

| <b>Position 1: Flipped Classrooms Should Be Implemented in Secondary Mathematics Classrooms</b>   |  |
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| <b>What are some facts that support this position?</b>  | <b>What are some facts that counter this position?</b>   |
| <p><b>Data proves that flipped classrooms increase student engagement and student achievement:</b></p> <ul style="list-style-type: none"> <li>• Cynthia J. Brame (2014), the assistant director of the Center for Teaching at Vanderbilt University, the #1 ranked school of education in the country, wrote a research article claiming that physics instructors (Carl Wieman and colleagues) taught two different physics classes the same way for 12 weeks. During the 12 weeks, the two classes showed no significant difference in academic achievement. The following four weeks one class was the experimental group and the other class was the control group. After the four weeks were up, the experimental class showed a 40% increase in student engagement and scored 33% higher on a test than the control proving that student engagement and student achievement increased using a flipped classroom (Brame, 2014).</li> <li>• According to Strayer (2012), students like the flipped classroom, it motivates them, and they are more willing to participate because the environment has greater innovation and cooperation when compared to a traditional classroom.</li> <li>• By making the classroom more coherent, students can take new ideas, give thought to them, and express their thoughts to create a learning community that is well connected (Strayer, 2012).</li> <li>• Students also find a greater support system for higher cognitive skills that</li> </ul> | <p><b>Flipped classrooms does not cause students to learn:</b></p> <ul style="list-style-type: none"> <li>• According to Linda Gojak (2012), NCTM President, videos do not necessarily encourage student understanding, nor do they ensure that students will remember the necessary procedures that will be needed in the next class to successfully complete the tasks.</li> <li>• A video does not promote adaptive reasoning. Students will still struggle when the wording or the problem is slightly different than the videotape lesson (Gojak, 2012).</li> <li>• A single instructional approach is unlikely to have a major impact on student achievement once the novelty wears off (Gojak, 2012).</li> <li>• It is not the flipping, but rather a multitude of strategies that considers the needs of the students and how to incorporate characteristics of an effective classroom (Gojak, 2012).</li> <li>• Finally, flipping does not have to occur for a teacher to develop a lesson that considers how students can develop a deep understanding for the goal of the lesson (Gojak, 2012).</li> <li>• According to Michael Horn, “change in structure alone is unlikely to produce vast improvement” (Horn, 2013). There is not enough sufficient data to determine its impact on student learning.</li> <li>• Practitioners are experiencing greater engagement. But is that because of the <i>newness</i> of the flipped classroom?</li> <li>• Flipping does not address the root</li> </ul> |

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| <p>are now emphasized in the classroom (Strayer, 2012).</p> <ul style="list-style-type: none"> <li>• The teacher has more time to assist one-on-one if necessary and students have greater peer-to-peer collaboration time for higher thinking skilled activities (Strayer, 2012).</li> <li>• The flipped classroom allows students who are hesitant to ask questions during a traditional lecture more inclination to do so during teacher-to-student monitoring (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• Students can move at his or her individualized pace (Fulton, 2012).</li> <li>• Students can rewind or replay confusing areas in the video (Horn, 2013).</li> <li>• Allows students the opportunity to spend more time on the content they need the most help with through meaningful learning activities (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• Students are actively engaged and are not passive learners by having individual, paired, and small group activities (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• Students eventually become aware of their own learning styles in time (Roehl, Reddy, &amp; Shannon, 2013).</li> </ul> | <p>causes of low motivation for low-achieving students.</p> <ul style="list-style-type: none"> <li>• With a lack of computer access and poor or no internet access, it could widen the gap of student achievement and place even more students at risk of falling behind (Horn, 2013).</li> <li>• What happens when move at your own pace becomes no pace?</li> <li>• If every teacher flips, students will have multiple video clips to watch nightly (Hertz, 2012).</li> <li>• A more telling sign is that charter schools that serve low-income students such as KIPP, Rocketship, Alliance, and Summit are <i>not</i> flipping their classrooms. The charter schools actively address student responsibility in other ways and do not rely on Internet and home computers. Online learning happens during the day at the schools (Horn, 2013).</li> </ul> |
| <p><b>Flipped classrooms improves the teachers practice by thoughtful planning and reflection:</b></p> <ul style="list-style-type: none"> <li>• According to Jeremy Strayer, Department of Mathematical Sciences, Middle Tennessee State University, states that flipped classrooms causes teachers to structure the on-line portion of the lessons (video clips) with the in-class activities to create a coherent whole. In other words, activities should be rich, engaging tasks that are tightly aligned with the videos and videos can be made using a variety of approaches</li> </ul>  | <p><b>Technology consumes time therefore not enough time is spent on planning and reflecting:</b></p> <ul style="list-style-type: none"> <li>• According to Strayer (2012), teachers are challenged how to best teach with technology. While grappling over the technology, teachers' valuable time is spent with technology and not on how to best teach for conceptual understanding (Strayer, 2012).</li> <li>• According to Roehl and colleagues (2013), teachers face challenges on making changes to online lectures (Roehl, Reddy, &amp; Shannon, 2013).</li> </ul>  |

