Action Research Plan
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Section I

A. Introduction

Videos are becoming more and more popular as a means to deliver instruction within the educational setting. The purpose of this study is to measure the effects of using video to deliver instruction in the mathematics classroom. The study will examine two different instructional delivery methods. The first will examine the effects of flipping the classroom on student achievement. Flipping the classroom is a relatively new practice where the teacher sends home a video for the student to watch prior to coming to class. Once the student returns to class, the teacher does reinforcing activities or a summary of the lesson and then allows the student time to work on problem sets or collaboration activities with their peers. Does this ever-growing in popularity method of instruction have positive or negative effects on student achievement?

The second part of the study will examine the effects of using videos in the classroom as an alternative to traditional teacher-led large group instructional methods. Students come to class, watch a video (usually with ear buds alone in their seats) and pick up a corresponding worksheet or practice set of questions or problems to do afterwards. The teacher's role becomes that of a "facilitator" or "data collector" as they track a student's progress while they sit at their desk or a table in the back of the room. The teacher's role in this instance is to provide one-on-one feedback to students as they complete various tasks and bring to the teacher for review.

This study will include participants from a typical suburban middle school in southern Missouri. The participants are 120 sixth-grade mathematics students divided into five

classrooms whose teachers use video to deliver instruction of various mathematics lessons. For the purposes of the study, two classrooms will deliver instruction via video in the classroom as the teacher “facilitates” as described above and two classrooms will use the “flipping the classroom” model of instruction. The last group will be the control group which will learn using the traditional lecture/homework model.

B. An Area of Focus Statement

It has been observed that mathematics instructors are using videos to deliver instruction more frequently than in the past. This is occurring both as a flipped classroom resource where the student watches the video at home and as an in class resource where the student watches the video individually in class. The focus of this study is to determine if “flipping a classroom” will increase student learning, motivation, and engagement.

C. Research Questions

- Does watching a video to learn mathematics have a positive effect on student achievement?
    - What is the optimal length of video to deliver instruction?
    - Do students learn better from videos made from outside resources or videos featuring their own instructor?
    - Does watching a video to learn math make homework less frustrating for students?
    - Does watching videos at home promote better engagement in the classroom?
    - Does flipping a classroom promote better student-teacher interaction?

D. Related Literature

By flipping the classroom, we are hoping to see student achievement rise. Teachers have reported that using the flipped classroom approach, students felt they learned more and felt more comfortable with peers and asking questions as opposed to standard lecture (Love et al, 2013). Students get more one on one time with their teacher because the teacher's time during class is not spent up at the board teaching the lesson. Instead, teachers can spend time during class giving the students hands on, problem based work and the students can get answers to questions on that work right then and there. That in turn, creates an environment where students feel comfortable asking questions and then can make sense of what they are learning which should help with achievement.

According to Fulton (2012), using the flipped model calculus students proficiencies rose an average 9.8%, precalculus proficiencies raised 6.1% and algebra II had a 5.1% increase. Post secondary education had similar results as students in the non-lecture section (flipped classroom) did more than twice as well on the test given compared to students in the traditional lecture section (Love et al, 2013). Schaffhauser (2013) says that videos give the students the chance to go and learn at their own pace and be in control of their own learning.. A traditional classroom setting does not allow for students to go at their own pace and there for achievement will not increase like it has for the flipped class models. From Estes, Ingram and Liu's (2014) perspective, students in the flipped sections not only increased engagement by 40% but attendance by 20%. All of these findings indicated that a flipped model does in fact increase student achievement, when used properly.

Parents are also generally happy with the results of the flipped classroom and the students liked how they could get help with the more difficult problems during class time (Fulton, 2012). With any new practice there will be some resistance to the change but the majority agree

that flipping the classroom aids in student achievement and engagement. Flipping classrooms is so much more than watching videos for homework; it increases interaction, personal time with students, and that increases achievement (Bergmann et al., 2013).

E. Description of the intervention or innovation

Depending on the outcome of the data collection instruments, innovation strategies could vary. Assuming that student achievement is better using the flipped classroom model, then all classes might consider using that model more often. Teachers will continue to perfect the "flipped classroom" model by sharing what is working/not working during their collaboration time thereby perfecting the process so that students yield the greatest effect size possible as it relates to student achievement.

