AN INQUIRY INTO FLIPPED LEARNING IN FOURTH GRADE MATH INSTRUCTION

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ABSTRACT
The objective of this action research project was to better understand the impact of flipped learning on fourth grade math students in a socioeconomically disadvantaged setting. A flipped instructional model was implemented with the group of students enrolled in the researcher’s class. Data was collected in the form of classroom observations, teacher reflections and surveys from both parents and students. Findings indicated that a flipped learning methodology shifted the role of the teacher to that of a classroom facilitator. Flipped learning also created an engaging instructional environment, which afforded students the opportunity to experience a greater sense a responsibility over their learning process. While parents responded to flipped learning in mixed ways, they overall reported positive changes in their children as a result of the shift in instructional methods. Conclusions and implications for practice are discussed.

As the nation focuses and debates the newest educational policies that drive instructional decisions, such as the 21st Century Skills Framework and Common Core State Standards (CCSS), millions of students, economically advantaged and disadvantaged, continue their journey through the American educational system. These students are guided by teachers, such as myself, who are striving to ride the waves of trends, fads and administrative directives with the goal and hope of positively impacting those young lives to enable more options for their future (Hardiman, 2012). This problematic issue of legislation affecting curriculum (Robinson, 1961) and constant change emerged as topics of concern in the 1960s and has continued since then (Schiro, 1992). More recent analysis of the effects of
reform changes on teachers found the increasing importance of personal investment by educators. It was concluded that curricular reforms in themselves fail to create positive learning outcomes; rather educator motivation and self-efficacy are more influential forces (Day, 2004). These two characteristics are also key factors for teachers taking an active role in educational change through action research.

A recent study analyzing income levels in regards to racial and economic segregation and school quality concluded that intergenerational upward economic mobility has been stagnant for the past few decades (using 1971-1993 birth data groups), (Chetty, Hendren, Kline, & Saez, 2014). There were strong connections found between economic segregation and poor school quality, as defined by test scores and dropout rates. In other words, if a child of poverty is educated by a low performing school there is a high probability that the student will not achieve a high school diploma and was defined as a localized problem across the United States. The great disparities in school quality and graduation rates for different socioeconomic groups motivated me to conduct this action research project in my classroom.

My experiences teaching in a socioeconomically disadvantaged (SED) Title 1 school, Spartanics Elementary (all names are pseudonyms), has led me to seek out resources and strategies to provide a high quality education and increase the academic success for my students in an effort to increase opportunities for their future and break the cycle of disenfranchisement. In my search for solutions, I identified flipped learning (Hamdan, McKnight, McKnight, & Arfstrom, 2013) as one possible option to equalize educational access for my struggling student population. Flipped learning is the process of front-loading instruction through strategies such as pre-recording lectures and lessons for students to watch prior to attending class. Time in class is then focused on learning activities and application of knowledge. Flipped learning often utilizes technology as a means for engaging students in the lesson outside of class. Through a grant, every student in this project was provided access to a laptop to use at home and wireless internet service.

In my action research project, I asked the following overarching question and subquestions about my 4th grade mathematics class. Overarching Question: What is the impact of flipped learning on the classroom learning environment with socioeconomically disadvantaged fourth grade mathematics students?

- Sub-question 1: How does flipped learning influence student participation?
- Sub-question 2: What are the students’ and parents’ attitudes and perceptions about flipped learning?
- Sub-question 3: What are the unforeseen challenges and benefits of flipped learning with socioeconomically disadvantaged students?

**Literature Review**

Flipped, or inverted, instruction gained popularity in 2009, as an approach to teaching organized around intentionally focused curriculum and student-centered learning theories
In traditional education, concepts are introduced in the classroom, and students practice the concept as homework. Flipped instruction moves the introduction of the material to homework and allows for students to be engaged in active learning activities or projects during class time (Bergmann & Sams, 2012) that help to cement concepts and understanding. Many of the key strategies involved within flipped learning have at one time or another been considered outdated strategies or potential educational fads, falling into the pendulum rhythms of educational reform (Paul & Elder, 2007), pushed to the wayside for more direct instruction strategies that would result in short term assessment improvements, a recent response to No Child Left Behind mandates. These strategies include authentic pedagogy and assessment, constructivism, cooperative learning, critical thinking, integrated curriculum, and problem solving, which are all practices rooted in a progressive approach to curriculum.

