforce that information (Clark, 2015). In Figure 1, the Regents of the University of Michigan explain flipped instruction. This figure graphically represents what happens inside and outside of the classroom when utilizing inverted instruction.

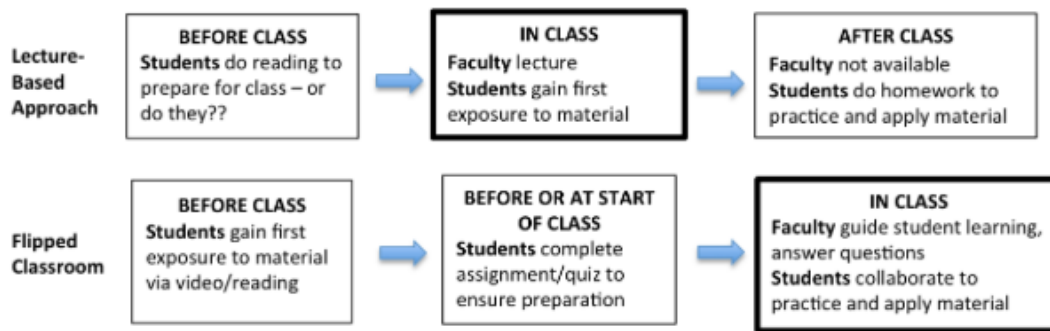


Figure 1. Chart showing the setup of an inverted classroom (The Regents of the University of Michigan, 2015).

This pre-exposure to class content is in opposition to traditional teaching methods, where teachers lecture in class, then give the students assignments to complete at home. Freeing the class from the lecture “burden” opens up more time for student interaction with instructors and

peers, and provides opportunities for in-depth analysis of difficult content when the student has the instructor available to help in the learning process. This literature review examines sources that discuss the usefulness of flipped classrooms and techniques, the origin of flipped classrooms, as well as their effect on the students' ability to make connections between lessons and disciplines, thus eventually leading to a higher quality education.

“Learning management must be adapted to the current situation/society and focus on improving higher order thinking skills of students” (Budsankom, Sawangboon, Damrongpanit, Chuensirimongkol, 2015, p. 2639). Students see the opportunity to make connections between lessons and material in class as an important learning tool (Dresner, De Rivera, Fuccillo, Heejun, 2014). Many suggest that the ability to think critically and synthesize complex information is among the best preparation to deal with change (Brierton, Wilson, Kistler, Flowers, Jones, 2016). “Learning theorists advocate that instructional strategies like those used in a flipped classroom enable students to learn and retain information better than through traditional lectures” (Rotellar, Cain, 2016 p. 1). Preparing students to deal with change and make connections is what educators strive to accomplish. In the courses used for this study, the instructor looked to foster an environment that would lead the students to make connections between lessons, and increase their ability to think critically. This ability to address complex issues and make connections serves as a precursor to higher order thinking skills.

Higher order learning, or higher order thinking, is most important as its process looks to strengthen students' problem solving skills (Raiyn, Tilchin, 2015). The strengthening of these skills, and the creation of higher order learning, can be fostered through the utilization of a problem based learning model (Barret, Moore, 2010). This argument prompts the discussion of the students' upward movement on the Bloom's Taxonomy Model (Figure 2). “Bloom's

taxonomy is the most referred to of all the frameworks in education. An implicit assumption in Bloom's taxonomy is that the higher order levels incorporate lower order levels" (Bagchi & Sharma 2014, p. 57). Bloom's taxonomy and thought process has also served as the basis for one of the few measurement tools for higher order learning. The Florida Taxonomy of Cognitive Behavior, which was created by Webb (1968), looks to measure the level of cognition that students achieve based on the professors classroom behaviors (López & Whittington, 2014).

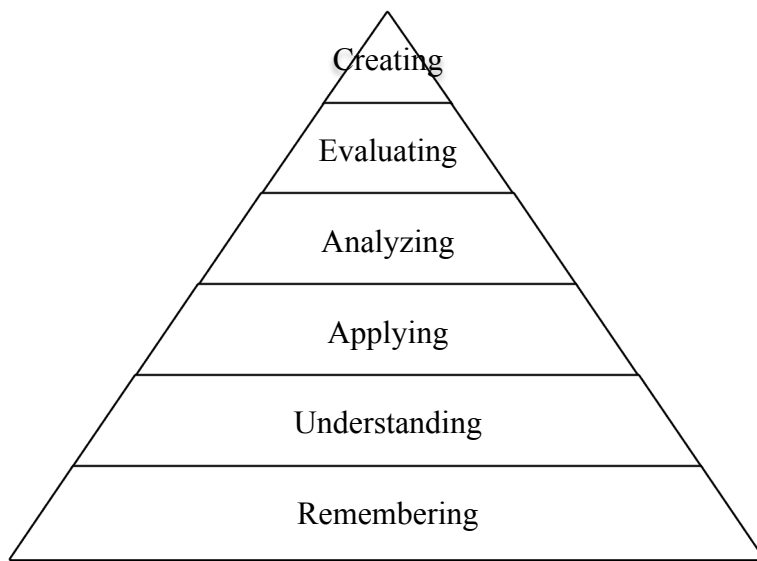


Figure 2. Bloom's Revised Taxonomy 2001 (Forehand, 2010)

It is simple to draw parallels between problem based learning (PBL) and flipped instruction. In PBL, students often participate in brainstorming activities and discussions, then collectively apply their gained knowledge (Barber, King, Buchanan, 2015). Similar practices are utilized in flipped instruction. Teachers have their students work outside of class individually and in groups. The students then come to class prepared to discuss the topic or participate in activities that apply what the students have learned to aid in the connection-making process.

“Early data suggest significant increases in student learning and achievement when flipping [is] compared to baseline data on the same courses taught in the traditional classroom lecture mode, using the same assessments” (Fulton, 2012, p. 13).

Constructivism serves as the theoretical framework for this study. This theory works under the assumption that students are active learners. Educators that employ flipped instruction rely on the student to take a certain amount of responsibility for their education. “Moving the delivery of basic content instruction online gives students the opportunity to hit rewind and view again a section they don’t understand or fast-forward through material they have already mastered” (Horn, 2013, p. 78). This style allows for the student to move at his or her own pace. Having the ability to move as fast or as slow as they want, students experience lower levels of anxiety. In addition, because the educator is available during the entire in-class portion of the course when utilizing the flipped model, they can help students one-on-one so they have a better opportunity to understand class concepts (Tucker, 2012). This ability to interact with the teacher individually proves valuable to some students, as they do not have to stop the entire class to ask a question. Stopping the flow of class may be uncomfortable to some students, as they face the fear of peer judgment. In a study that looks at the role of fear in education, investigators found that participants frequently mentioned the fear of peer judgment as a factor impacting their learning experiences (Perrin, O’Neil, Grime, Bryson, 2014).