If using the teacher as a facilitator in the classroom and using videos to deliver instruction is found to yield the highest student achievement, then, we will accommodate this model by developing it further during team collaboration time. This might include using small groups in class so that students who are working at the same pace can sit together and work problems with partners or small groups after they watch their videos. This will allow the teacher time to work one-on-one with students but also allow for support for other struggling students in the class. This model limits the amount of time with the instructor so other supports will need to be established. Peer tutoring may be a nice supplement to this model.

Lastly, if it is found that traditional lecture-style instruction is the most effective, then we will continue to use this model as it is always done. Since this model has a tendency to encourage the lazy, unengaged learner, it might be best to offer multiple learning strategies in a classroom that utilizes the lecture-style learning model. Hands on activities as well as small group activities will ensure that all students, regardless of learning style, will be accommodated.

Section II

A. Overview of your Data Collection strategies

During this process we will use four different data sources to conduct our research. These include teacher surveys, student surveys, classroom observations, and pre/post test of the students. The plan is to start with a pretest and then give it again as a post test to allow us to monitor student growth throughout the process. Surveys will be given to the teachers and students to find out what strategies they felt were effective and ineffective. Observations will be used to record how the teachers are using their class time.

The validity of the data will come from comparing 5 different classrooms with two of them watching videos in the classroom, two of them watching videos at home, and a fifth one that will continue the traditional learning environment without watching videos. Each teacher will be required to cover the exact same curriculum, but teach it in different ways. All students then will be given the same pre and post test to monitor student growth. For some of the styles attendance in the classroom is more important so we will not count the data for students who have missed 15% or more classes.

B. Data Sources

In order to gain the information needed, we decided to use four different methods of data collection. Those methods include teacher surveys, student surveys, classroom observations, and pre/post test of the students. Surveys will be given to both the teacher and student at the end of the semester to help determine if the using videos for instruction was successful or not. The teacher survey will measure the how the videos were used in the learning experience and what types of obstacles were faced while implementing the use of videos in the classroom. While the students will be given a survey to help develop how they perceived the

implementation of videos in the classroom. Observations throughout the semester will be used to record real tithe use of videos in their learning experience. me data on the teachers and students using the videos in their lessons. Lastly, a pre and post test will be developed to be given to all students in the sixth grade to monitor student growth. With these results we will be able to compare the students who use videos in their learning and those who did not.

C. Data Analysis plans

After we have collected data from the teacher survey, student survey, observation, and pre-test/post-test, the analysis phase will begin (see Appendix B - Data Collection Matrix for details on what data collection instrument will be utilized for each sub-question). It will be extremely important to pay close attention to commonalities as we go item-by-item through the responses to each question on both the teacher survey as well as the student survey. Since the surveys include many questions in the form of linear scale type where respondents can choose 1 to 5 on a strongly disagree to strongly agree scale, it will be easy to create bar diagrams to analyze common responses to each question. For open ended questions, we will collect data on similar responses and then summarize their answers in a paragraph.

For the observation instrument, we will create “look fors” and only collect data on those items as they are observed. Since this instrument has not been created at this time, specifics are unclear but will likely be collected as part of a frequency table so that we can document how many times an identified behavior occurs.

The pre- and post-tests are essential to the ARP. Measuring student achievement sheds light on what teaching strategies work and what strategies do not work. Once the pre- and post-tests are created, we will calculate the difference between each item on the assessment and then calculate the percent increase or decrease thereby measuring the change over time.

Hopefully, this will highlight the teaching strategies that have a strong positive effect on student achievement.

Section III

A. Questions to be Answered

1. **Will there be other people involved in your action research project? If so, who are they and what would be their responsibilities?**

   The people involved in this action research project will be four sixth-grade math teachers and their students. The teachers will all agree to use one of the three teaching strategies in their classrooms for a specified period of time. Also involved will be the principal in the building who will approve the research as well as a district administrator who will receive a report of findings upon completion of the project.