Flipped learning is continuing to gain popularity. Two independent surveys by Sophia and Flipped Learning Network (FLN) conducted in 2012, and jointly in 2014 (N=2358), found that recognition of flipped learning as an instructional strategy increased from 73% to 96%. Flipped learning has been adopted by many secondary teachers with an increase from 48% (Flipped Learning Network, 2012) of teachers surveyed, flipping some curriculum content, to 78% as of 2014. A literature review by Yarbro, McKnight, McKnight, and Arfstrom (2014) revealed a rapid increase in FLN members, approximately, 2,500 in 2012 to 10,000 in 2013 and a flipped learning conference attendance of 20,000 in 2014.

As flipped learning is gaining popularity, teacher reports and research have also indicated benefits in student achievement and teacher pedagogy. An initial, non-scientific 2012 Flipped Learning Network-ClassroomWindow online survey of 450 participating teachers flipping instruction correlated a 67% increase of achievement scores and 80% indicated significant improvement in student attitudes (FLN, 2014). A 2014 follow up online survey, conducted jointly by FLN and Sophia, found an increase of reported engagement improvement of 8% to 88%, and 71% indicated they experienced improved academic achievement. The surveys also revealed that nearly half, 46%, of the flipped learning teachers have 16 years or more of instructional experience, indicating that flipped learning is not just a trend with new teachers. It must be noted that these data findings were voluntary survey responses by teachers already invested in using flipped learning or interested in the concept. It is unclear if hard data was collected for reports of academic growth or attitude improvement.

In 2009, high school math teachers in Minnesota were found implementing a flipped learning environment, which resulted in significant growth in mathematics for the participating student population (Hamdan et al., 2013). In reviewing the state math test (Minnesota Comprehensive Assessment) results from 2009 to 2011, mastery-level growth rose from 34.4% to 73.8%. The school was awarded National Blue Ribbon status in 2010 for mathematics. This case study was one of the first public successes for flipped learning in public education.
Criticism of flipped learning stems from opposition to any amount of didactic teaching or lecture based instruction (Ash, 2012). While sole use of instructional lecture is not considered to be a good practice, according to Hattie’s (2009) research on instructional methodology effectiveness, most lessons must incorporate it to some extent. The key differences of didactic strategies in the flipped learning methodology are the visual and interactive qualities found in teacher-created video lectures on websites. The ability for students to replay lessons when needed removes the stresses of trying to capture the information in the moment (Bergmann & Sams, 2012), that frantic, finger cramping note taking, a divided attention effect, which interferes with conceptual comprehension (Hardiman, 2012).

The traditional passive, lecture based, instruction format that is found throughout the United States could be a cause for poor, or deficient and below grade level expectation, performance in mathematics. Some educators believe that simply transitioning personal lecture into PowerPoint presentations is an effective strategy for flipped learning (Amare, 2006; Young, 2004). However, a change in lecture delivery does not necessarily increase student engagement, and this method of instruction is still primarily focused on students listening without participating. Flipped learning methodology emphasizes alternative use of the time in the classroom with the teacher present, the use of guided, exploratory and interactive practices and student driven activities. In a theoretical position paper, Ruffini (2014) identified seven benefits that came as a result of flipped learning: 1) increase in student centered and independent learning; 2) more face-to-face time with peers, and teachers guiding and intervening when needed to correct errors in the moment; 3) adjustable learning pace offers accommodations for both faster and slower concept development; 4) more opportunities for cooperative, collaborative, and group inquiry based learning; 5) extended lesson availability for absent students; 6) increased parental participation; 7) opportunities for multi-modality instruction.