While many people accept that “flipping” education could enhance student learning, data-based research about the flipped classroom is still in its infancy and more research is needed. Some criticisms of current scholarship exalting the value of flipped instruction include the following: 1) most assessments are anecdotal (Enfield, 2013), single-shot case studies (no control or pre-tests); 2) impact is seldom assessed with evaluation of learning, but with student self-

reports or ex-post-facto observation-based assessments (Mason, Shuman, & Cook, 2013), and when analyzing learning, the focus is on lower order thinking skills rather than higher order thinking skills; 3) when controls are used, these are with nonequivalent student groups (Mason et al., 2013), do not take into account student self-selection, and are with courses that differ much more than in the “flipped” treatment (may use different faculty or have inherently different learning objectives and content), and 4) comparisons in learning and impact do not take into account differences in amount of time and effort outside of class invested by students. Finally, of special importance to this study, there is not an abundance of scholarly work analyzing the impact of flipped instruction on students’ ability to address complex issues.

Some argue that a major downfall to the flipped classroom, as it is designed today, is that students must have access to technology. Without a computer or access to the Internet, it is nearly impossible for a student to be involved in these courses. However, flipped instruction is not limited to the use of technology as its sole crux. The use of any educational tools that a student interacts with before class can be classified under the flipped classroom umbrella (Mehring, 2016). It is argued that flipped instruction also has the downfall that many students may not be used to this type of instruction, and therefore need additional time to adjust their learning styles to fit the new model of education. Further, some students resist flipped instruction because of the perception that it is more work for the student, which might and might not be true, depending on the course and instructor. If flipped classroom methodologies are introduced to students earlier in their education, familiarity with this teaching model will prepare them for its future use. Finally, the issue of accountability must be addressed. The pre-class learning phase of flipped classrooms relies on the students to take responsibility for their education (Green, 2015). Without student buy-in, it can become difficult to implement an inverted classroom (Heyborne,

Perrett, 2016). The ALDR 3820 Reflections on fighting hunger course was chosen for research to evaluate the impact of the flipped classroom on the students' learning because the instructor was prepared to teach fully flipped lessons and was interested in learning more about their impact on students' learning, and the teaching and learning strategies that best helped students in her classroom. Without a full spectrum study, it is difficult to see if the flipped classroom truly is effective. This study analyzed the relationship between flipped instruction practices and teaching strategies employed, and how they impacted the learning of students.

Chapter 3 - Methods And Procedures

Background of the Study

This research was part of a larger project entitled “Impact of teaching strategies in hunger issues courses,” approved by the Institutional Review Board (IRB) of the University of Georgia on April 8, 2015 (STUDY00002064). The research presented in this document involved three sections of a course, ALDR/AFST/LACS 3820 Reflections on Fighting Hunger, all taught by the same instructor, Dr. Maria Navarro. During Spring 2015, Dr. Navarro taught two sections of the course, one in the morning (Group A), and one in the afternoon (Group B). During Fall 2015, she taught a third section (Group C).

Originally the research intended to compare student learning and perceptions between two sections of the course, one where most of the lessons were to be taught through a completely flipped process, and one where most of the lessons were to be taught through on a “more traditional way”. Figure 3 shows a comparison of a flipped lesson and a traditional lecture-type lesson. In the study, the flipped lessons would include student interactions with the materials before class (instructor pre-recorded lectures, TED talks, readings, etc), an accountability measure (short papers, quizzes) to ensure that the students did the homework and came prepared to class, a class activity where the students would interact with their peers and the instructors to reinforce the materials reviewed before class, a post-class reflection, and a final evaluation of learning (test). The more “traditional way” course was to include more than just the formal lectures detailed in Figure 3. (i.e., interactive/Socratic presentations, class activities, discussions, etc.). It was labeled as “traditional” because the students were to interact with the content during

class, not before class, and all they were asked to do after class was to study for the final exam. Thus, the main difference between the two course sections was that the flipped classroom had additional elements for student interaction with content before class and after class.

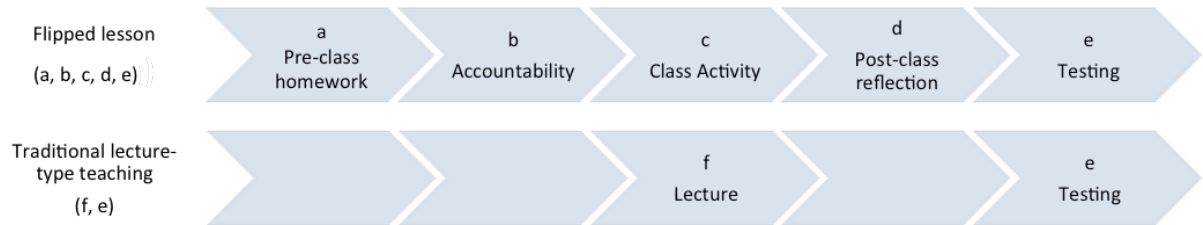


Figure 3. Comparison of a lesson taught using flipped techniques versus tradition lecture-type teaching.

Upon contemplation of this model (comparing a fully flipped course with a traditional course), the researchers began to question the ethical nature of the study. Was it ethical for the sake of research to provide a group with what the researchers considered “better” teaching? If one group were to excel compared to the other because of the teaching methods, would it be fair to give students in the other group lower grades for the course?

The researchers decided that the initial plans of comparison between a fully flipped and a traditional course had to be changed. The new research model included three groups, with flipped lessons in all groups, non-flipped lessons in all groups, and all types of in-class teaching methods for all groups (i.e., lectures, activities, discussions, etc.). For example, if Group A had lesson 1 through a flipped model, they would do lesson 2 through a more traditional way. Conversely, group B would do lesson 1 in a traditional way, and lesson 2 through a flipped process (Table 1). The comparisons then would be lesson by lesson rather than the whole course. When Group C was added, additional comparisons were included, whereas one could compare not only “flipped” versus “non-flipped”, but also the impact of different in-class teaching strategies.

Table 1

Example of Organization of Lessons in the Study

	Topic 1	Topic 2	Topic 3
Group A	Flipped	Traditional (In-class Interactive Lecture)	Traditional (In-class Activity)
Group B	Traditional (In-class Interactive Lecture)	Traditional (In-class Activity)	Flipped
Group C	Traditional (In-class Activity)	Flipped	Traditional (In-class Interactive Lecture)

*Traditional stands for a non-flipped class, meaning that it did not have pre-class components (assignments, accountability measures) or post class components (assignments, accountability measures), other than the final exam.

Population of the Study, Recruitment, and Consent

The target population were students in the three sections of the ALDR/AFST/LACS 3820 Reflections on Fighting Hunger course (Groups A, B, and C). The sample of potential participants in the study consisted of all students in the three sections of the course (census of the target population). All students were asked to participate in the study. Students were initially recruited by the instructor, with an announcement in class (see recruitment script, Appendix C). Two reminder emails followed this initial recruitment effort, one by the instructor, and one by the graduate students (see reminder emails, Appendix C).

