FLIPPING THE CLASSROOM

Flipping the Classroom: A Means to Increase Student

Performance in Middle School

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**Abstract**

The flipped classroom is areversal of traditional teaching where students learn new content by watching a video lecture or reading new material at home prior to class. The class time is used to do the harder work through strategies such as problem-solving, discussion and/or debates. The purpose of this study is to implement the “flipped classroom” model and examine its influence on students’ performance for 7th grade Pre-Algebra classes. Mr. Macias taught two different classes the same Pre-Algebra unit. He implemented flipped classroom model for one class and used the traditional instruction for the other. Data was collected from unit assessments and a student survey. The result showed that students participating in the flipped classroom performed better compared to students participating in traditional classroom.

**Introduction**

Educational technology has become a fast growing delivery tool at all education institutions levels. With the increased availability of the Internet, computers, tablets, smartphones, and educational applications, the question is how best to use technology when helping students learn. Another challenging question is how to design instruction that facilitates students’ movement into active learning rather than passive learning. Lemmer (2013) stated that, students today expect more from a classroom experience than a passive learning opportunity that consists mostly of one-way communication with limited student interaction. Instead, they prefer classroom experiences that encourage and help them develop knowledge for themselves. The flipped classroom responds to the needs of modern learning and provides an effective model of reinvention.

Flipped, blended, or converted classrooms are often used interchangeably. Flipped classroom is an instructional model that was developed by Jonathan Bergmann and Aaron Sams in 2007. In flipped classrooms, students learn new content by watching a video lecture at home prior to class, and what used to be homework is done in the class. Therefore, class time is specified for problem solving, discussion, and different interactive activities. Flipped or converted classrooms involve what Bliuc (2007) describes as “systematic combinations of co-present (face-to-face) interactions and technologically-mediated interactions between students, teachers and learning resources”.

As flipped classroom has become a growing teaching approach, its effectiveness and usefulness must be examined in many educational settings. This research examines the effectiveness of flipped classroom based on the following question” does flipped classroom method improves students’ performance compared to traditional teaching method in 7th grade Pre-Algebra classes students.

 **Literature Review**

Study by Tune, Sturek, and Basile (2013) titled “Flipped classroom model improves graduate student performance in cardiovascular, respiratory, and renal physiology” examined the effectiveness of a traditional lecture-based curriculum versus a modified flipped classroom curriculum of cardiovascular respiratory and renal physiology delivered to first year graduate students in Indiana University, School of medicine.

The Study question is: Does flipped classroom model improves graduate student performance in cardiovascular, respiratory, and renal physiology? The study was conducted on 27 first year graduate students. Those students were enrolled in either Mammalian physiology course. 14 of them were enrolled in traditional course and 13 of them were enrolled in flipped course. 15 of them were men and 12 were women. The majors steps in performing the study were: choosing sample, providing 8 weeks instruction, conducting quizzes and exams, conducting students’ perspective survey, analyzing data, and drawing the conclusion. In this study, the authors used to kind of data; students’ test and quizzes scores and students’ survey responses. The authors reported data as means. Statistical comparison was completed by as unpaired t-test and Pearson correlation analyses

The result showed that, the flipped instructional model appeared to have strong positive effects on overall student performance. Students have different opinions about what comprise flipped instruction. The most primary view is that pre class preparation allows for more in class activities and discussion and more active learning. The authors concluded that, the flipped classroom model for cardiovascular, respiratory, and renal physiology was largely positive. The authors encouraged the adaptation of such model at instantiation with sufficient technical support to facilitate delivery of pre-class lecture to students. Moreover, this model provides the instruction with significant more class time to emphasize important concepts and engage students in problem- solving exercises.

The authors indicated some concerns about the study. The major concern is that there are some negative opinions about the flipped class format regarding the workload, the requirement to watch lecture followed by an hours-long discussion doubles student content/study hours.

 Another Study by Strayer (2012) titled” How learning in an inverted classroom influences cooperation, innovation and task orientation. Learning Environment Research” compared the learning environments of an inverted introductory statistics class with a traditional introductory statistics class at the same university.

The research question was: How does the learning environment of an inverted classroom compare to the learning environment of a lecture homework classroom? This study took place in two different introductory statistics classrooms taught by the author at a U.S. university. A demographic analysis of students at this university shows that a typical student at this university is a middle-class White American from the Midwest.

Researcher regularly collected data from the classrooms using participants’ words and actions as the main data source. Field notes were collected to gain insight into student behavior in the classroom. four researchers were recruited to be part of a data-collection team to observe and take field notes for the classroom settings during the middle and again towards the end of the semester. Other data were collected during selected class sessions using sound recordings. Three members from the data-collection team conducted one-on-one and focus group interviews at the end of the semester.