While Ruffini (2014) discussed benefits of flipped learning, the author also recognizes the drawback and restrictions: 1) technical difficulties that interfere with accessing lesson content-lack of computer or unreliable internet service; 2) limited school technology resources and training; 3) negative student motivation; 4) increased planning for teachers to provide in-class activities; 5) limited technical skills of teachers to create lesson videos; 6) the fluctuating nature of the educational community in embracing new methods of instruction. The last restricting issue is the most concerning. If the educational community loses interest in flipped or blended learning, research interest will as well resulting in inadequate data to truly evaluate its effectiveness.

**Methodology**

Action research is “a practical way of looking at your own work to check that it is as you would like it to be” (McNiff, 2002, p. 12). It provides a systematic approach for educational practitioners to investigate their classrooms, schools, teaching strategies and student learning (Mills, 2014). Therefore, the action research methodology most closely aligns with the purpose of this study, which was to investigate the impact of flipped learning on students learning in my fourth grade math class and to reflect on the changes that occurred.
Action research also provides a systematic approach to this investigation involving planning, acting, observing and reflecting (Kemmis & McTaggart, 1988). This allows educators to deliberately implement methods of inquiry in order to better understand the situation at hand.

**Action Plan**

I initiated this project in my classroom during the 2014-2015 school year. Beginning the school year with traditional classroom instruction, I gradually phased in flipped learning as the year progressed. During the flipped portion of the study, students completed online frontloading curriculum content each night as homework prior to the next day’s developmental activities. Students without computer and internet access at home received laptops on loan from the school district. Due to a delay in the district’s acquisition of the laptops, these students did not receive their computers until the end of January 2015. Until that time, the students without home computers and internet access completed the outside of class assignments after school on the classroom computers.

In the first quarter of the school year, traditional lecture along with modeled and guided instruction was used. Throughout the second quarter, I implemented a modified flipped learning model. In the modified flipped period, the online lessons were used on Mondays, Tuesdays and Thursdays. Full flipped learning, with online interactive lessons and tasks went into effect in the third quarter. Students completed online assignments four days a week with no assignments Friday through Sunday. The students completed an opinion survey to gather motivation and interest information three times, beginning, midway, and end of the data collection period August 2014 through March 2015.

During flipped instruction, the students completed homework recording sheets by taking notes and recording activity results, or written descriptions of instructional content. Every morning the students turned in the completed work. A 10-15 minute review and debriefing of content from the night before was followed by an accountability quiz. The remaining math instruction time (60 minutes) was used in peer paired and group interactive application tasks that exercised the knowledge introduced the night before to develop and cement curriculum content skills and critical thinking.

**Participants**

Participants in the study included myself, the classroom teacher, along with 27 students enrolled in my fourth grade class (eight to eleven year-olds) and their parents. I am a 25 year veteran teacher who has taught at the research site for the entirety of that time. My teaching style emphasizes constructivism and collaboration in a community environment. I design instructional activities that allow students to build understanding through active engagement, while setting cooperative goals using group discussion and demonstration. My teaching fosters critical thinking through prompting questioning that is asked throughout lesson instruction. Throughout the project, I planned the units of instruction along with the correlating web-based front-loaded lessons and homework assignments. I also monitored and assisted with daily practice activities.
Student participants in the study were enrolled in my fourth grade class. There were 32 students enrolled in the class, and 27 of the students had stable attendance. There was an equal population of male and female students. Ethnicity demographics were as follows: Asian – 21.88%, Hispanic – 37.5%, Native America – 6.25%, Native Hawaiian – 3.13 %, Unknown – 3.13%, White – 28.13% (Illuminate Education, 2015). English language learners were 12.5% of the sample population and 84.38% of the population fell within socioeconomic disadvantaged (SED) classification criterion. These demographics point to the diversity of my student population in terms of ethnicity. It also indicates the high number of SED students enrolled in my classroom.

Parent participants were involved minimally in the study. Parents were asked to monitor student homework completion as a normal part of the educational partnership. A survey was administered to the parents at the end of the data period. Out of a minimum potential response pool of 27, survey data was collected from 18 surveys; a 66% response rate. Parental demographics points to the diverse backgrounds of the students involved in the study. The education level of participating parents ranged from no high school completion to college degrees. The prominent language of the parent population was English at 89.47% and 10.53% were non-English speakers (Hindi, Hmong, Mandarin, and Spanish). These numbers do not reflect the amount of second language learners.