Participating in the study did not required students to do anything additional other than what they were doing already for class. In fact, it simply involved allowing the researchers to use and include in their research the information/data that were collected through student participation in class activities, lesson feedback, assignments, quizzes, group work, exams, and evaluations (see consent form, Appendix D).

Out of the 129 students enrolled in the three groups (Group A = 51; Group B = 45; Group C = 33), 86 signed the consent form and agreed to participate in our study (Group A = 33, Group B = 30; Group C = 23). This participation gave a response rate of 67%. No preferential treatment or incentives were given to students who choose to participate in the study (allow for their course data to be used for research purposes).

It is important to note that the groups in this study were not equivalent. The groups were not equivalent because the students self selected which section of the course they were taking. Because this study does not involve random assignment of participants in groups, it is categorized as a quasi-experimental design (Lai, Kwok, Wong, Fu, Law, Yip, 2016).

Research Design and Data Collection

This research used data from student grades in three course tests, ensuing from three different lessons, the Loess Plateau Lesson, the Excellent Development Lesson, and the Case Study Lesson. Tables 2, 3, and 4 summarize the research design, lessons, organization of delivery methods, and type of data used for the research.

The Loess Plateau Lesson and the Excellent Development Lesson: Groups A, B, and C were not equivalent, as students had self-selected into the groups. Because of this lack of equivalence between groups, the researchers added a component in their research to determine if the groups could be considered academically similar. At the beginning of the semester, the instructor delivered two lessons in exactly the same way to the three groups using videos and websites that the students were asked to watch and browse on their own, and then answer to an online quiz. The Loess Plateau Lesson consisted on a 53-minute video by the World Bank about a land rehabilitation project in China, and the Excellent Development lesson asked the students to browse the webpage and watch a 31-minute video of a non-profit organization working in

food security in Africa. The use of videos and websites, as well the independent review by the student, helped avoid differences that could appear because of the instructor's delivery and group dynamics in class. The grades of the students in these quizzes were used to compare the groups and determine whether or not they were academically different (Research Question 1)

The Case Study Lesson: In order to address research objectives 2 and 3, the groups (A, B, and C) were given a precursor case study (Appendix A), and a case study on the final exam (Appendix B). The precursor case study was presented to the students utilizing different teaching methods in each of the groups, and was aimed to familiarize the students with the process of analyzing a case study. Group A was presented the information in a traditional format with an in-class activity. While in class, students in Group A were placed into smaller groups, given the precursor case study, and asked to discuss with their groups the case study, and answer the case study questions. Group discussions were overseen by the instructor. After discussion, the smaller groups were then asked to present their thoughts and comments about the case study to the rest of the class. This modified traditional treatment (no pre-class assignment) utilized the full 75-minute class time. Group B did not have a pre-class assignment, and was presented the information in a more traditional that utilized an in-class interactive lecture. The instructor presented the information through a "Socratic" lecture using a PowerPoint presentation, and adding questions posed to the audience throughout the presentation. Students were allowed to engage and ask questions throughout the duration of the lecture, but the instructor was the one guiding the process and "telling" the students about the case study, and the question and answers to the case study storyline. The traditional lecture treatment used the full 75-minute class time. Finally, Group C was given the information in a fully flipped format. Before class, the students were asked to complete the precursor case study and turn their work in for a grade. This served

as an accountability measure to ensure that the students completed the pre-class portion. While in class, the students participated in group discussions concerning the case study. This in-class activity lasted for 30 minutes. Following the class, students were given the opportunity to make corrections to their case studies and resubmit them for a grade. This revision and correction served as post-class reflection homework. In total, students in Group A and B devoted 75 min of class time to the case study and no out of class time to the case study. Students in Group C devoted 30 minutes of class time and about 45 minutes or more outside of class.

During the final exam, a separate case study (Appendix B) was presented to the students. This case study was modeled after the precursor case study (Appendix A). The students were asked to complete the case study and give their recommendations. A grading rubric (Table 5) was used to grade the student's answers for the case study on the final exam. The grading rubric was created with responses that the researchers believed should be addressed by the students. In order to organize the exam data in line with research questions, three separate categories were created from the grading rubric: Basic Issues Category, Impact Category, and Question Category. The individual rubric items for each of these categories are presented in Tables 7 and 10, in the results section.

The Basic Issues category was used for research objective 2. This category was created from items in the rubric that were not new to the students by the time they participated in the precursor case study. On the contrary, they had been addressed and discussed in several lessons in the course prior to the precursor case study. The Impact and Question categories were created to organize the data for research objective 3. The Impact category was created from responses within the rubric that addressed the impact or implications the program proposed in the case study would have on the people involved in the program. While these issues were complex, the

students had already had some lessons prior to the precursor case study that discussed impact, however, they had never been asked to evaluate the impact of a program themselves. Finally the Question category was created using the responses in the rubric where the value of the program in the case study was questioned. This construct was very complex, as it was the first time that the students were asked to question the legitimacy of a program.

In order to give a quantitative output to qualitative data, the students were given scores based on if they mentioned a response within the rubric. If the students mentioned a response within the rubric they were scored appropriately. By quantizing the qualitative data, the researchers were able to assign numerical values to categories that could then be compared and analyzed (Seltzer-Kelly, Westwood, Pena-Guzman, n.d.). The responses were graded utilizing theme frequency. Theme frequency does not score the students based on the amount of times they mentioned a response, but rather, if they addressed a certain response at all (Wao, Dedrick, Ferron, 2011).

Table 2

Organization of Specific Lessons Within Study

Lesson Name	Group A	Group B	Group C	Testing
Loess Plateau				
Excellent Development	a, e Video	a, e Video	a, e Video	Quantitative quiz
Case Study precursor	c, e Class activity TRADITIONAL with in-class activity	f, e Lecture TRADITIONAL with in-class interactive lecture	a, b, c, d, e Pre-class case study, Accountability essay, Class activity, Post-class reflection FLIPPED All components of a flipped classroom	Open-ended case study question in final exam

- a. Pre-class homework (watch video presentations, readings, case studies)
- b. Student accountability (quiz, test, or pre-class essays)
- c. Class activity (in-class discussions, problem solving activities, case studies)
- d. (Guided) Post-class reflection homework (Post-class essay)
- e. Testing (multiple choice quantitative tests, homework essays, open ended question in final exam)
- f. Interactive lecture

Table 3

Regular Practice Class Procedures that Served as Data Sources for the Study

Regular Practice Procedures	
Examinations	The final examination took place at the end of the semester. On the final exam, a case study was given to the students. This case study was similar to the precursor case study, which was presented differently to the three groups. The student answers to this case study were used as data for this study. The instructor initially graded the case study using a rubric (Table 5). From the rubric, items were organized into three categories (Basic Issues category, Table 7, Impact category, Table 10, and Question category, Table 10).
Quizzes	Online quizzes were conducted every week to track the progress of the students and to serve as a form of accountability for the students. The grades from multiple-choice quizzes for the Loess Plateau lesson and the Excellent Development lesson were used to compare the Groups and determine whether or not they should be considered different in terms of the academic ability of the students.

