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Repurposing Class Time: The Flipped Classroom Model

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Repurposing Class Time:

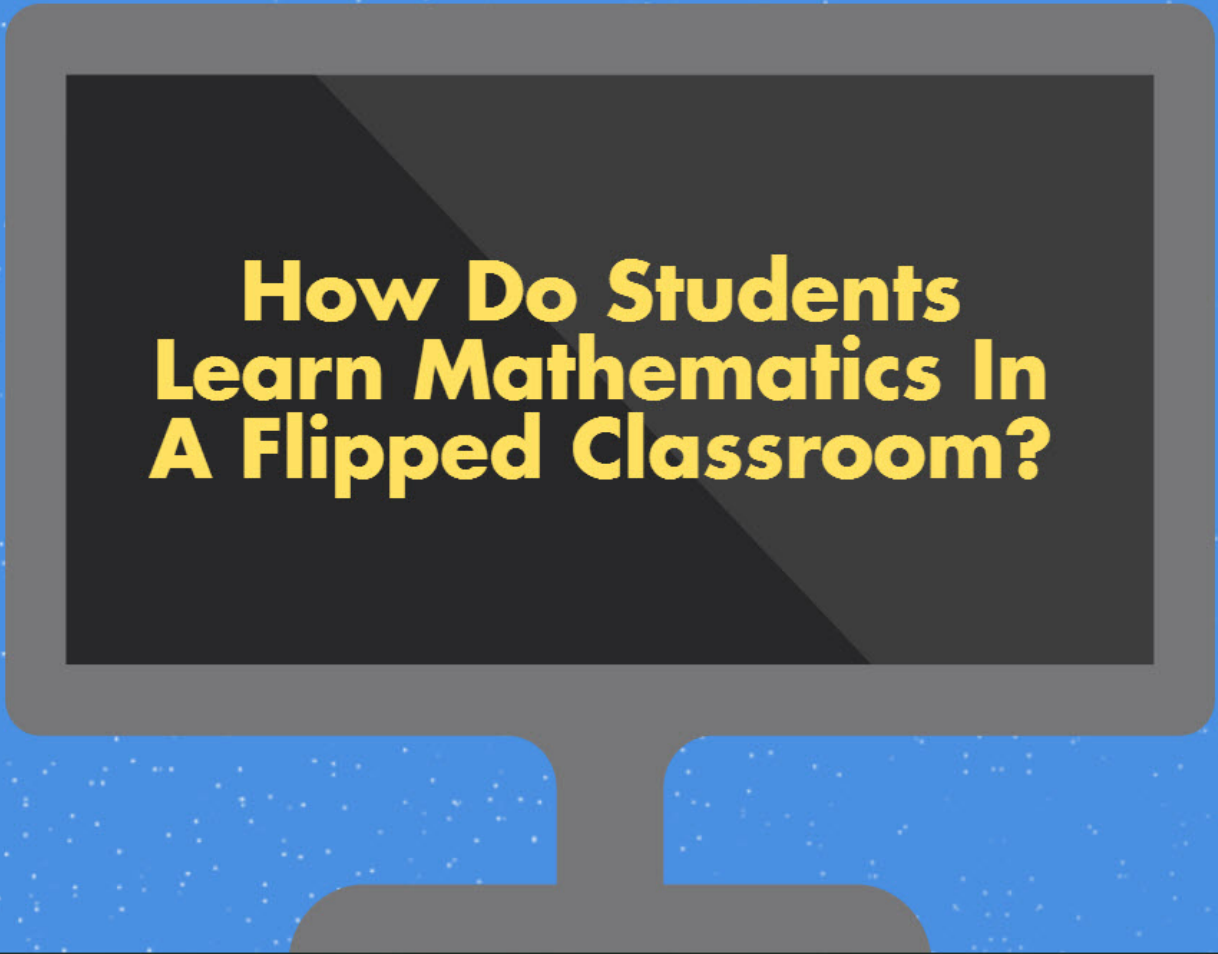


The Flipped Classroom Model

By: Troy Huber and Leah Nillas*

10th Annual Inquiries into Teaching and Learning
(in conjunction with the 28th JWP Research Conference)

Research Question

A stylized illustration of a computer monitor with a grey frame and base, set against a blue background with a pattern of small white dots. The monitor's screen is black and displays the research question in yellow text.

**How Do Students
Learn Mathematics In
A Flipped Classroom?**

What is a

FLIPPED

Classroom?