All participants were fully aware of their participation in this action research project prior to the beginning of the study. The parents of student participants signed an Informed Human Consent Form. Minors were debriefed and made fully aware of their participation, but they were not required to sign a consent form as the instructional strategy of flipped learning was designed as a natural part of classroom instruction.

**Action Research Site**

The research site was located in a metropolitan area within a larger agricultural area in California. Spartanic Elementary School is a founding site for the school district being established in 1959 and is a high rental community. The school population consists of 86.4% socio-economically disadvantaged, defined by qualification for free and reduced pricing breakfast and lunch meals (California Department of Education, 2014). The state Department of Education reported a total of 1,108,838 computers in use that are less than four years old as of the 2013-2014 school year (California Department of Education, 2014). In the state, the current student to computer ratio is nearly six to one (5.6). The research site average stands at over 16 students per computer (16.4) at the time this project was conducted.

Supplemental educational services (SES) are provided through on-site Reading Recovery trained instruction in primary grades (1-3) and Read 180 (a computer assisted program) for upper grades (4-6). These services focus on language arts skills exclusively. An after school math lab was conducted for math skill intervention for ten to fifteen students from fourth through sixth grade for ninety minutes, three days a week.
Data Collection
Data was collected through parent and student surveys, observations, and curriculum based assessments. Survey data was gathered from students through Likert scaled teacher-made surveys conducted prior to the study (Appendix A), mid-study (Appendix B) and post-study (Appendix C). The surveys were administered in both hard copy and through SurveyMonkey. Questions were designed to evaluate students’ opinions and experiences with flipped learning. Parent participants also completed a Likert-scaled survey to collect their observations, experiences and concerns about flipped learning and their child (Appendix D). Student surveys were piloted the year prior with students from 2013-2014 fourth grade class. Their responses were analysed, and the questions were revised to collect the desired data as set out in research design. Parent survey questions were not piloted, but were designed to provide additional data from an influential factor, parent attitudes and support.

Observational data was gathered through anecdotal records kept by the classroom teacher. Specific attention was paid to student interactions and engagement through processes in order to monitor student understanding and attitudes towards flipped learning. Video clips and photographs were also taken periodically throughout the study during classroom practice activities. Curriculum-based qualitative data was gathered from resources used for instruction such as video lessons and homework. These resources included learnzillion.com, tenmarks.com, conceptuamath.com, and mobymax.com.

Data Analysis
Data was analyzed with a dual coding system, which uses two rounds of data coding to develop findings (Esterberg, 2002). In the first round of analysis, trends were identified. Instead of approaching the data set with previously defined themes, efforts were made to allow the themes to emerge from the data itself. A list of general themes was developed from this first round of analysis. I conducted a second round of focused coding to narrow these themes and identify supporting data.

Findings
In an analysis of survey responses, observational data and curriculum based results, I found that three significant findings emerged: Teacher as Facilitator, Student Responsibility, and Parental Support. In the following section, I investigate these findings in detail.

Teacher as Facilitator
One of the most significant changes in the flipped classroom was the shift that occurred in my role as the classroom teacher. This change presented both benefits and challenges. I found that flipped learning required an exceptional amount of planning and locating appropriate online resources in the initial phase of implementation.

This was also compounded with issues surrounding the district’s recent shift to the Common Core State Standards and the challenge of becoming familiar with those changes. My role in the classroom changed from being the “sage on the stage” to being a facilitator of
student-centered activities. I was no longer in direct control of student learning or at the center of the class structure. Preparing for class took more time and energy, but during the class session, the students were able to assume more control over their learning. Since my learning philosophy is based in constructivism, the role of facilitator was a natural occurrence and one that I have engaged in as much as possible. Having administrative approval, although reservedly given, to conduct this study eased my mental stresses about testing results, which allowed me the freedom to truly enjoy observing the student engagement and progress evolving in the learning environment.