The author first analyzed his data using open coding. He wrote a number of exploratory memos on the unfolding analysis and coding the qualitative documents such as student’s reflection focus-group observation, interview observation, classroom observation and transcripts of class session. The authors used data analysis included organizing the data, generating categories and themes and testing hypotheses.

The author found that, in general students in the inverted class were more willing to work together and engage in activity in the classroom than the students in the traditional classroom. Students in the inverted classroom exhibited a desire to want to explain concepts to other students. Moreover, students in the inverted classroom preferred more innovation in the classroom and they reported that they experienced more innovation in the classroom when compared with the traditional students.

Hani Morgan graduated from Teachers College, Columbia University with two postgraduate degrees and from Rutgers University with a doctoral degree. His first master’s degree from Columbia’s Teachers College was in curriculum and teaching, and his second was in international education. He specialized in foundations of education when working on his doctoral studies at Rutgers. At USM, he has taught a variety of courses including Foundations of Multicultural Education, Social Studies Education in Elementary Schools, Management and Organization of Diverse Classrooms, Problems in Educational Research, and High School Curriculum; and he serves as co-chair of the scholarship committee. The author of over fifteen published articles, Morgan has written on many topics in education in journals such as Childhood Education, Multicultural Education, Early Childhood Education Journal, The Reading Teacher, Educational Horizons, Multicultural Review and Reading Improvement.

The purpose of this article try to investigate the "flipped classroom" advantages and limitations and reminding school leaders before decide to adopt this approach, they need to consider the lack of research on flipped classrooms and the limitations of a lecture-based style of teaching. I believe it is practical. 453 teachers who tried this approach(flipped classroom) indicated that most of them found it to be helpful, especially for students with special needs and those in advanced placement classes; 99% of these teachers said they would use it again the following year. Some schools, such as Clintondale High School in Michigan, are achieving remarkable results after flipping their classroom. At Clintondale, the failure rate of 9th-grade math students plummeted from 44% to 13%.

A school district in Los Altos, California, decided to try Khan Academy for math instruction with a class of 5th-graders and two classes of 7th-graders. Finding it to be successful, the school extended the program to all 5th- and 6th-grade classes and to 7th-graders at or below grade level. Another district in Oakland also had success in math with this program; some of its students used the Khan program and outscored their peers in a traditional algebra class.

Data collected from other resources and surveys such as Goodwin, B., & Miller, A., Fulton, K. P.

The author compare data a little bit, he compare the 9th-grade math students’ failure rate before and after used “flip classroom”. Besides, he found out most of teachers would like try this new method again. The results showed advantages and concerns about flipped classroom. Advantages include: When implemented effectively, flipping the classroom allows more chances for students to work at an appropriate pace, and teachers have more opportunities to help students with difficult content. Reduced Cost: As a consequence of providing instruction on video, school districts have fewer textbooks to purchase and often spend much less per year when they flip classrooms. Additionally, the flipped classroom can be especially beneficial for students who get little help with homework at home and for schools with budget problems. When students have to miss class, the flipped classroom allows them access to school material at any time, allowing them to remain up-to-date even when absent. Concerns: flipping the classroom does not guarantee that students will be engaged or that they will watch the videos.

I believe the credibility of the research was enhanced by author reporting the results of many different cases that flipped classrooms improve academic achievement. Also, the author not only focuses on its advantages but its limitations which make me feel this research sounds objective and rational.

The author used many others resources in different grade different school to finding flip classroom is successful. Unlike other articles, this research also provide the limitations and critics of the flipped classroom in order to warming school leaders should consider limitations before they decide to adopt this approach.

The Enhanced Flipped Classroom: Increasing Academic Performance with Student-recorded Lectures and Practice Testing in a “Flipped” STEM Course is a quantitative research article. The authors used a two-tailed t-test of the participating students’ performance in a “flipped” college course and compared it to the results of the previous year’s students who did not participate in the “flipped” classroom.The primary goal of this study was to increase students’ academic performance in Physiological Psychology by encouraging professors to use more effective teaching techniques. The secondary goal of the study was to provide alternative teaching techniques that could be implemented in other STEM courses. The primary question raised by this study is does the implementation of a flipped classroom improve outcomes for students?

Flipping the classroom is a fairly new topic and is a fairly new research topic. Answering this research question will add vital information to the small body of research that has already taken place on the topic. This research was conducted with college psychology majors at a historically Black college and university (HBCU) taking Psychological Psychology. Many of the students participating in the study expressed a dislike for biological sciences. The data collected for this survey were students’ final grades of two sections of a Physiological Psychology course. One of the courses for which the final grades were collected was a flipped classroom and the other class was a traditionally run classroom setting.The researchers used a two-tailed t-test to analyze student performance in the in the flipped class and the previous class which had not been flipped. After the analysis of the data, it was found that the students’ whose class was flipped final grades were significantly higher ( t(79)= 2.22, p=.029, Cohen’s *d*=.5) than the students who took the course in the previous semester whose class was not flipped.