2. **What negotiations would you need to undertake prior to beginning your project? For example, would you need to secure an administrator's permission? Parents' permissions?**

   To undertake in this project, it will be necessary to ask permission of the building principal as well as the Director of Secondary Learning. This will ensure the integrity of the project so that we are transparent in what we are doing and the outcomes we receive from doing the research are shared with teachers of the district so that they, too, can learn from our project. Parent permission is not required as the results will only be shared within our school district.

3. The projected timeline for the 2017-2018 school year, will be as follows:

   - Weeks 1-2 Introduce the study to students and parents
   - Weeks 3-12 Collect Data
     - Week 3 Administer Pre Test

    - Week 12 Administer Post Test and Surveys
- Weeks 13-14 Analyse the data
- Weeks 15-16 Interpret the data to determine our recommendations

4. After analyzing and interpreting the data, we will develop recommendations during the final two weeks of the semester (weeks 17-18).
5. **What would be your overall strategy for implementing any recommended actions resulting from your project (e.g., who would need to be involved in the implementation process? What support might you need? What factors in your school culture might inhibit or support any innovation or intervention actions?)**

   The first step will be to make sure there is a 100% administration support to the plan. They will need to make sure the faculty is on board with the plan and help maintain a positive learning environment throughout the building. In order to be proactive with the community, more specifically the guardians of our students, communication will need to be made with parents to control any resistance that may come from them. The second step will be to provide all staff the proper professional development in order to make sure they feel comfortable and confident implementing the plan. If they are not prepared there is a chance that even with a great plan the implementation may be unsuccessful. Extra mentoring support should be offered to those who do not feel prepared to implement the plan.

6. **What would be your process for ongoing monitoring (data collection and interpretation) of recommended actions?**

   In order to monitor the implementation of our plan, we will conduct three actions. The first of those will be to have administration conduct unannounced

observations to see how the teachers are implementing the new strategies. The second will be to conduct a second teacher survey halfway through second semester to find out their feelings of how the plan is going. The final will be to have a running Google Document for teachers to share ideas, success stories, and failures.

References

Fulton, Kathleen. (2012). Upside Down And Inside Out: Flip Your Classroom To Improve Student Learning. Learning & Leading with Technology, Vol. 39, 12.

Betty Love, Angie Hodge, Neal Grandgenett & Andrew W. Swift. (2014). Student Learning and Perceptions in a Flipped Linear Algebra Course. International Journal of Mathematical Education in Science and Technology, 45:3, 317-324.

Michele Estes, Rich Ingram & Juhong Christie Lu. (2014). A Review of Flipped Classroom Research, Practice, and Technologies. International HETL Review, Vol 4.

Schaffhauser, Dian. (2013). The Math of Khan. T.H.E. Journal, Vol. 40, 19-25.

Bergmann, Jon, Jerry Overmyer, & Brett Wilie. (2013). The Flipped Class: Myths vs. Reality. The Daily Riff.

Appendix A - Literature Matrix

Area of Focus Statement: The focus of this study is to determine if "flipping a classroom" will increase student learning, motivation, and engagement.

Research Question: Does watching a video to learn mathematics have a positive effect on student achievement?

Sub-Questions: What is the optimal length of video to deliver instruction? Do students learn better from videos made by outside resources or videos featuring their own instructor? Does watching a video to learn math make homework less frustrating for students? Does watching videos at home promote better engagement in the classroom? Does flipping a classroom promote better student-teacher interaction?

Author/s	Year	Variables Considered in the Study						
		Academic Achievement	Critics of Videos	Growth Mindset	Parent Perspective	Student Perspective	Teacher Perspective	Teaching Practices/Professional Development
Schaffhauser, Dian	2013	Article states that as an alternative to lecture, teachers should "think out loud" in other words, open up your head and explain what you are thinking to students.	Khan Academy takes us back to drill and kill methods of instruction rather than an emphasis in problem solving.	Khan Academy videos allow students to be in control of their own learning.				
Mayes, D. R.	2010				Dissertation found that parents appreciated the videos because they could use them to help their students at home. Also, students that struggled could rewatch the videos.	Students would use the videos to preview upcoming material.	Teacher felt the videos gave students additional time to process the videos and were also beneficial to students who were absent.	
Brame, C.	2013	Students who engaged in the flipped classroom model scored 2.5 st. dev higher than the traditional		"A 'metacogniti ve' approach to instruction can help students learn to take				