I also found that I was more able to stay one step ahead of my students through the vast amount of information available to me from the grading and tracking systems on the curriculum websites. These resources provided me with a nightly snapshot of my students’ progress. This allowed me to gauge the success of the lesson. I was then able to respond appropriately and address misunderstandings and difficulties that students had with the content. Often, the students were surprised that I was not only prepared for class with guided modeling and extra practice activities directly related to their confusions, but also for any prerequisite skill issues interfering in the mathematical process.

**Student Responsibility**

The role of the students also changed with flipped learning, as they were expected to display a greater amount of autonomy and individual motivation to complete their out of class assignments. For my fourth grade students, this initially proved to be challenging. The students needed more oversight and monitoring from both the teacher and the parents. Some of the students did not understand that I would know if they had not completed their work. I addressed this issue by providing immediate feedback in the morning after the work was to be completed. Students who had not completed their work were required to complete their assignment during recess. A reduction in missing or incomplete work was corroborated through analysis of missing math assignments from the first and third quarters. The average for missing assignments in the first quarter was 2.35%. In the third quarter the average was 1.35%, almost reduced by half.

As the project progressed, the students self-reported a greater sense of autonomy. On the mid-study survey, 93 percent of the students indicated that if they were having trouble with an assignment, they would seek help from math websites on their own without being prompted by a teacher. A parent also reflected positive sentiments about this change in his/her child. The parent reported, “I like [flipped learning] due to the fact that it allows my child to get self-help and engage in independent learning. This type of strategy increases rigor and level of engagement.” During lesson debriefing students’ questions and requests to model or elaborate on mathematical concepts shifted from procedure and formulaic process clarification to application. Watching videos and online modeled lessons the night before was not, in this project, intended to entirely replace in-class instruction, but rather to frontload content that was elaborated on the next day. With the wide range of learning styles and rates of individual students within a single classroom, the goal was to identify an instructional system that allowed for students to accelerate or remediate as needed and provide a greater percentage of class time for application practice with teacher support.
More students also demonstrated signs of being self-motivated during in-class activities. Student self-reporting on the final survey of 84.62% enjoying practice activities during class time supported recorded anecdotal data of increased engagement. They had a “let’s get down to business” attitude. There was also a reduction in off task behaviors and an increase in task completion during allotted time frames. In other words, the students completed the application tasks in the amount of time given, staying on task until the group was done. In fact most of the collaborative groups rarely needed extra time and were eager to go on to the next task before debriefing.

Along with an increased level of student responsibility, a greater sense of community also evolved through this project. Due to the implementation of flipped learning, the learning activities in the classroom shifted from being teacher-driven to student-centered. The students were often required to work together to complete their task. As the students engaged in activities in a communal setting, they each took on responsibilities as active participants. I observed that students who were hesitant to participate were encouraged and influenced by their peers. This had a positive effect on their academic performance.

**Parental Support**

Parents responded in various ways to the flipped learning environment. Of the entire parent population that was surveyed, only two thirds (18 parents) responded in either the digital or written format. Within this group, 83% responses came from parents that provided technology or their child participated in the after-school ASES program. Only 17% (3 participants) of the responses came from the loaner laptop population of 11 students. This was reflective of the typical level of parental support and school involvement for this group of students.

Overall, most parent ratings placed flipped learning as a positive experience in the eight to ten range (78%) on a scale of one to ten, ten being the highest and most positive. Three parents had a more neutral opinion with a rank of six, and one parent was marginally negative with a rating of four. When assessing parent feelings about their child’s growth, 61% felt there had been higher than average improvement, while 39% indicated average growth. One parent noted that he or she was personally learning from the flipped instruction. “It has been very good and I am also learning; thank you flipped learning.”

Several parents indicated that both they and their child felt relieved from the stress of homework. They also suggested that the online resources helped them understand what their child was learning and working on. When students struggled with the content that they learned at home, they were able to ask questions and review the material the next day in class. In addition, many students who did not have the necessary resources at home at the beginning of the year had home computers and internet service by the end of the study.