Table 4

Lessons, Data, and Research Design summary

Lesson Name	Data Utilized	Treatment
Loess Plateau lesson	Quiz grade (multiple choice) of Loess Plateau lesson	Group A, B, and C - same treatment
Excellent Development lesson	Quiz grade (multiple choice) Excellent Development lesson	Group A, B, and C - same treatment
Case Study	Mean score of individual components of " Basic Issues " category from final exam case study	Group A: traditional with in-class lecture Group B: traditional with in-class interactive lecture Group C: flipped with all components of a flipped classroom
Case Study	Mean score of individual components of " Impact " category from final exam case study	
Case Study	Mean score of individual components of " Question " category from final exam case study	

Table 5

Grading Rubric for Final Exam Case Study

Case Study Grading Rubric
Is inequality addressed? How will it impact different peoples differently?
Did they propose the need for a needs assessment?
Do they question the value of the recommendation?
Is education mentioned other than fertilizer and corn or extension?
How do they access the fertilizer?
How do they afford the fertilizer?
How do they know how to use the fertilizer? (Education)
Why corn?
Suggest alternatives for corn.
What will be lost in the transition?
What will this do to their subsistence agriculture?
What will it do to diversity?
How will lack of diversity impact nutrition?
How will it impact risk?
How will it impact environment?
How will they know how to grow it?
They don't have access to the market to begin with. (Transportation)
If they did have access to the market, corn would be harvested at the same time, flooding the market.
Thinks we should do it (transposed)
Additional considerations
Proposes solutions to the problem (Do this, not that)
Other

Data Analysis

After the completion of the course, the data was compiled, and the quantitative data was put into spreadsheets that could be analyzed using a statistical program. The data was analyzed using the Statistical Package for Social Sciences (SPSS v. 23). SPSS could be accessed through the University of Georgia's virtual computer lab, or V-Lab. SPSS was used to calculate means, standard deviations, and perform ANOVA tests, and independent samples t-tests to compare means between groups. The results and outputs of this data can be seen in Chapter 4 – Results.

The quiz grades in the lessons Loess Plateau and Excellent Development were compared between Groups to determine whether or not the Groups could be considered academically similar, to address Research Question 1. The final exam data from the case studies was organized in three categories, Basic Issues, Impact, and Question. The results of these categories were used to compare the Groups A, B, and C as a means to compare the impact of the three different treatments. The Basic Issues category was used to address Research Question 2, and the Impact and Question categories, to address Research Question 3.

Chapter 4 – Results and Discussion

Research Question #1

What are the demographics of the study participants? Are students from the different Groups similar academically?

Out of the 129 students enrolled in the three groups (Group A = 51; Group B = 45; Group C = 33), 86 signed the consent form and agreed to participate in our study (Group A = 33, Group B = 30; Group C = 23), resulting in a response rate of 67%.

All participants were undergraduate students at the University of Georgia, and were coming from a wide variety of colleges and majors. In Group A, there were 16 males and 17 females. In Group B, there were 9 males and 21 females, and in Group C there were 10 males and 13 females. Overall, the study group was 40.7% male and 69.3% female, which is close to the demographics of the University of Georgia as a whole (42.8% Male, and 57.2% Female) (College Data College Profile 2014).

While it would have been interesting to analyze other demographic characteristics of the study participants, and explore whether or not the demographics had an impact on students' response to the flipped classroom and the different teaching and learning methods, the researcher chose to focus on the Group responses as a whole, rather than on the individuals, and no other demographics were recorded. However, differences in distribution of the demographic characteristics of participants between groups could have affected the academic preparation of the students, their learning, and the data analyzed in this study, possibly impacting the results more than the treatment themselves.

The assignment of the students in the different groups was not a random distribution. In fact, the students self-selected their course section, and there could have been significant differences in the academic ability of students between groups. Because of the quasi-experimental design (Lai, Kwok, Wong, Fu, Law, Yip, 2016) of the study it was necessary to test whether or not the groups were similar academically.

In order to test if the groups were similar academically, the researcher performed an ANOVA test to compare the three groups. The data used to compare the academic level of students were the grades of students in the quizzes for two of the lessons of the study, the Loess Plateau lesson, and the Excellent Development Lesson, completed at the beginning of the semester. Students in all groups (A, B, and C) received the two lessons in the exact same format (see Tables 2 and 4) and completed the same quizzes. The researcher used a significance level of 0.05 for the ANOVA test. The results of the ANOVA test are shown in Table 6.

Table 6

ANOVA Test Comparing Quiz Grades the Loess Plateau Lesson and the Excellent Development Lesson Groups A, B, and C (Same Treatment in all Groups)

		Anova Table					
			Sum of Squares	df	Mean Square	F	Sig.
Loess Plateau	Between Groups (Combined)		96.156	2	48.078	1	0.372
	Within Groups		3942.692	82	48.082		
	Total		4038.848	84			
Excellent Development	Between Groups (Combined)		48.559	2	24.28	0.154	0.857
	Within Groups		12893.976	82	157.244		
	Total		12942.536	84			

Because the p-value was not less than the 0.05 significance level, there was no reason to assume that the groups were significantly different in their academic ability at the beginning of the class, assuming that the grades in these lessons were an appropriate representation of the academic ability of the students regarding this course. Other data, such as GPA, could have been used to compare academic ability of students. However, given the wide variety of majors represented in the course, and the difference in grading patterns between colleges and majors, the researcher considered more adequate to compare the students using the grades of common tests. Further, this comparison allowed a comparison regarding academic ability related to the course, rather than a wide variety of disciplines.

Research Question #2

What were the differences in the ability of students to address basic issues in a case study when comparing between treatment groups?

After completing a lesson that addressed a case study (precursor case study, Appendix A) using different teaching and learning strategies in each treatment Group (A: traditional, with in-class activity; B: traditional, with in-class interactive lecture; and C: flipped, with all components of flipped classrooms), the researcher analyzed the differences in the ability of students to address basic issues in a similar case study (final exam case study, Appendix B) when comparing between treatment groups. These basic issues were dealt often in class, not just in the case study.