- The typical lecture and homework elements are reversed
- Students view instructional videos outside of class
- Class time is devoted to working through problems, projects, or discussions that seek to reinforce concepts and engage students in collaborative learning

What does this look like?

Videos

Parallel lines
and their
transversals

chp 3-1



0:00
05:08



Sources



EDpuzzle



YouTube



Khan Academy



National Geographic



TED Talks



Veritasium



Numberphile



Crash course



Vimeo

Literature Review

- Early research has shown supporting evidence of students' learning when using the flipped classroom approach (Mattis, 2015; Bhagat, 2016)
- Robinson's (2006) observations and data analysis shows that the change from lecture based to student-centered learning resulted in an increase in test scores and a significant decrease in the number of failing students

Students in the flipped classroom were more receptive to cooperation and innovation in the classroom (Strayer, 2012)

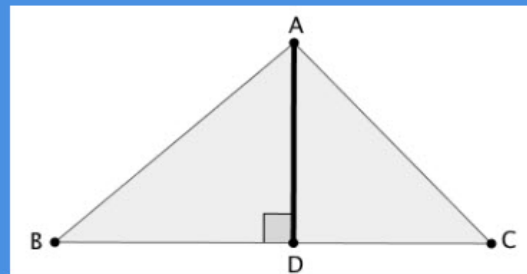
The flipped classroom instruction can improve students' motivation by creating a sense of student autonomy through student control and independence (Abeysekera & Dawson, 2015)

Methodology

- Used flipped lessons as a method of improving skills necessary for learning mathematics
- Created multiple interactive lesson plans that utilized the flipped approach
- Conducted in three Honors Geometry classes that lasted one semester, with the fifty participating freshman and sophomore students
 - Collected lesson plans, field notes, and student work

Vocabulary Development

- Students watched videos outside of class that oftentimes focused on new vocabulary
- Selection of videos based off of vocabulary
- In-class activities further developed students' understanding of the vocabulary



Identifying Altitude Problem



■ Correctly Identified Segment

■ Provided Correct Explanations ■ Students

Vocabulary Development

Vocabulary learned throughout flipped lessons included:

- “Parallel lines and transversals vocabulary including alternate exterior and interior angles, consecutive interior and exterior angles, and corresponding angles”
- “Naming triangles by the sides using the vocabulary terms scalene, isosceles, and equilateral triangles. It also went through naming triangles by their angles using terms like acute, obtuse, and right triangles”
- “Special segments of triangles including angle bisectors, perpendicular bisectors, medians, and altitudes”
- Properties of triangles and the hinge theorem

Active Learning and Discovery



- Engaging activities supplement video content
- Flipped lessons allow for additional class time for students to explore and attempt to recognize new information and relationships
- Lessons were carefully planned and intentionally left out aspects of the curriculum that students then discovered on their own

In-Class Discovery Project

Boise, ID; Helena, MT; and Salt Lake City, UT are three large cities in the northwestern part of the United States. Although each city has a local hospital for minor needs and emergencies, an advanced medical facility is needed for transplants, research, and so forth. You have been hired to determine the best location for this facility. Construct the incenter, orthocenter, centroid, and circumcenter. Then determine which location will work best for the hospital and explain your reasoning.



Student Work Sample



Hospital Location Choices



▲ Circumcenter (64%)
 ▲ Centroid (14%)
 ▲ Incenter (14%)
 ▲ Orthocenter (8%)

Independent Mathematical Thinking

- The flipped classroom also offered development of students' responsibility and autonomy
- Responsibility
 - Watching videos before class
 - Engaging in class activities
- Autonomy
 - Students figuring out the relationship between special angles
 - Students individually learning how to construct each of the special segments and centers of triangles

Results

Coded the data collected and identified the following themes:

1

Vocabulary Development

2

Active Learning and Discovery

3

Independent Mathematical Thinking

Conclusions

- Students described the flipped classroom as being more engaging.
- Gave students the ability to learn at their individual pace.
- The teachers role shifts from instructor to facilitator.
- Students are able to learn collaboratively with peers and receive one-on-one instruction from the teacher.

Limitations

- Data from this study was mostly qualitative.
- This study did not compare quantitative data of the effectiveness of the flipped classroom to that of traditional instruction.
- The flipped pedagogy was implemented in an honors classroom.

Future Research

- Repeated studies that aim to measure the effectiveness of the flipped classroom compared to traditional instruction.
- Additional studies that measure students' retention of information

Discussion

What happens if a student does not have internet access at home?

What if students do not watch the videos outside of class?



Questions



THANK YOU