While there were positive responses to flipped instruction, there were also concerns. One parent felt that he or she would not have been successful in the flipped environment, but this parent still felt that it was a positive experience for the child. “Is it enough? Does it reflect effectiveness in absorbing the learning? I think it works for her. Personally, I probably wouldn’t do as well with it but for her, it is an amazing alternative.” Another
parent felt disconnected from the child’s learning and reflected that he or she was uncomfortable with the lack of control available as the parent.

I like the fact that he is enjoying it and his grade shows it but I am uneasy about not being able to review homework on paper or check his work. I feel like I don’t know how he is doing with it in the classroom but that might be because I am a ‘creature of habit’. BUT his grades are good so I am trusting in the program.

While the majority of parents reported positive effects with their child’s learning and engagement, the new and unfamiliar nature of flipped learning did cause some discomfort.

CONCLUSION
From this action research project, I concluded that flipped learning led to positive changes in my fourth grade math class. The flipped instruction fostered enthusiasm, confidence and intrinsic motivation in my students, which was reflected in the survey responses and observed student daily behaviors and comments. The classroom no longer resembled a traditional structure and was more analogous to a constructivist-driven, collaborative environment. Students were actively engaged in peer conversations, and for the most part, they were involved with tasks that required greater focus and a deeper understanding of the concepts. There was a noticeable reduction in what is described in this class as “lumps on a log waiting for a frog to sit on them” behavior. Students transitioned from passive receptacles of learning to activators of learning. This resembled a shift away from Freire’s (2000) “banking concept” of learning, in which education is an act of depositing and retrieving information. The banking approach is disempowering for students and removes opportunities for critical and creative thinking: My student population, who were primarily from socioeconomically disadvantaged settings, moved away from the banking model. Flipped learning provided them with opportunities to experience voice and power during the learning process. This sense of ownership also contributed to higher levels of motivation in my students exhibited by 92.31% reporting that they would seek out online help on their own. Students exhibited greater responsibility not only for the laptops assigned for their use, but also in understanding that preparation for the next day’s lesson was crucial for participation and success as a member of a learning team. The students increasingly took on ownership of their learning, protective of class time and became their own monitors of on task behavior and most developed leadership roles.

Flipped learning was also successful in bringing technology into the homes of students who previously did not have access to computers or consistent internet connections. Technology is often a barrier to student success and leads to long term inequities in terms of accessibility and usage skills (Bowman, Palmer, & Harroff, 2013). National Center for Children in Poverty (NCCP) estimates that SED family income needs are nearly twice the $23,283 Federal threshold for basic necessities which most likely leaves acquiring a computer and internet service as a low priority or not a possibility. This fact forces SED children into educational disadvantage as compared to the more affluent situated in regards to education resources. During the school year, the students in my class lacking
technology resources were provided with loaner laptops and wifi to help narrow the gap in advantages. As noted in the third finding, several of the students who did not have the necessary resources at home obtained computers and established internet access from various sources. While this does not address the challenges that the families confronted to obtain these resources, it indicates a greater priority on the availability of technology in the home.

**Professional Implications**
The process of performing an action research project reinvigorated my teaching as well as validated instructional choices I have made over the years. Developing a plan of action and seeing it to fruition with focused scrutiny of this particular instructional strategy as well as the personal reflection was very fulfilling and enlightening as an educator. I have often seen new strategies highly promoted and adopted without enough contextual consideration to support it. The research that I conducted helped me evaluate the benefits and limitations of technology based flipped learning within my classroom environment. Analysis uncovered encouraging results in certain areas (behavioral and perceptive), and prompted questions for further study in others (academic) for me to contemplate. Motivation, personal responsibility and heightened levels of satisfaction in learning were key elements for success. And while my students performed better than some of the non-SED schools in our district on the new Common Core State Standards test (SBAC), there is still much more to be done to hone this strategy for optimum academic results at the elementary level.