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| <p>if applicable using multiple representations (Strayer, 2012).</p> <ul style="list-style-type: none"> <li>• With this in mind, teachers are forced to consider a natural progression for the sets of videos, spend more time on using engaging activities, and reflect on their practice (Fulton, 2012).</li> <li>• During this reflection process, teachers hone skills by spending more time dissecting curriculum and customize the curriculum to assist students' conceptual understanding that is available 24/7 ( Herreid and Schiller, 2013).</li> <li>• Also, during this reflection process, data analysis can take place when grading assignments. Specific struggles can quickly be diagnosed and addressed during class time (Herreid and Schiller, 2013).</li> <li>• During this class time, students can spend more time on their weak areas, review video clips anytime, and the teacher can spend more one-on-one time with students mentoring them to address weak areas (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• All of this becomes a win-win for the teacher and the school district. Teachers can master their craft by considering prior knowledge for students to gain entry points, a logical natural progression throughout the unit, analyze student work formally and informally, which leads the teacher to pose questions to address any misunderstandings in class.</li> <li>• School districts can save money by limiting the amount of purchases for mathematics textbooks, which are not necessarily aligned with the state standards anyway.</li> <li>• Teacher video clips can also be a valuable resource for professional development. Teachers can view each</li> </ul> | <ul style="list-style-type: none"> <li>• Flipping a classroom will not guarantee any greater consideration of the natural progression needed for students to gain entry points and teachers may not tightly align in-class activities with the videotapes.</li> <li>• According to Herreid and Schiller (2013), quality videotaping requires a significant amount of time, which would reduce time for customizing curriculum and data analysis. Often times, the quality of the videos is marginal at best and finding quality videos already made is difficult (Herreid and Schiller, 2013).</li> <li>• Many times the videos pre-made is primitive (Horn, 2013).</li> <li>• Many times, students will resist flipping because of the commitment outside of the classroom. Students come to class unprepared causing significant amount of catch-up time, which is counter-productive for in-class higher level thinking (Herreid and Schiller, 2013).</li> <li>• There are no guarantees that flipping will increase teacher competency or increase student achievement. Teachers may feel overwhelmed by time constraints and produce lackluster videotapes that do not tightly align with classroom curriculum.</li> <li>• If technology is driving instruction, we have major problems in our mathematics classrooms (Fitzpatrick, 2012).</li> </ul> |
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| <p>other’s videos providing valuable insight into teachers’ knowledge packages (Fulton, 2012).</p>  |  |
| <p><b>Benefits for the learning community:</b></p> <ul style="list-style-type: none"> <li>• The feedback cycle between the teacher and the student has greater potential to help bolster student learning (Horn 2013).</li> <li>• The flipped classroom promotes thinking inside and outside the classroom (Herreid and Schiller, 2013).</li> <li>• Frees up class time for discussion and teacher and student creativity (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• Parents have a window into student content (Fulton, 2012).</li> <li>• Absent students can watch the videos and gather insight into necessary skills they miss much easier than reading a textbook and trying to follow an algorithmic approach from the book (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• Instruction can easily be differentiated (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• Teachers can demand mastery before they attempt the next skill (Fulton, 2012).</li> <li>• Technology is flexible and is appropriate for 21<sup>st</sup> century learning (Fulton, 2012).</li> </ul> | <p><b>Flipped classroom does not benefit all members of the learning community:</b></p> <ul style="list-style-type: none"> <li>• Federal and state funding to schools have been reduced. Financial limitations are a concern to public schools, teachers, and students. Many schools lack the necessary amount of computers to successfully implement flipped classrooms (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• The average score on student evaluation of a flipped classroom is about ½ what the same professor gets when teaching using the traditional format for college-ages students (Berrett, 2012).</li> <li>• Flipped classrooms are just not well received by all students (Roehl, Reddy, &amp; Shannon, 2013).</li> </ul> |