		lecture students.		control of their own learning by defining learning goals and monitoring their progress in achieving them" (p. 18).				
Bergmann, Jon, Jerry Overmyer, and Brett Wilie.	2013						So much more than watching videos for instruction. It increases interaction and personal time with students and they can get personalized learning	Teacher is the "guide on the side" and is a " **blending** of direct instruction with constructivist learning."
Sams, Aaron.	n/a		Teaches educators to ignore the research on the folly of homework				"The Flipped Class is not a methodology, it is an ideology."	A class that uses screencasting as an instructional tool
Fulton, Kathleen	2012	"calculus proficiencies are up an average of 9.8%." "Accelerated Algebra II, there was a 5.1% increase in median test scores" " In 2006, Byron's high school math mastery level was 29.9% on the Minnesota Comprehensive Assessment (MCA). In 2010, its mastery rate had risen to 65.6%"			Do not need to pay for a tutor anymore, better use of the teacher's time, they are there to help during class time	Students like that they can get through lessons faster, pause lectures to write notes if needed, can ask questions during class		

Betty Love, Angie Hodge, Neal Grandgenett & Andrew W. Swift	2014	Little research has been done to assess the effectiveness	Self paced learning that students can view as many times as needed				Not for everyone in terms of learning style and flexibility Reserves class time for active problem based learning & practice activities	There is no single model for implementing a flipped classroom, it is still in the stage of innovation

Appendix B - Data Collection Matrix

Area of Focus Statement: The focus of this study is to determine if “flipping a classroom” will increase student learning, motivation, and engagement.

Statement /Observation: It has been observed that mathematics instructors are using videos to deliver instruction more frequently than in the past. This is occurring both as a flipped classroom resource where the student watches the video at home and as an in class resource where the student watches the video individually in class.

Research Question: Does watching a video to learn mathematics have a positive effect on student achievement?

Research Sub-Questions	Data Source		
	1	2	3
What is the optimal length of video to deliver instruction?	Teacher Survey (teachers using flipped model)	Student Survey	Observation
Do students learn better from videos made from outside resources or videos featuring their own instructor?	Observation	Student Survey	Pre-Test/Post-Test
Does watching a video to learn math make homework less frustrating for students?	Student Survey (students who have flipped and traditional classes)	Teacher Survey (teachers who have used both ways preferably)	
Does watching videos at home promote better engagement in the classroom?	Teacher Survey	Student Survey	Observation
Does flipping a classroom promote better student-teacher interaction?	Teacher Survey	Student Survey	Observation

Appendix C - Data Analysis Matrix

Area of Focus Statement: The focus of this study is to determine if “flipping a classroom” will increase student learning, motivation, and engagement.

Statement /Observation: It has been observed that mathematics instructors are using videos to deliver instruction more frequently than in the past. This is occurring both as a flipped classroom resource where the student watches the video at home and as an in class resource where the student watches the video individually in class.

Research Question: Does watching a video to learn mathematics have a positive effect on student achievement?

Data Collection Technique	Data Analysis Strategy		
	1	2	3
Student satisfaction survey with Google Forms	Compile data items on a Likert scale survey	Group items with mean scores over and under 3 on a Likert scale to identify areas of satisfaction and dissatisfaction	Identify common themes between the Flipped Classroom and whether or not students felt successful in the environment.
Teacher opinion survey with Google Forms	Compile data on items from survey using Likert scale.	Create a bar graph displaying respondents answers to the survey questions.	Compile and organize open ended questions and look for trends
Student Pre-Test/Post-Test with multiple choice items using Socrative.com or similar	Do an item analysis on the assessment to identify understanding before and after watching a video.	Find the average of the entire class on the pre- and post-assessments to measure group understanding.	Create a bar graph to show the averages and compile our information
Student Observation	Calculate the number students engaged and not engaged with learning and calculate the percentage of students in each category	Record student questions to reflect on whether the students were engaged or not	

Appendix D - Instrument

Link to Google Form - Student Survey