Students’ improvements in attitude and increased responsibility, reflected in their relaxed, cheerful active participation in class activities, has convinced me that this is a worthwhile instructional strategy that I will continue to use. I will also continue to modify the methods and instructional strategies based on the changing needs of my students. As educational reform continues to unfold through standards clarifications, good first teaching practices research and the implementation of data collection and analysis in professional learning communities, my personal reflections illustrate the greatest impact is that the cyclical process of action research has become a natural, integral and perpetuating element of my instructional practices to provide quality instruction for my students.

**References**


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**Biographical note:**

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**Teresa D’addato** has been teaching at the same Title I school for the past 27 years (Clovis Unified School District, Fresno, CA). During that time she has served as a master teacher, mentoring teachers new to the profession. She holds a Master’s Degree in Curriculum and Instruction and is an advocate for research-based progressive educational strategies in the classroom and professional development through action research.

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Appendix A

Student Survey Prior to Study

Flipped Classroom Opinion Survey

1. What is your gender?
   - Female
   - Male

2. How much effort do you put into homework?
   - Almost no effort
   - A little bit of effort
   - Some effort
   - A lot of effort
   - A great amount of effort

3. What would you rather do?
   - Work book homework on paper with a pencil
   - Watch lesson videos
   - Do computer activities
   - Both work book and computer activities

4. How much do you like math?
   - I hate math
   - I don’t like math
   - Math is okay
   - I like math
   - I love math
6. How well do you think you will learn math watching the lessons at home as homework?
   - A great deal. I will learn math the best this way.
   - A lot. I will learn math better this way.
   - A little bit. It will help me to learn math sometimes.
   - Only a little. It won't help me very much.
   - Not at all. It will not help me learn math.

6. What level of work do you think the lesson note-taking is?
   - Not enough
   - Not too much
   - Just right
   - A little too much
   - Too much, I'm running out of time.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
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   ____________________________________________________________
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   ____________________________________________________________
   ____________________________________________________________
Appendix B

Student Survey Mid-Study

* 1. What is your gender?
   - Female
   - Male

* 2. How much do you like working in groups?
   - A great deal
   - A lot
   - A medium amount
   - A little
   - None at all

* 3. How well do you like working by yourself on learning activities at home?
   - Not at all
   - Very little
   - A little
   - A lot
   - A great deal

* 4. How much effort do you put into homework?
   - Almost no effort
   - A little bit of effort
   - Some effort
   - A lot of effort
   - A great amount of effort

* 5. How likely are you to go to some of the homework websites on your own?
   - Highly likely
   - Very likely
   - Likely
   - A little likely
   - Not at all likely
6. How well do you think you will learn math watching the lessons at home as homework?
   - A great deal. I will learn math the best this way.
   - A lot. I will learn math better this way.
   - A little bit. It will help me to learn math sometimes.
   - Only a little. It won’t help me very much.
   - Not at all. It will not help me learn math.

7. How much do you like doing the in-class math practice activities?
   - A great deal
   - A lot
   - Medium
   - A little
   - Not at all

8. How do you like doing homework on the computer or laptop?
   - A great deal
   - A lot
   - Medium
   - A little
   - Not at all

9. What level of work do you think the lesson note-taking is?
   - Not enough
   - Not too much
   - Just right
   - A little too much
   - Too much, I’m running out of time.

10. Do you think you have grown in your math skills more because of the ‘flipped classroom’ format?
    - A great deal. I’d give myself an 5.
    - A good amount. I’d give myself a 4.
    - A fairly good amount. I’d give myself a 3.
    - A little bit. I’d give myself a 2.
    - Not at all. I’d give myself a 1.
APPENDIX C

Student Survey Post-Study

Flipped Math Learning Final Student Survey

1. Do you feel that watching the math lesson videos helped you?
   - Strongly Agree
   - Agree
   - Undecided
   - Disagree
   - Strongly Disagree

2. How more comfortable were you with the math activity the next day?
   - Very ready, I understood the lesson.
   - Ready, but I still had one or two questions.
   - A little ready, I had questions and wanted the teacher to model for me.
   - Not ready, I needed more modeling by the teacher.
   - No clue, I didn't understand the math lesson at all.

What made the lessons harder or easier to understand?