The data was collected from student responses to a case study in the final exam All groups received the same case study and questions in the exam (Appendix B). The case study in the final was modeled after the precursor case study, addressed differently in each of the three groups (Tables 2 and 4). Group A treatment consisted in a traditional format (without the pre-class and the post-class components of the flipped classroom), with an in-class activity (75

minutes). No accountability measures were used after the in-class activity. Group B addressed the precursor case study also with a traditional format. Under the traditional treatment, the students received the information in class through an interactive lecture (75 minutes). Class C participated in the case study through a completely flipped format. The fully flipped format for this case study included the following:

- Pre-class homework and accountability measure: Read the case study and answer the questions individually, submitting the answers to the professor prior to class. Bring the answers to class to use in the in-class activity (approximately 30 minutes of individual work)
- In-class activity: Small group discussions about the case study, and general discussion with the instructor facilitating (30 minutes)
- Post-class reflection homework: Submit corrections to the individual assignment (for grade improvement) (15 minutes)
- Testing: Final exam case study

In order to assess whether or not there were significant differences between groups in the ability of the students to address basic issues in the case study, the researcher created a “Basic Issues” category utilizing the grading rubric for the case study (Table 5). This category included answers and observations from students that addressed topics that were quite basic and were mentioned very often in class (i.e, education) (Table 7).

Table 7

Rubric Components for the Basic Issues Category

Contributions from students that addressed Basic Issues Category (items in rubric)
Is education mentioned other than fertilizer and corn or extension?
How do they access the fertilizer?
How do they afford the fertilizer?
How do they know how to use the fertilizer? (Education)
How will they know how to grow it?

In order to see if there were any significant differences within the scores of the three groups, the researcher ran an ANOVA test with a significance level of 0.05 (Table 8). The means of the Basic Issues scores for each of the groups can be found in Table 9.

Table 8

ANOVA Test Table for the Basic Issues Category from the Case Study on Final Exam to Compare Results Between Groups (A, B, and C)

		Anova Table					
			Sum of Squares	df	Mean Square	F	Sig.
Basic Issues Construct	Between Groups (Combined)		0.166	2	0.083	0.966	0.385
	Within Groups		7.149	83	0.086		
	Total		7.316	85			

Table 9

Means for the Basic Issues Category Across the Three Groups of the Study

Group	Basic Issues Category	
A	Mean	0.3697
	N	33
	Std. Deviation	0.30871
B	Mean	0.4667
	N	30
	Std. Deviation	0.28446
C	Mean	0.3826
	N	23
	Std. Deviation	0.28228

Based on the p-value in the ANOVA test, the researcher determined that there were no significant differences between the groups when comparing the scores for the Basic Issues category.

The results indicate that the groups did not differ significantly in terms of their ability to address basic issues when analyzing a case study, regardless of the format and teaching and learning strategies used when they did the precursor case study in class. This result was expected, as the students had learned to analyze and discuss these basic issues in many lessons in the class, which included in all cases (Groups A, B, and C) other lessons in flipped formats, with a wide variety of teaching and learning strategies.

Research Question #3

What were the differences in the ability of students to make connections and address complex issues in a case study when comparing between treatment groups?

After completing a lesson that addressed a case study (precursor case study, Appendix A) using different teaching and learning strategies in each treatment Group (A: traditional, with in-class activity; B: traditional, with in-class interactive lecture; and C: flipped, with all components of flipped classrooms), the researcher analyzed the differences in the ability of students to make connections and address complex issues in a similar case study (final exam case study, Appendix B) when comparing between treatment groups.

The precursor case study, the treatments for each group, and the final exam questions were the same as the ones described for Research Question 2.

In order to assess whether or not there were significant differences between groups in the ability of the students to make connections and address complex issues in the case study, the researcher created a two assessment categories utilizing the grading rubric for the case study (Table 5). The categories created were labeled Impact and Question (Table 10). The “Impact” category grouped comments from students that referred to their acknowledgement that the

program proposed in the case could have negative consequences and impact, asked questions about the possible consequences, and proposed actions measures to take in order to minimize these consequences. While the category “Impact” addressed student ability to address a complex issues such as negative impact and possible strategies to minimize it, it was not unique to the precursor case study. In fact, students in the course had the opportunity to analyze impact, discuss negative consequences of development programs, and propose strategies to minimize these consequences in several occasions. For all Groups (A, B, and C), these opportunities had taken many forms, and in all cases students had had the opportunity to study them under at least one flipped lesson. The “Question” category was created from the responses of the students that showed concern regarding the implementation of the program, and resulted in the student questioning the value of the program. While there was an expectation that by the end of the course the students would question the impact and value of development programs, only in the precursor case study did the students “practiced” active criticism of development programs. The items organized for each of the categories (Impact and Question) are listed in Table 10. One of the rubric items, “thinks we should do it” was transposed before analysis. If students thought that the program should be implemented, they received a 0 for that item, and if they thought that the program should not be implemented, they received a 1.

Table 10

Rubric Components for the Categories “Impact” and “Question” from the Final Exam Grading Rubric for the Case Study, to Assess Differences in the Ability of Students to Make Connections and Address Complex Issues

Contributions from students that addressed Impact and Question categories (items in rubric)	Impact	Question
Is inequality addressed? How will it impact different peoples differently?	X	
Do they question the value of the recommendation?		X
Why corn?		X
What will be lost in the transition?	X	
What will this do to their subsistence agriculture?	X	
What will it do to diversity?	X	
How will lack of diversity impact nutrition?	X	
How will it impact risk?	X	
How will it impact environment?	X	
If they did have access to the market, corn would be harvested at the same time, flooding the market.	X	
Thinks we should do it (transposed)		X

An ANOVA test was performed to determine if there were any significant differences between groups for the two categories (“Impact,” and “Question”) created from the case study responses. A significance level of .05 was used for this test. The results of the ANOVA test are presented in Table 11. The mean scores for the categories are presented in Table 12.

Table 11

ANOVA Test Table for the Impact and Question Categories from the Case Study on Final Exam to Compare Results Between Groups (A, B, and C)

		ANOVA Table					
			Sum of Squares	df	Mean Square	F	Sig.
Impact	Between Groups (Combined)		0.233	2	0.117	1.761	0.178
	Within Groups		5.498	83	0.066		
	Total		5.731	85			
Question	Between Groups (Combined)		1.446	2	0.723	18.089	0
	Within Groups		3.318	83	0.04		
	Total		4.765	85			

Table 12

Means for the Impact and Question Categories Across the Three Groups Within the Study

Group		Impact	Question
A	Mean	0.3636	0.3939
	N	33	33
	Std. Deviation	0.29596	0.22753
B	Mean	0.2944	0.3333
	N	30	30
	Std. Deviation	0.19906	0.1238
C	Mean	0.4275	0.6522
	N	23	23
	Std. Deviation	0.26508	0.23524

The ANOVA test in Table 11 shows that there were no significant differences between the groups in the results from Impact category at the .05 level. However, the results for the Question category were found to be significantly different across the three groups. While the

Impact category did incorporate complex issues, the need for analysis of impacts and consequences was a lesson that the students learned and practiced in many occasions throughout the course curriculum, not just in the precursor case study. In fact, impacts and consequences had been discussed in many occasions, and in all cases (Groups A, B, and C) through a variety of teaching and learning strategies that included flipped lessons. However, the idea of questioning the recommendation posed in the case study was new to the students, and it had only been addressed in the precursor case study. All of the groups had only experienced this idea once, in the precursor case study. All groups addressed the same question, though through a variety of processes: Group A in the class activity of the case study, Group B in the interactive lecture of the case study, and Group C in the pre-class assignment of the case study, in the in-class activity, and in the post-class reflection (fully flipped lesson).