Based on the results of the research, the authors concluded that flipping the classroom yielded positive outcomes in terms of students’ final grades. Students in the flipped class showed an average of an entire letter grade improvement when compared to the previous semester’s class in which the flipping teaching strategy was not implemented.

From this research report, I learned that flipping the classroom yields favorable results in students’ grade performance. I also learned that the use of technology in the classroom can be a valuable asset to increase student learning. One of the things that struck me most about this article was the overwhelming positive response that the students gave about the flipped classroom. In this technology driven day and age, if we teachers provide them with the material in a way that they understand and can relate to, they are more likely succeed.

The Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment was investigated at a Miami University. The authors of this study took a large interest in the variety of learning modalities in a single classroom. The practical purpose of the study was to find out if flipping the classroom would address the learning needs of a diverse group of students. This study took place at Miami University (Ohio) where the typical student is Caucasian, from an upper-middle class family and resides either on campus or off-campus in nearby housing. The average age of the incoming freshman is 18 years old. Most of the participants were in the fall semester of their sophomore year with little to no experience with economic and maintained a “B” average. The participants were undergraduate students with various learning styles (as identified by the Myers-Briggs Type Indicator) in an introductory economics class.

In order to evaluate student perceptions of the flipped classroom, the participating professors issued an end of the semester survey. The survey consisted of several statements to which students were to give a rating on a scale of 1 to 5. The survey also consisted of open ended questions to which participants gave constructed responses. The researchers discovered that the participants open ended responses were relatively consistent with the numerical scale results.In order to collect data, the researchers used a scale survey at the end of the course. Students were to read a statement and rate it from 1 to 5, 1 being the lowest and 5 being the highest. There was also and open-ended question portion of the survey. To analyze the data, the open-ended responses were categorized based on the similarity of the responses.

The results of the survey show that the majority of the student participants felt positively with their experience in the flipped classroom. The following statements received an average score of 3.9 on the survey: “I prefer this classroom format to a traditional lecture”, I believe that I learned more economics with this classroom format” Some of the consistent open ed responses were as follows: “I enjoyed this class very much. I learned more than I ever thought I would in a new creative and inspiring way. I encouraged this class to be continued in the same way...” “I really enjoyed the class structure and setup. I was a little nervous after the first day of class when we talked about how much responsibility is required for this class, but it wasn’t as bad a sI thought”, “As for the class itself, I love the way it was run!”

The use of open-ended questions on the survey enhanced its credibility because it allowed the participants to express freely how they felt about the flipped classroom experience. It was not limited to statement being provided with the expectation to simply choose a rating on a scale. The use of open-ended questions took the process of surveying a step further. The outcome of this survey was striking due to the fact that the study showed improved outcomes for students with a variety of educational needs. Based on the addition of this research t o the relatively small body of research that exists on the topic, researchers can continue to build on the topic and eventually come to a consensus about the effectiveness of flipping the classroom.

Dr. Findlay Thompson from Mount Saint Vincent University conducted a case study with three sections of Business 1112 and used the flipped classroom model for one of the three sections and the traditional lecture-style teaching methodology for the other two. Dr Findlay’s goal was to investigate the effectiveness of the flip classroom in an introductory business course at the university of Mount Saint Vincent. In this study, open-ended questions were used to inquire about the students' experience with a flipped classroom. Open-ended questions were used because they encourage respondents to answer freely, respond in their own words, result in unanticipated answers, and often provide richer data compared to closed questions.

 The purpose of the Dr Findlay’s study was to examine the results of a flipped classroom trial conducted for business 1112, an introductory business course at MT Saint Vincent University in the fall semester 2012. Questions were primarily personal and practical. In addition, the purpose of this study is to determine whether or not a flipped classroom is an effective way to engage students in their learning process. Three sections of Business 1112, Introduction to Business Administration, were taught by Dr. Sandi Findlay-Thompson, an Assistant Professor at Mount Saint Vincent University in the fall 2012 semester. Section (01) was taught using the flipped classroom methodology and classes were held on Mondays and Wednesdays from 11:05 am - 12:20 pm. There were 30 students registered in this section and 28 were in the age category of 18-24 years. Section (02) was taught using a regular lecture-style methodology and classes were held on Mondays and Wednesdays from 3:05 - 4:20 pm. There were 42 students registered in this section and 37 were in the age category of 18-24 years. Section (05) was taught using a regular lecture style methodology and classes were held on Tuesdays from 6:05 - 8:35 pm. There were 36 students registered in this section and 28 were in the age category of 18-24.

In this study, open-ended questions were used because they encourage respondents to respond in their own words and often provide more data compared to closed questions. Seven out of a 30 students were selected to be interviewed and they were randomly selected. The interviews ranged in length from 35-70 minutes and open-ended questions were recorded. The information from the interviews was then recorded using Excel spreadsheets to identify patterns.