3. Do you watch the lesson videos on time when they are assigned as homework?
   - Always
   - Most of the time
   - Some of the time
   - Not very often
   - Never
4. How much did technical problems (Internet, laptop, or website) keep you from completing your on-line homework?

<table>
<thead>
<tr>
<th>1 out of 4 days</th>
<th>2 out of 4 days</th>
<th>3 out of 4 days</th>
<th>4 out of 4 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero, never any problems</td>
<td>a problem</td>
<td>a problem</td>
<td>a problem</td>
</tr>
<tr>
<td>Every day there was a problem that kept me from doing my on-line work.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. What gave you the most problems in doing your on-line homework?

<table>
<thead>
<tr>
<th>Internet</th>
<th>computer</th>
<th>website</th>
<th>Other</th>
</tr>
</thead>
</table>

Please explain the other problems that you had.

6. What computer and Internet do you use?

- Home computer and Internet
- Learner laptop and Internet from school
- ASES - used classroom laptops or school lab

7. How much effort did you put into learning math using the lesson videos?

<table>
<thead>
<tr>
<th>A lot more effort</th>
<th>A little more effort</th>
<th>Same effort</th>
<th>Less effort</th>
<th>No effort</th>
</tr>
</thead>
</table>

Explain why.

8. What did you like the most about watching the lesson videos before the class activities?


9. What didn't you like about watching the lesson videos?


10. How would you rate flipped learning (watching the lesson videos before class activities)?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
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</tr>
</tbody>
</table>

Please explain

11. Please rate the following websites (1-worst, 5-best):

<table>
<thead>
<tr>
<th>Website</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConceptuaMath.com</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>Tannenra.com</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>Learnzillion.com</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>MobyMax.com</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>StudyJams.com</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
</tbody>
</table>

Other (please specify)

12. Please describe your experience with flipped learning for math lessons.


# Appendix D

## Parent Survey

<table>
<thead>
<tr>
<th>Flipped Learning Parent Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watching math lessons for homework before classwork the next day.</td>
</tr>
</tbody>
</table>

1. How positive has flipped learning been for your child?

<p>| | | | | | | | | | |</p>
<table>
<thead>
<tr>
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<tbody>
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<td></td>
</tr>
</tbody>
</table>

Comments:

* 2. How much growth do you feel your child has made in math skills?

<table>
<thead>
<tr>
<th>No growth</th>
<th>Little growth</th>
<th>Average growth</th>
<th>above average growth</th>
<th>A great deal of growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Comments:

* 3. How independent has your child been with homework?

<table>
<thead>
<tr>
<th>Very dependent-constant redirection is needed</th>
<th>Moderately dependent-occasional redirection is needed</th>
<th>Very independent, no redirection is needed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
* 4. How much has your child liked watching the lesson videos before the next day's class activities?

<table>
<thead>
<tr>
<th></th>
<th>Greatly dislikes</th>
<th>Dislikes</th>
<th>Neutral</th>
<th>Likes</th>
<th>Greatly likes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

* 5. **Flipped-Learning** (Watch instruction at home. Work with the teacher at school.)

Please rate your level of agreement with the following statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well suited to meet my child's needs.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Helped my child feel more confident in math.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Helped improve my child's technology skills.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Is an improvement over past teaching strategies that my child has experienced.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The classroom website was helpful.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Comments:

* 6. How much did technical problems interfere with your child’s ability to complete the video lessons?

<table>
<thead>
<tr>
<th>Frequency of Problems</th>
<th>Zero, never any problems</th>
<th>1 out of 4 days there was a problem</th>
<th>2 out of 4 days there was a problem</th>
<th>3 out of 4 days there was a problem</th>
<th>Every day there was a problem that interfered</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>


7. What form of technology interfered most?

- Internet failure
- Computer
- Log-in issues
- Website
- Other

Other (please explain)

6. How was online technology provided to your child?

- Home computer and internet service
- After-school ASES Program
- Grant loaner laptop with internet service

9. What did you like the most about this form of learning for your child?

10. How could the flipped-learning experience be improved for your child?

11. Describe your experience as a parent while your child has participated in flipped-learning.