While the ANOVA table showed that there were significant differences between groups, it did not detail the nature of these significant differences, and did not explain in what Group students demonstrated higher ability to question the value of the program detailed in the case study. In order to assess the nature of these differences the researchers performed a series of comparisons between groups through independent samples t-tests comparing Group pairs (Tables 13, 14, and 15). Independent samples t-tests were not performed for the Impact category, for ANOVA test did not find significant differences between the groups.

Table 13

Independent Samples T-Test Showing the Comparison of Groups B and A for Category

“Question”

B and A Groups Independent Samples T-Test (Category “Question”)									
Equal variances	Levene's Test for Equality of Variances		t-test for Equality of Means				t-test for Equality of Means		
	F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Assumed	19.02	0	-1.30	61	0.2	-0.06061	0.04682	-0.15422	0.03301
Not assumed			-1.33	50.34	0.19	-0.06061	0.0456	-0.15219	0.03097

Table 14

Independent Samples T-Test Showing the Comparison of Groups A and C for Category

“Question”

A and C Groups Independent Samples T-Test (Category “Question”)									
Equal variances	Levene's Test for Equality of Variances		t-test for Equality of Means				t-test for Equality of Means		
	F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Assumed	0.96	0.33	-4.12	54	0	-0.25823	0.06266	-0.38387	-0.1326
Not assumed			-4.09	46.462	0	-0.25823	0.06304	-0.3851	-0.13137

Table 15

*Independent Samples T-Test Showing the Comparison of Groups B and C for Category**“Question”*

B and C Independent Samples Test (Category “Question”)									
Levene's Test for Equality of Variances		t-test for Equality of Means				t-test for Equality of Means			
Equal variances	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Assumed	5.24	0.026	-6.37	51	0	-0.31884	0.05003	-0.41928	-0.2184
Not assumed			-5.90	31.265	0	-0.31884	0.05401	-0.42895	-0.20873

When analyzing the independent samples t-tests, the researchers found that when comparing Groups B and A (Table 13), there were no significant difference in the mean scores of the Question Category. Group A addressed the precursor case study through a traditional format (no pre-class and post-class components) with an in-class activity. Group B addressed the precursor case study through a traditional format (no pre-class and post-class components), with an interactive in-class lecture. In this case, then, the difference between the groups was the type of in-class teaching strategies (in-class activity or interactive lecture). Only slightly modifying the teaching method did not have a significant impact on the ability of the students to make connections and address complex issues. Conversely, the comparison between Group C (fully flipped version of the case study) and Groups A and B, did show significant differences between

the groups (Table 14 and Table 15). Table 12 shows the means for the Question Category across the three groups showing that the score for Group C was higher in all cases. Thus, the Group that addressed the precursor case study through a fully flipped lesson showed higher ability to question the program and the program recommendations (a lesson that had only been covered once in the course, during the precursor case study), indicating that the process followed for that group better prepared the students to make connections and address new complex issues in a case study.

Chapter 5 - Conclusions And Recommendations

Purpose and Research Questions

The purpose of this study was to evaluate the effectiveness of flipped instruction techniques in a collegiate class setting. To this end, the researchers compared student learning between groups who had participated in different learning environments, and assessed differences in the ability of students to address basic and complex issues when analyzing a case study. There were three Groups. In Group A, students analyzed a case study through a traditional lesson (no pre-class or post-class components) with an in-class activity. In Group B the case study was presented through a traditional lesson (no pre-class or post-class components) with an in-class interactive lecture, and in Group C, the students analyzed the case study through a lesson with all the components of a flipped classroom. This will help gain broader knowledge of how students learn, and how we can implement different pedagogical methodologies to aid in the enhancement of learning and critical thinking. Specifically, it will help interested practitioners better design curriculum that involves flipped components and flipped classrooms. To accomplish the purpose, the following research questions were identified:

Research Question #1: What are the demographics of the study participants? Are students from the different Groups similar academically?

After completing a lesson that addressed a case study using different teaching and learning strategies in each treatment Group (A: traditional, with in-class activity; B: traditional, with in-class interactive lecture; and C: flipped, with all components of flipped classrooms), what were the differences between groups regarding the following abilities:

Research Question #2: What were the differences in the ability of students to address basic issues in a case study when comparing between treatment groups?

Research Question #3: What were the differences in the ability of students to make connections and address complex issues in a case study when comparing between treatment groups?

Conclusions

As advancements in technology are made and change is implemented, it is important that learning environments continue to adapt and change. “Learning management must be adapted to the current situation/society and focus on improving higher order thinking skills of students” (Budsankom, Sawangboon, Damrongpanit, Chuensirimongkol, 2015, p. 2639). It should be the goal of the educator to continue to provide an environment that fosters the synthesis of information. Students see the opportunity to make connections between lessons and material in class as an important learning tool (Dresner, De Rivera, Fuccillo, Heejun, 2014). This study assessed the effect that different teaching methods had on the ability of students to address basic and complex issues when analyzing a case study.

For the theoretical framework of this study, constructivism was used. According to Schunk (2012), constructivism “underlies the emphasis on the integrated curriculum in which students study a topic from multiple perspectives” (p. 231). One of the basic fundamentals of constructivism is that knowledge is first produced in the mind of the student (Dabbagh, 2005). This idea of knowledge arising from the mind is where we begin to see constructivism’s relation to flipped classrooms, as students interact with the content before class and begin to make their own assumptions and thought processes about the information.

The study included three different sections of a course. The three Groups were found to be similar academically. The mean scores for two lessons completed by the groups after receiving the same educational treatment were compared using an ANOVA test (Table 6). There were no significant differences between the groups when evaluated at the .05 level of significance.

Each section addressed a case study through different processes and completed the same test at the end of the course. For the case study, group A reviewed the case study in a traditional format (no pre-class or post-class assignments) that utilized an in-class activity. The group was given the information via an in-class activity in which the students discussed first the case study with their individual groups and then presented a summary of their conclusions to the whole class. This activity utilized the full class time of 75 minutes. No accountability was used after the in-class activity. Group B was given the information also in a traditional format and included an in-class interactive lecture. The students received the information in class in a Socratic lecture style that used the full class time of 75 minutes. The students were allowed to ask the instructor questions throughout the duration of the lecture. Group C was given the information in a completely flipped format (with pre-class and post-class assignments and assessments). For the in-class element of group C, 30 minutes were utilized for the in-class activity. It is estimated that the students spent 45 minutes outside of class between the pre-class homework and the guided post-class reflection homework, totaling 75 minutes (or more) invested in the lesson, which is the same amount as the investment by the students in the other groups.