 Dr. Findlay was the author and investigator of this study. Dr. Findlay was responsible teaching the three sections of Business 1112, Introduction to Business Administration. Dr. Findlay also collected data from all the participants and conducted recorded interviews. Investigators compared individual student responses to determine the academic outcomes between a flipped classroom style versus traditional lecture-style as well as analyzing student opinions regarding their views of a flipped classroom environment. Students were asked a number of questions including whether or not they would enroll in another flipped class if given the opportunity, allowing the researchers to gain insight into their opinion of a flipped classroom compared to a traditional classroom. Excel spreadsheets were used to record student responses.

Student's overall opinion on the flipped classroom was mixed. Students A, C, F and G spoke positively to the opportunity to complete work normally assigned for homework in class. Students F and G both felt the flipped classroom allowed them to get help from their professor enabling them to do better on assignments. Students B and D preferred a more traditional learning environment they believe that a flipped classroom seemed like more work. The majority of students did express interest in enrolling in another flipped class with Students A, F and G all stating they would do so if given the opportunity. All of these students said the flipped classroom allowed them to complete assignments in the classroom which helped them meet deadlines, access immediate help from their professor and in their opinion helped improve their grades.

In this study, Dr. Findlay, author and investigator of this study used open-ended questions to encourage respondents to respond in their own words and obtain accurate and specific information. Open-ended questions are ideal to get a better sense of the opinions that students have about a flipped classroom. I believe that the fact that the Dr. Findlay is the author and investigator of this study may skew the data in this study

 After reading this study, I realized that the majority of the students who experienced a flipped classroom seem to enjoy it and have a positive opinion of this innovative teaching method. Students like the idea of having class time to complete activities and focus on problem solving and having the assistance of their peers and professor if needed. However, there are some students who feel that a flipped classroom creates more work for them and prefer the traditional teaching model.

The article “The Use of a Flipped Classroom to Enhance Engagement and Promote Active Learning,” by Dr Jamaludin is a quantitative research study because the data comes from questionnaires that measure cognitive, behavioral, emotional and agentic engagement. The author also treats the numerical data with statistics. The author also identifies a relationship between the different types of engagement.

The general purpose for this study is to determine if the use of a flipped classroom promote Reeve’s (2013) four-aspect conceptualization regarding student engagement. The author believes that students’ behavioral, emotional, and cognitive engagement will exit if there is a relationship with the teacher and instructional support during learning activities.

This particular study focuses on the use of a flipped classroom to promote four different types of engagement. The author believes that the use of a flipped classroom will promote behavioral, emotional, cognitive and agentic engagement. Unlike the other research studies that I encounter, this study focuses on specific types of engagement in conjunction with the use of a flipped classroom. This study will investigate if there is a correlation between the different types of engagement and the use of a flipped classroom.

A descriptive quantitative methodology was used in which 24 undergraduate TESOL students took the course QMT 212 Instructional Design. The responders of this study attend Universiti Sains Malaysia, a premier public institution of higher learning.

In this research, a structured questionnaire was used that is based on Reeve (2013).. This instrument used a 7-point Likert scale that ranges from 1=strongly disagree, 2=disagree, 3=slightly disagree, 4=neither agree or disagree, 5=slightly agree, 6=agree, to 7=strongly agree. The data from the respondents were analyzed using the Statistical Package for the Social Sciences version 20.

 The results indicate that a flipped classroom promotes behavioral, emotional, cognitive and agentic engagement. In addition, the results show that emotional engagement ( *x* =5.79)(sd=1.02) has the highest score, followed by behavioral engagement ( *x* =5.62)(sd=0.69), cognitive engagement ( *x* =5.61) (sd=1.02) and agentic engagement ( *x* =5.1)(sd=1). This study also shows that, for active learning to occur, emotional engagement is one of the important factors as compared to other types of engagement.

The evidence in this research shows that a flipped classroom promotes cognitive, emotional, behavioral and agentic engagement. The author believes that this study process has been a great experience for lectures and students in a new environment designed to implement active learning. In addition, the author believes that the benefits of student engagement offset the challenges that come with implementing a new way of teaching.

There are some challenges and problems that must be faced by the lecturer and the students using a flipped classroom to promote active learning to improve student engagement. The process of changing from a traditional classroom to a flipped classroom can be challenging because of the lack of facilities, internet accessibility and effective models.

Educators from different fields of study and educational levels are investigating innovative methods of instruction to help students learn and develop their learning skills. This study explains that a flipped classroom can maximize the time in the classroom by focusing in higher level questioning and problem solving. The lecturer no longer must lecture for most of the class time while students take notes; class time no longer is used to lecture, but instead, is used for activities and problem solving.

The research conducted by Strayer was more like a case study. There was an experimental group, which used the flipped classroom. As well as a control group. Both groups were given the same concepts in an introductory statistics university classroom, by the same professor.