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| <p><b>Position 2: Flipped classrooms should not be implemented in secondary mathematics classrooms without further quantifiable data.</b></p>  |   |
| <p><b>What are some facts that support this position?</b></p>  | <p><b>What are some facts that counter this position?</b></p>   |
| <p><b>Flipped classrooms are a method for delivering instruction. The process itself does not increase student learning.</b></p> <ul style="list-style-type: none"> <li>• Linda Gojak, president of NCTM advocates that videos that only teach a procedure do not help students’ conceptual understanding of the topic (2012).</li> <li>• Gojak said, “a single instructional</li> </ul> | <p><b>Flipped classrooms are engaging for students, therefore they impact student learning.</b></p> <ul style="list-style-type: none"> <li>• Effective flipped classrooms are thoughtful educators. They reflect and revise their practice constantly (Bergmann &amp; Sams, 2012).</li> <li>• Personalizing the videos was key for success for Bergmann and Sams</li> </ul> |

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| <p>approach is unlikely to have a major impact on student achievement once the novelty wears off,” (2012).</p> <ul style="list-style-type: none"> <li>• Some videos are only presenting content one way; good instruction requires multiple approaches (Hertz, 2012).</li> <li>• Flipped classroom is not new per say, it is similar to team learning (reading assignments before class and quizzes and case studies in class), Just-in-Time Teaching (web-based assignments before class, instructor adjusts lesson to suit needs), “Hybrid courses and “blended courses” (combination of traditional classroom interactions and internet-based lessons. All of these methods require students to prepare out of class so classroom time can be more application (Herreid &amp; Schiller, 2013).</li> <li>• Andrew Miller, an educational consultant, said, “if you’re still relying on lecture as your primary mode of getting content across you haven’t don’t anything to shift the type of learning that’s occurring,” (Ash, 2012).</li> <li>• While many teachers have reported an increase in student engagement, there are few studies to show an increase in student achievement.</li> </ul> | <p>(Bergmann &amp; Sams, 2012).</p> <ul style="list-style-type: none"> <li>• A flipped classroom is a redesign that can re-engage students to increase motivation (Tucker, 2012).</li> <li>• The concept allows for more active learning time with the teacher, such as problem-based learning, peer tutoring, collaborative learning, cooperative learning, and peer-assisted learning, and creates more student-centered classrooms (Bishop &amp; Verleger, 2013).</li> <li>• The higher cognitive functions utilized in class activities can be associated with deeper learning (Brame).</li> </ul>                      |
| <p><b>It takes a considerable amount of time to adequately flip a classroom.</b></p> <p>Time for the teacher:</p> <ul style="list-style-type: none"> <li>• Bergmann and Sams encourage teachers and schools to consider:</li> <li>• The professional development time to learn to make videos (since students respond best to teacher made videos)</li> <li>• Time to plan what content is presented in the videos, and the best method for presenting that content</li> <li>• Time to plan activities for in class that match the objectives, provide adequate connections for the students, and allow for differentiation.</li> </ul>   | <p><b>Effective teachers are already spending time doing these things, and after initial groundwork was completed, creating videos did not take much more time.</b></p> <ul style="list-style-type: none"> <li>• In a study of flipping an economics class, “Preparation time was significantly reduced after the initial groundwork was completed,” (Roehl, Reddy &amp; Shannon, 2013).</li> <li>• Premade videos can be obtained from online such as Khan Academy, TEDEd, PBS and TeacherTube (Herreid &amp; Schiller, 2013).</li> <li>• Teachers build in reflection for the homework assignments, after they</li> </ul> |

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| <ul style="list-style-type: none"> <li>• Time to create the videos. Quality videos, if teacher made, require a significant amount of time to prepare (Herreid &amp; Schiller, 2013).</li> <li>• Time to reflect, adjust and modify, and recognize that flipping is different for every teacher, every school, and every area. Videos and lectures must be tailored for students (Herreid &amp; Schiller, 2013).</li> </ul> <p>Time for the students:</p> <ul style="list-style-type: none"> <li>• Students are required to assume responsibility for learning (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• Teachers are not flipping the time things occur, but flipping the responsibility – Bennett said (Finkel, 2012).</li> <li>• Students become aware of their own learning process, therefore need to reflect on lessons to make connections (Roehl, Reddy, &amp; Shannon, 2013).</li> </ul> | <p>watch the video, or during class time.</p>  |
| <p><b>There are significant financial requirements for successful flipping.</b></p> <ul style="list-style-type: none"> <li>• There are financial limitations as flipping requires students to have access to computers and Internet outside of school (Roehl, Reddy, &amp; Shannon, 2013).</li> <li>• Costs for districts to provide professional development, software and devices on which to create videos.</li> <li>• Charter schools serving large numbers of low-income students are not trying to flip (Horn, 2013).</li> <li>• Due to this, some think flipping is only successful in upper-income schools because of finances and access to computers and Internet at home.</li> </ul>  | <p><b>Limited technology at home is not an issue, and flipping can save districts money.</b></p> <ul style="list-style-type: none"> <li>• Students can go to the library, teachers can burn DVDs, or students can watch videos on smart phones. (Hertz, 2012).</li> <li>• Budgets may be increasing class sizes; this is a method for providing more individual instruction (Berrett, 2012).</li> <li>• Flipping provides a curriculum that is accessible any time and doesn't require districts to purchase textbooks.</li> </ul> |