“Early data suggest significant increases in student learning and achievement when flipping [is] compared to baseline data on the same courses taught in the traditional classroom lecture mode, using the same assessments” (Fulton, 2012, p. 13). The researchers looked to test

this statement. When evaluating the ability of students to make connections and address complex issues when analyzing a case study, the researchers found that the scores of the students who participated in the precursor case study utilizing a fully flipped format were significantly higher than those of their peers in the other research Groups. In fact, one of the categories (Question), that measured the ability of the students to critique the program detailed in the case study, and make judgments about its recommendations and solutions, without being prompted to do so, had a significantly higher mean score for group C, which was the group that received the information utilizing a fully flipped process (Table 11).

While the ability of the students to address complex issues and content differed across the treatment groups, the researchers also looked at how different treatments impacted the students' ability to address basic issues when analyzing the case study. When evaluating the mean scores of the Basic Issues category, there were no significant differences between the groups (Table 8). Because of the lack of differences, it can be inferred that the educational treatments for that specific case study did not have an impact on the ability of the students to address basic content in the case study, which was not surprising because the students had addressed, analyzed, and discussed similar issues throughout the course, and through different teaching and learning methods, which included in all cases flipped lessons.

Recommendations

The students who participated in the fully flipped case study scored significantly higher regarding their ability to address complex issues in the case study. While this study is not conclusive, a general recommendation would be to consider the value of flipped classrooms and their elements in specific contexts and integrate them in the curriculum when appropriate. However, based on the information gathered in this study, it would be the recommendation of the

researchers that for a flipped classroom to have an impact on the ability of the students to address complex issues in a similar context as the one utilized in this study, a fully flipped educational treatment should be utilized rather than just some activities. The fully flipped treatment method for the research included the following:

- Pre-class homework and accountability measure: Read the case study and answer the questions individually, submitting the answers to the professor prior to class. Bring the answers to class to use in the in-class activity (approximately 30 minutes of individual work)
- In-class activity: Small group discussions about the case study, and general discussion with the instructor facilitating (30 minutes)
- Post-class reflection homework: Submit corrections to the individual assignment (for grade improvement) (15 minutes)
- Testing: Final exam case study

The fully flipped method of instruction “allows instructors to foster an active learning environment without having to sacrifice content coverage” (Prud'homme-Généreux, 2016, p. 58). Using this teaching method, practitioners are able to expose their students to information before class, effectively allowing the students to have more time to synthesize the information (Yu, Wang, 2016) and have meaningful interaction with the instructors and peers during class time. It has even been suggested that there are increased levels of teacher efficacy when employing a flipped classroom (Gross, Marinari, Hoffman, DeSimone, Burke, 2015).

The study found that, for a flipped classroom to be successful, organization must be of the utmost importance. A significant amount of preplanning is necessary in flipped instruction due to the pre-class portion of the process (Gaughan, 2014). Though the planning for the pre-class element can be extensive, it allows for the educator to spend more time in class focusing on questions and concerns that the students may have. In a flipped classroom, “class time is primarily used for interaction, rather than instruction” (Green, 2015, p.180). Interactions in the classroom, including teacher-to-student communication and student-to-student communication,

align with social constructivist learning theory (Vygotsky, 1978). As students are allowed to discuss what they have learned before class, they are actively participating in the learning process (Howitt, Pegram, 2015). Other important elements of the flipped classroom are the pre-class accountability measures to ensure that the students complete the pre-class assignment, come prepared to class, and are ready to be active participants in the planned activities. Finally, structured post-class reflection (and accountability measures) is also very important, as reflection helps students consolidate their learning and link it to their world.

To enhance the dimensions of the study, adding more demographic factors could be researched to see how flipped instruction impacts individuals based on demographics. Rotellar and Cain asserted that there is a change in the demographics of students today (2016). By gaining this information, it could add to the depth of this study. Some of these factors could include:

- Household income
- Previous exposure to a flipped classroom
- Race
- Previous education level
- Education level of parents

Knowledge of students' previous involvement in a flipped classroom could be an additional element for future studies. Evaluating this data could add to the understanding of how students learn. If the student has been exposed to a flipped classroom previously, does it impact their ability to utilize the tools offered to them during the pre-class portion of the lessons? Essentially, this would allow the researcher to know if there is a learning curve when implementing a flipped classroom, or flipped instruction techniques. The pre-class learning phase of flipped classrooms relies on the students to take responsibility for their education (Green, 2015). Issuing a pre-course and post-course questionnaire to assess the students' perceptions of their personal learning styles could allow for the evaluation of the impact that

flipped classrooms have on the students taking responsibility for their own education. There is much confusion within the literature on how flipped classrooms impact the students' learning styles (Koo, Demps, Farris, Bowman, Panahi, Boyle 2016).

This study was performed at a Land Grant Institution, and focused on an agricultural class, so it may be more encompassing to perform this study at different institutions and in multiple class types. If this study were conducted elsewhere it would include a wider subject base and add to the validity of the findings if the findings were similar to those of this study.

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Appendices

Appendix A- Precursor Case Study

Case Study: The poultry meeting

It is 1970. The broiler industry is young in the Dominican Republic, where you serve as a USAID Project Manager in a country-wide cooperation project. You have two people on your staff: An outstanding young animal production specialist, and an agricultural engineer and plant production specialist. The animal production specialist was a poultry advisor in Georgia before coming to the DR, and has extensive knowledge about the poultry industry. In the DR she has, with great difficulty, helped producers increase broiler production from approximately zero (discounting "backyard" flocks) to approximately 11,000,000 broilers annually. The government is not in the broiler production business. All production is in the private sector.

Broiler: young chicken bred and raised for meat production

Prices are relatively stable, yielding profits to the new broiler producers of about 10% above costs (including amortization of capital expenditures including housing, equipment, etc.) over 10 years – the time that poultry loans are available, and including interest on the loans. For improved strains of broilers (the type of broilers that a large broiler operation would have), the cost of production, on a "dressed broiler" basis, is \$.37 per pound. Prices in the markets are hovering around \$.50 per pound for dressed broilers. From time to time, however, those prices will drop to about \$.45 per pound for dressed birds, hold steady for a while, and then drop further to \$.40 per pound; at other times, especially during holidays, they will rise to about \$.57 per pound.

Dressed broiler: "ready to cook meat"

The broiler industry is built around improved strains, considered "soft" by citizens. Native strains, considered "hard," are used for cockfighting, are more flavorful, are more liked by people, and sell for as much as \$1.00 per pound, dressed, in the market.