The research question was: How does the learning environment of an inverted introductory statistics classroom compare with the learning environment of a more traditional lecture-homework introduction to statistics classroom? This article starts by discussing the persistent challenge of how to best use technology when helping student learn. The researcher describes strategies to using computer technology to introduce students to course content outside of the classroom, so that student may gain a deeper understanding to the content discussed in the classroom.

The researcher suggests that the inverted classroom design has been around for decades, as teachers have wanted/required students to read course content outside of the classroom. Thus, allowing for more student engagement in the classroom. The use of technology has only been around for the last 40 years, with the introduction of the Television and instructional videos, as well as the overhead projector. The inverted classroom design was brought about with the idea to move the lecture portion out of the classroom (if not replace it with technology), to allow more time for investigation in class.

The importance of this study is to see if using the technology for the instruction portion of the lesson, enhances the investigation portion and problem solving skills inside the classroom.

The motivation behind the research was a desire to inform teaching practice and suggest the implications of structuring production classroom learning.

This research took place in two different introductory statistics classrooms taught by the researcher at a U.S. university. The demographics show that a typical student at the university is a middle-class White American for the Midwest. The researcher has been teaching at this particular college in the math department for 6 years and had a great deal of experience teaching introductory statistics using both traditional and innovative teaching methods.

The data that was used and recorded started at the beginning of the semester; the students in the two study classrooms for introduction to statistics had experienced learning in their respective environments (inverted vs lecture-homework). Having 2 weeks left in the quarter, the CUCEI was administered to provide insight into (a) student perceptions of their actual learning environment and (b) the student opinions of what their idea was for the best learning environment.

CUCEI data was used using many quantitative methods including Cronbach’s alpha reliability coefficients, discriminant validity measures, exploratory data analysis, repeated measures multivariate analysis of variance, *t* test, and Cohen’s *d* effect size calculations.

The findings were reported in two prime categories. Analyzing the quantitative results produced a picture of what happened in each of the two classrooms in the study.

Question 1: How students think of the actual learning environment compared to their preferred learning environment. Students as a group felt the learning environment did not meet their preference compared to their preferred learning environment.

Question 2: Did student scores vary on the CUEI between the inverted and traditional class. There was a large difference between the traditional and the inverted classroom on the survey.

Question 3: What would be the students preferred version: Students in the inverted class preferred a class with more Innovation and Cooperation when analyzed next to the traditional class.

The author concludes that there are limitations to his findings in the study. The first being that he was their instructor as was as the researcher. This made it hard to write observation notes and observe behaviors between the classes. Another limitation was that because he was their teacher the students were not forthcoming with criticism of the experiment. A final limitation was that the students were not randomly assigned to the two test classrooms. and because of this lack of randomization the researcher could not make generalizations to a larger population.

The CUCEI did indicate that the inverted classroom student were more likely to cooperation, they valued the learning with partners.

Some of the cautions that the author raises about interpreting the study are that limitation were that the students were not randomly assigned to the two test classrooms, and because of this lack of randomization the researcher could not make generalizations to a larger population.

The author speaks about the homework, while the traditional class knew when the homework was due and when the test would happen. The inverted class was “fragmented in nature”. While many student struggled as the semester went on most made the adjustment. As far as the in class discussions, student still struggled with how to orient themselves in the classroom and with the activities.

My perception before reading the article was that the inverted classroom was a positive way to approach teaching. However, after reading the article, I see the pitfalls of this type of teaching. Preparing for the lecture (as far as videotaping to meet all the student needs), assigning homework, getting students to participate in a group environment are among some of the problems I did not foresee.

Things I really liked about the article was that student do like group discussions and that this type of instruction deepened their understanding of the concept. That working with peers made the material more accessible rather than the teacher lecturing.

The investigators for the case study “Case studies and the flipped classrooms” are Clyde Freeman Herreid and Nancy A. Schiller. Clyde Freeman Herreid is a Professor in the Department of Biological Sciences at the University at Buffalo. Nancy is an Engineering Librarian also at the University of Buffalo. Herreid and Schiller introduce flipped classroom. In the flipped classroom model, what is normally done in class and what is normally done as homework is switched or flipped.

The article did not make anything explicit.

The research question that the investigators want to answer is:

(a) Must we abandon case studies and leave storytelling to books, films, TV, elementary school teachers, and preachers?

The purpose is theoretical, the use of the “flipped” classroom moves beyond the tradition way of teaching, as well as academic learning. The researchers want to determine if moving from a formal academic learning style will allow students to:

(a) move at their own pace

(b) Doing “homework” in class gives teachers a better insight into student difficulties and learning styles

(c) Teachers can more easily customize and update curriculum and provide it to students 24/7

(d) Classroom time can be used more effectively and creatively.