## **Summary and Recommendation:**

### **I. Opening - Definition**

- a. Flipping the classroom is a hot topic in education circles. Flipping the classroom uses technology to move the lectures outside the classroom and uses the time in class to apply the content with student centered learning activities.
  - i. The pioneers of the flipped classroom, two chemistry teachers, started posting their lectures and notes on YouTube to allow students who missed class or needed to review the lecture the opportunity to do so at their convenience.
  - ii. These two instructors noticed that there was more interaction in class between students and teachers as well as between students and peers.
  - iii. The teachers also noticed that they had more time to work with students that needed help and that these students began to improve.
  - iv. In addition, students that were ready to progress began to work at their own pace outside of class.
  - v. After the teachers published an article about their findings, the flipped classroom movement began.

### **II. Why it is controversial**

- a. After reading about the success of the flipped model of instruction, many administrators are eager to implement this teaching platform in their school.
  - i. Supporters of this movement point to the data that shows increased student engagement using the flipped model.
  - ii. Detractors point out that this movement is so new that hard data showing a link between flipping the classroom and increased student achievement is not available.
  - iii. These opposing viewpoints have led to the controversy that surrounds the implementation of the flipped classroom.

### **III. Closing - Summary of Positions**

- a. Summary of Position 1 - Support of Flipped Classroom
  - i. The flipped model can be an effective platform in which to deliver current learning theories.
  - ii. Current learning theories point to increased student achievement when students become the agents of their own learning and are actively involved

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- in their own knowledge formation. Deep and conceptual understanding of a new idea increases as a person is actively participating in and constructing their knowledge in a way that is personally meaningful. The flipped model allows this student centered approach to learning to occur.
- iii. By flipping the classroom, the teacher is able to employ instructional best practices.
    1. This model forces a teacher to have a more reflective teaching practice as they look at student work and prepare the videos and matching activities used for the lesson.
    2. If needed, the teacher is able to easily modify the instruction and make it available to students via the Internet 24/7.
    3. The teacher is also better able to use the class time to observe and assist students with difficulties as well as provide deeper understanding through investigations, labs, and student centered activities.
  - iv. By flipping the classroom, the student is able to benefit.
    1. The flipped model allows students to work at his or her individual pace.
    2. The student can review material online or advance to the next lesson.
    3. Students are more engaged in class because they have pre-learned the material and are able to connect the classroom activities and investigations to this knowledge.
    4. The use of technology increases engagement and interest in the lesson for the student.
- b. Summary of Position 2 - Concerns about the Flipped Classroom
- i. The flipped classroom model is new and there is not much hard data to prove that flipping the classroom is linked to student achievement. Research indicates that student engagement is increased but engagement does not always translate into achievement.
  - ii. Students are often initially resistant to this new technique, as it requires them to think about the material at home before its introduction in the classroom. The flipped classroom does not nor cannot begin to address all of the root problems of a student's apathy towards school and learning. This apathy is especially a problem for our under resourced students.
  - iii. The flipped classroom requires the use of technology that may be not be accessible for some students.
  - iv. Most importantly, the success of the flipped classroom requires that the teacher employ best teaching and learning practices.
    1. The teacher must have available to them or create themselves high



- quality videos that address the learning targets for the students.
2. Activities and labs that match and build on the instructional videos seen outside the classroom must be created and used in the classroom. The search for and creation of these materials can be quite time consuming.
  3. Teachers must also embrace the shift in the learning culture from a teacher-centered approach to a student-centered approach.
  4. Without all of these ingredients, the flipped classroom model is just the same “sage on a stage” teaching model being delivered through a video.

#### IV. Recommendations

- a. The flipped classroom is just a model to deliver instruction. According to the research, the flipped classroom in itself, is not what increases achievement. The entire success of the flipped classroom as an agent to increase student learning rests on the teacher employing best practices and current learning theories.
- b. Our recommendation to administrators is twofold:
  - i. Administrators should: continue to follow the flipped classroom movement as it shows promise as a teaching platform.
  - ii. Administrators should: focus their time and resources on providing teachers with training in best teaching practices and current learning theories so that they will employ student centered learning and increased student engagement whether they are in a traditional classroom or a flipped classroom.

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