A nutrition team from abroad has visited the country. Its final report notes findings of severe protein deficiencies in the diets of the poor. The recommendation left by the team included the strong statement that broiler production be increased rapidly to approximately 50,000,000 birds annually, based upon unmet nutritional needs of the population for proteins of animal origin. The nutrition team did not talk with the people in agriculture. The report of the nutrition team was reported in a leading newspaper in the capital; the recommendation was the headline lead in the article.

The President calls the Minister of Agriculture to his office. The President asks the Minister why the agricultural development team is not working with the nutrition team to address the problem. "Take immediate steps," he orders, "to increase broiler production dramatically." This order was not announced to the general public.

The Minister gives you a phone call. He explains his orders and requests a meeting with you and your team, especially the animal production / poultry specialist. He will be asking for advice.

Please, answer the following question. Submit your written answer and bring a copy to class (your answer should be about one page long – a bullet point list if fine (rather than narrative). Your advice may include recommendations, challenges, concerns, etc.)

1. What will be the general nature of your advice and recommendation(s)?

Source: Texas A&M University, Department of Agricultural Education, Dr. J. E. Christiansen,
modified by Maria Navarro

Appendix B- Final Exam Case Study

Case study 1: CORN in Marinet. In your answer to this case, please integrate the lessons learned in as many class lessons as possible.

- You have been hired by a non-profit organization to help with agricultural development in a community of small and very poor farmers in a small country in Asia, Marinet. These farmers practice low-input agriculture, have no formal education, and rarely go to the market (no need and no stable transportation means). Most of their agriculture is subsistence agriculture, meaning that they consume most of what they produce, and most of their food comes directly from their own plot of land.
- The first day of the job, you are given a report from expert agriculturalists that indicates that the agricultural conditions (precipitation, temperatures, day length, soil, etc.) are very similar to those in Georgia, and that the corn produced in Georgia would grow very well in your community in Marinet as long as it received the same amount of fertilizer used in Georgia. The report also shows that if the community in Marinet changes from what they produce now to the corn they are recommending, their agricultural productivity will triple. You have no reason to doubt the report from an agricultural perspective (and you should NOT doubt it from an agricultural perspective).
- Your new employer tells you that your job is to help the community of small poor farmers in Marinet achieve better food security. He suggests that you should go to Marinet and help the farmers switch all their crops to this “miracle” corn so that they can triple their agricultural productivity and sell their corn in the market to increase their income.

The question: Your boss suggests you two meet to discuss your next steps. How do you prepare for the meeting? What do you tell your boss? How do you support your suggestions?

(You may use both front and back)

Appendix C- Recruitment Materials

In-class script

Dr. Navarro (professor) to students, in class (a few minutes prior to the end of the class):

I (Dr. Navarro) and my graduate students (Chesley Davis, Rachel Wigington, and Chris Campbell) are doing research on the "impact of teaching strategies in two hunger issues courses." The research will help my graduate students complete the requirements for their graduation in their master of agricultural leadership. We are inviting you to volunteer to participate in this study. This will help us better determine what teaching strategies you prefer and have been more effective and impactful to you as students in my class. We are distributing the consent forms (*a graduate student will then distribute the consent forms*). Please review the consent form. If you agree to volunteer to participate, please return the signed form to the graduate students in the class. All we are asking you to do is to allow us to use your course data for research purposes. No additional work, requirements, or materials are being asked from you. You have a few minutes now to review the consent form. Please let us know if you have any questions. Thank you for your collaboration.

Reminder email via ELC email by professor.

I (Dr. Navarro) and my graduate students (Chesley Davis, Rachel Wigington, and Chris Campbell) are doing research on the "impact of teaching strategies in two hunger issues courses." The research will help my graduate students complete the requirements for their graduation in their master of agricultural leadership. We are inviting you to volunteer to participate in this study. This will help us better determine what teaching strategies you prefer and have been more effective and impactful to you as students in my class. Please find attached the consent form for this research. If you agree to volunteer to participate, please return the signed form to the graduate students in the class. All we are asking you to do is to allow us to use your course data

for research purposes. No additional work, requirements, or materials are being asked from you. Please let us know if you have any questions. Thank you for your collaboration.

Reminder email via ELC email by one graduate student

Dr. Navarro and three of her graduate students (Chesley Davis, Rachel Wigington, and Chris Campbell) are doing research on the "impact of teaching strategies in two hunger issues courses." The research will help us complete the requirements for graduation in the master of agricultural leadership. We are inviting you to volunteer to participate in this study. This will help us better determine what teaching strategies you prefer and have been more effective and impactful to you as students in Dr. Navarro's class. Please find attached the consent form for this research. If you agree to volunteer to participate, please return the signed form to any of the graduate students in the class. All we are asking you to do is to allow us to use your course data for research purposes. No additional work, requirements, or materials are being asked from you. Please let us know if you have any questions. Thank you for your collaboration.

Appendix D- Consent Form

Consent Form

You are being invited to participate in a research study entitled “Impact of teaching strategies in two hunger issues courses” This research hopes to investigate the effectiveness and impact of various instructional strategies used in different versions of two of my courses, ALDR/AFST/LACS 3820 Reflections on Fighting Hunger, and ALDR/AFST/LACS International Agricultural Development (face to face, distance, and honors versions). Your participation will involve allowing the researchers to use and include in their research the information/data that were collected through your participation in class activities, lesson feedback, assignments, quizzes, group work, exams, and evaluations. You don’t have to do anything else.

Your participation, of course, is voluntary but would be greatly appreciated. You may choose not to participate or to withdraw your consent at anytime without penalty or loss of benefits to which you are otherwise entitled. If you agree to allow us to use of your data for this research project, please simply sign on the line below; if you don’t agree, none of the work that has your name in it will be included in the research.

The results of the research study may be published, but your name or any identifying information will not be used. In fact, the published results will be presented in summary form only. Only the researchers will have access to data, and all work will be confidential. There are no known risks or discomforts associated with this research, and the decision to participate in the study will have no bearing on your grades or class standing. There are no direct benefits anticipated by participating in this study, however the findings from this project may benefit teaching faculty in higher education by evaluating the efficacy of various teaching strategies.

The researchers conducting are Dr. Maria Navarro (Department of Agricultural Leadership, Education, and Communication, 706 583 0225, mnavarro@uga.edu), and her graduate students Rachel Wigington (rsw@uga.edu), Christopher Campbell (chris571@uga.edu), and Chesley Davis (chesleyd@uga.edu). You may ask any questions you have now. If you have questions later, you are encouraged to contact the researchers by the means above. If you have any questions or concerns regarding your rights as a research participant in this study, you may contact the Institutional Review Board (IRB) Chairperson at 706.542.3199 or irb@uga.edu.

Research Subject’s Consent to Participate in Research:

To voluntarily agree to take part in this study, you must sign below. Your signature below indicates that you have read this entire consent form, and have had all of your questions answered.

Maria Navarro
Principal Investigator

Signature

Date

Name of Participant

Signature

Date

Please sign both copies, keep one and return one to the researcher.