This study is taking place in an introductory statistics class with traditional statistics class at the same university using the College and University Classroom Environment Inventory, the location of the university is not stated in the report.

The data was collected by a combination of interviews, field notes and focus groups. At the National Center for Case Study Teaching in Science Listserv, 15,000 + teachers were surveyed. The researcher recruited participants in a statistics class, architectural engineering course and a chemistry course. The procedures used were final exam scores and “percent success” (the percentage of students who finished the course with a letter grade of C or higher) we compared between the “reverse-instruction” (RI; flipped) and regular sections. In addition, student feedback was gathered using a Student Assessment of their Learning Gains (SALG) survey and student course evaluations. Comments on the SALG survey suggested that the RI (flipped) students became more interested in and felt less intimidated by chemistry and found the online video and Powerpoint materials useful.

The design or research method used to enhance the credibility of the study involving the flipped classroom that used the Student Assessment of their Learning Gains. The research involved real students that are or have experienced these topics. If the survey was given to the students that have never been in a flipped classroom, then the results would not be able to show the impact of this type of instruction. The researcher has to be mindful of the population that is being researched and make sure that the population is being represented correctly.

The part of the study that I found powerful was the positive aspects of the videos and students using technology to learn materials from the classroom. I have never considered having my students do the lesson at home and come to class ready to complete the problems. I think this would be a very useful, because students get very tired of sitting through a lecture. I teach math and I am always telling my students you need to practice the math to gain a better understanding. I can only lecture them so much and sometimes the math language gets in the way of the real ideas. I often feel students focus on the language and not what the process really means. If I ever taught using this method, I would get to practice more with my students and I would gain a better understanding of the pitfall and misconceptions they have. I agree with the article, that technology is coming whether we are ready for it or not. Students are not doing their homework and getting the practice they need, and using the flipped classroom model would allow them the practice they need in one concept to build on the next.

**Assumptions**

 One of the greatest assumptions is that students will learn more material by having more in-class practice with the teacher being present to ask questions. This is not true. If the student did not watch the videos they will not be able to do the activity in class and then be even more frustrated than if they had received direct instruction with examples being presented. Many students are able to retain information better this way because they are able to ask questions and get direct feedback.

 Other assumption is that we are in the 20th century and all students have the same access to computers. While school have computers for students to work on, the computers are not always available or in working order. Also students may only have one computer at home and several siblings that may need access and therefore causing the student to not be able to watch part of all of the video.

**Research Question and Hypothesis**

 After reviewing the literature on the topic of flipping the classroom, researchers found that more research should be done on this topic. For this reason, the objective study is of this study is to determine if flipping a classroom yields favorable outcomes in the form of higher assessment scores. Based on the literature reviews and prior knowledge about learning in a classroom setting, we hypothesized that flipping the class would indeed yield favorable results in the form of higher assessment scores. In this study we will be reviewing data from two classroom settings. One class will be presented the content in a traditional format (direct instruction in class and practice at home). The other class will be taught the content in a flipped classroom setting. Mr. Macias will use direct instruction videos for students to watch at home prior to receiving exposure to the content in class. Watching these videos outside of the classroom will prepare students to participate in class time practice activities. Participating students will be given a survey on their thoughts and ideas in regards to their experience with the flipped classroom. This will inform educators of how to accommodate the needs of all students concerning the flipped classroom model.

 Once the classes the classes have been delivered the content and practiced, researchers will compare the flipped model with the traditional model by comparing the results of an identical assessment taken by both classes. The research team will make recommendations about the flipped classroom based on the findings of the research.

**Key Terms**

For this study, the following definitions apply:

**Flipped Classroom-** The flipped classroom is areversal of traditional teaching where students learn new content by watching a video lecture or reading new material at home prior to class. The class time is used to do the harder work through strategies such as problem-solving, discussion and/or debates.

**Dependent Learners-** Learners who require a large amount of direction from the teacher.

**Collaborative Learners-** Learners who work best when learning as a part of a team.

**Independent Learners-** Independent learners learn best when left to his or her own devices.

**Assimilators and Convergers**- Learners who take in information through abstract conceptualization.

**Divergers and Accommodators**- Learners take in information through concrete experiences.

**Interactive Activities-** Activities that encourages students to be part of the lesson instead of being a passive observer, quietly sitting in a desk taking notes or memorizing material. This hands-on, real-world learning style strengthens the students’ critical thinking skills, encourages imagination and works their problem-solving skills.

**Methodology-** 1. A collection of rules and methods used by a discipline. 2. The analysis of the principles or procedures of inquiry in a particular field.

**Empirical-** Evidence or data that is based on experience or observation is considered empirical.

**Engagement**- The response of students that represents the range of action students take to advance from not knowing, not understanding, not having skills, and achieving,

**Annotations-** A note added to a book or text as an explanation or comment.

**Self-regulated learning environment-** The process of learning in an environment where the student directs, monitors, and regulates actions towards the goal of information acquisition.

**Student centered learning-** A wide variety of instructional strategies that are intended to address the distinct learning needs, interests, aspirations, or cultural backgrounds of individual students and groups of students.

**Cognitive-** Relating to, being, or involving conscious intellectual activity (as thinking, reasoning, or remembering)

**Mixed-methods research-** Quantitative and qualitative approaches are mixed within or across the stages of the research process.

**Cooperative learning-** The type of learning that refers to students working in teams on an assignment or project under conditions in which certain criteria are satisfied, including the that the team members be held individually accountable for the complete content of the assignment or project.

**Blended learning-** The mixture of face-to-face classroom experiences with online learning experiences from the distributed learning tradition.

**Intelligent tutoring system ALEKS-** Instructional tool that supports conventional teaching in mathematics. An intelligent tutoring system has been able to adapt to a student’s developing knowledge and skills, and has provided precise feedback when mistakes are made.

**Educational technology-** Aims to improve education. Technology should facilitate learning processes and increase performance of the educational system(s) as it regards to effectiveness and/or efficiency.

**Significance of the Proposed Study**

The traditional classroom methods work well for many students, but still, there are many others who are struggling in their study. Not all students learn at the same pace so that traditional one-size-fits-all education does not work sometimes.

With technology developing, many educators try to use technology in classroom in order to help students get better scores. Flipped classroom, According to Morgan, H. (2014), “This new method of teaching, has spread rapidly in the past few years in K-12 settings because some educators believe it enhances learning in many ways.” Our research is significant, because we need to make sure that flip classroom will help students for better performance. Our research will examine this new method in two different math classes and it will prove or disprove the theory. If our research proves the flip classroom has a good influence in students’ test scores. It will be a great choice for teachers in their future teaching.

**Design and Methodology**

**Subjects**

This study will take in a middle school in Highland, CA. The middle school has a population of 16% African American, 66% Hispanic, 12% White, and 6% other. 12% are English Language Learners and 30% are Reclassified Fluent-English-Proficient. 14% of the students have disabilities and 11% are in the Gifted and Talented Education Program. 92% of these students are eligible for free and reduced lunch.

The participants for this student were the students of Mr. Macias. The study will take place in 2 different 7th grade Pre-Algebra classes. These classes will be labeled A and B. Classroom A is GATE Identified with 12 out of 32 students in the GATE program classroom B is also considered a GATE Identified class with 14 out of 35 students in the GATE program.

Mr. Macias is an experienced middle school teacher of six years in the low to middle socioeconomic city of Highland, California. He has taught math classes ranging from math support to Algebra 1. He will be flipping 2 diverse classes of Pre-Algebra students. It is his first time flipping a classroom.Mr. Macias will begin presenting the idea flipped classroom as a teaching to meet their needs.

**Instrumentation and Data Collection**

Mr. Macias shared the idea of the flipped classroom model to the students as a teaching method to maximize class time. Mr. Macias believed that many students did not have internet access at home. Consequently, he had the students complete the following survey (Appendix A):

**Technology Survey**

Please check all that apply

* Television with DVD player
* Computer with Internet access
* Cellphone with internet access
* I am enrolled in the after school program CAPS

Mr. Macias found that out of 28 students 32 have Internet access at home. Consequently, decided to explore other options. At the middle school site there is an after school program called CAPS. The four students who didn’t have internet access at home were able to enrolled in the after school program to access the videos only.

Mr. Macias will use videos from the internet of math topics to be viewed by the students. Students will watch the video as part of their homework outside of the classroom and will take notes on the videos to discuss them the next day. Students will ask questions and/or share an idea about the lesson on the next day. Teacher will summarize the main idea of the concept and proceed to guided and independent practice. If student was not able to watch the video, there will be a computer available for the student to access the video.

Data will be collected from unit assessments and a student survey. The unit assessment data will be collected and compared to data from the same assessment by students who are learning in a traditional class setting.

Mr. Macias will compare the results from a Common Assessment under the flipped classroom model with the results of the traditional classroom model. Mr. Macias will concentrate on proficiency. In the state of California, a students is consider to be proficient if the student scores 70% or higher. Illuminate will be used to collect the data for the common assessment.

**Presentation of Findings**

The students will take a survey anonymously to determine if their confidence in math increased if they were exposed to the flipped classroom. The questions will be associated with the use of the flipped classroom in comparison with the traditional classroom.

**Flipped Classroom: AF 4.1 Common Assessment**

 **Traditional Classroom: AF4.1 Common Assessment**

The flipped classroom model has 11% higher in mastery of the standard compared to the traditional classroom. Although is not a substantial difference, the flipped classroom has a higher percentage of mastery compared to the traditional classroom model

**Student Survey Results**

 Mr. Macias’ students were given an anonymous survey to determine their confidence with math with the flipped classroom in comparison with a traditional classroom. Thirty students completed the survey. The possible student responses were “strongly disagreed,” “disagreed,” “neither agreed nor disagreed,” “agreed,” and “strongly agreed.” The following are the results of the five statements that were given (Appendix B):



Most of the students either felt that the videos were useful and helpful. The students who didn’t think the videos were helpful probably didn’t realize the effects the videos had on their class time. Many of the students expressed that they liked the videos because they were able to learn the concepts twice.



A grand majority of the students agreed with this statement. The small percentage op student who disagreed wanted to watch the videos in class rather than outside of class. This may be due to the fact that middle school students do not like to do homework



The grand majority of the students feel that they have a better understanding of the mathematical concepts under the flipped classroom model. The flipped classroom allows students to ask for help from their peers and teacher, consequently, increasing their confidence in math.



The wording of this question was not properly chosen**.** Students if given the option will select that homework should be done during class. Although, most students like the flipped classroom they will prefer to take the notes during class.



According to the results of this survey question, most students have confidence in their math skills through the use of the flipped classroom. Math is difficult for many students, having a support system is necessary for success.

**Limitations of the Design**

 In this day and age of computer technology and 21st century learners, this model may be difficult to implement. Sometimes just the idea of having to make instructional videos is enough for teachers to reject the flipped classroom model. Teachers with limited time and resources to create the type of online lecture materials that are needed for a flipped classroom.

 It is key to remember lecturing is not the key to learning. While this method may work for some learners, many others survive with a model that takes a constructivist approach. This model is not meant to replace teaching but rather take the class from a teacher-centered approach to a student-centered approach. This allows the teacher to focus more on a one-on-one teaching rather than standing at the front of the classroom being tied to a board.

Our research was limited to a few classes Mr. Macias taught and data is very limited to those students. This study that our group performed does not have the necessary amount of data gathered to support a wide variety of student represented at his school. Also, Mr. Macias had never used this teaching strategy before and did not have enough practice, time or training to be effective.

As with all instructional strategies, the flipped/inverted models will not work with all students. Teachers will need to be mindful of this and make the necessary accommodations.

Limitations through the instructional videos are the focus of this study they are only one part of many instructional strategies used in these classes. Students who do not have internet access at home, may use the library or other classrooms that have computers on campus.

 Other limitations may include students not watching the videos at home and therefore not being prepared to participate in the activities in the class. The homework (readings, videos) must be carefully tailored for the students in order to prepare them for the in-class activities. (Herreid and Schiller. 2013) This is difficult to do when teachers do not make their own videos, but instead rely on sources such as Kahn Academy, Catasia, PaperShow and ShowMe. The students are not use to that type of teaching and it may be difficult for them to pick up key point of the lesson.

 Not all classes lend themselves to flipping. Courses that are more social or inquiry-based, or those that do not have lots of factual content for students to learn, are not suited for this model. The flipped classroom should only be used when it is beneficial to the students and another way to reach the students through differentiated instruction.

 Finally, this type of model is not for everyone. If student’s do not understand the purpose of the flipped classroom, or students do not buy in to the flipped models, and teachers do not let go or are not trained, this model will not be successful. (Findlay-Thompson, Sandi, Mombourquette, Peter. 2013)

**Conclusion**

 Although our study showed growth in the students achievements, it would not serve our purpose if we ignore the percentage of the students that did not do well in this model. According to the survey given to the students, there were a good handful that did not feel this model was helpful and they did not feel any more confident in math. These are the same students who did not perform well on the common assessment. It is important to question ourselves as to why the flipped model did not work for them. The inverted classroom had an indirect effect on student achievement; the direct effect came from the teacher building relationships and a culture with the students. Furthermore the teacher intervened when the students were struggling.

**Recommendations for Further Research**

There are some practical recommendations to be suggested. This type of teaching is not a preferred design for introductory courses. Therefore finding out how to implement this is an introductory course. Many student in these classes do not have an interest in the topic therefore will not take the lessons seriously and do the studying they need to do outside of the classroom. They could also become frustrated with the lack of student-teacher face-to-face interaction. In more advanced classes, student have more at stake in the understanding of the material in order to advance their knowledge for future classes. (Straryer. 2012) How can we make connections to make all subjects valuable. Another recommendation stems from a result, supported in the literature (Frederickson et al. 2005) and confirmed here, that students in an inverted classroom become more aware of their own learning process than students in more traditional settings.

Other recommendations could include. How to train teachers to be effective in this type of instruction. What type of activities work best with the in-class portion of a flipped model. How to prepare students for this model of instruction.

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**Appendix A**

**Access Survey**

**Technology Survey**

Please check all that apply

* Television with DVD player
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* Cellphone with internet access
* I am enrolled in the after school program CAPS

**Appendix B**

**Student Survey**

