
These authors studied 104 math students in one California high school before and after using a flipped classroom approach. The researchers used the Attitude Toward Mathematics Inventory (ATMI) and four categories were studied: value of mathematics, enjoyment, self-confidence and motivation. Students were given the ATMI before starting the flipped classroom approach and after 27 weeks of using it.

The results of the study showed modest gains in all four categories with the highest gains in value and enjoyment. When broken down further into the four math classes studied (Algebra 2, Pre-Calculus, AP Statistics and AP Calculus), higher gains were noted in the AP classes. Also gender differences were rather strikingly different. Male students showed higher before and after scores in all four categories. And the gains were steeper. Female students were more flat or even decreasing (in motivation).
This is a reliable and useful study, but it is small and limited. Only one school was studied and only upper level high school math students were included. These students have already had success in math or they wouldn’t be taking higher level high school classes. This could explain the smaller than expected gains in all four categories (value, enjoyment, self-confidence, motivation). It would have been more broadly applicable to have included Algebra 1 and Geometry students as well.

This study was helpful to me professionally because I expected the gains to be higher in all categories. So seeing the reality of student perceptions and attitudes about the change is instructive for future applications of the flipped classroom in mathematics. I was hoping for more data about student performance using flipped classrooms for Math, compared to traditional lecture/homework approaches and this study did not provide any such data.


The author details one math department in Minnesota who developed their own curriculum using technology and flipped classrooms. The high school PLC teamed up with an 8th grade math teacher as well as district representatives to create YouTube videos of the 10-15 minute lessons. Class time was then used for practicing. Students falling under 70% came to lunch time intervention classes to help them catch up.
Teachers reported awkwardness at first, but quickly became comfortable with the technology. Students and parents were unsure at first as well, but have come to support this new approach. Gains in math mastery were notable. They used the Minnesota Comprehensive Assessments to show that in 2006, mastery was 29.9%. In 2011, mastery was 73.8%. Composite ACT scores went from 21.2 in 2006 to 24.5 in 2011. In 2012, 86.6% of Byron’s seniors completed four or more credits of math.

Though this is just one school, the comprehensive adoption of flipped classrooms for math for a period of years is valuable when looking at the gains in test scores. This is the kind of reporting I was looking for in researching the topic of flipped classrooms and math. The gains by this school’s students are notable and encouraging and can provide a model for other schools.


The authors reviewed a number of sources on flipped classrooms, including Salman Khan’s approach with math content. All instructors were looking for ways to increase one on one interaction with their students. And all scenarios provided in this article mentioned the serious time it takes to set up YouTube videos or other technology lectures. Once they were set up however, class time could be spent working with students as they “practiced” what they learned outside of class.
Though not a research study, this paper provided enough examples to show that student learning was positively impacted. However, student achievement was not reviewed. Anecdotal evidence is helpful, but not objectively reliable or applicable on a large scale. The need to include anecdotal evidence is clear though, because the technology to create flipped classrooms is still relatively new.


The authors detail the research history (relatively sparse) of using flipped classrooms at the college level. These early studies had positive results, but more research was and is needed. This study was designed to fill that void. Two sophomore linear algebra classes were studied, one traditional, one flipped. A total of 55 students were involved in the study. They were not aware of which class was flipped. The same instructor taught both classes and provided the videos to both classes. About one third of students watched the videos multiple times.

Three common exams were given, as well as a final exam to both classes. There were greater gains from exam 1 to exams 2 and 3 in the flipped classroom. Both classes of students scored similarly on the final, with the average being slightly higher in the flipped classroom. On an exit survey, flipped classroom students provided feedback that they felt more connected to their peers in the class and that they had more fun learning
this way than in the traditional classroom. I liked that the author pointed out that the traditional approach to math education works well for some students, but not for others.

This study was extremely well designed and carried out. Using the same instructor eliminated possible skewing of the data due to teacher differences. Though it was a small study, the control group and experimental group were closely matched and easy to compare. The authors note that solid research is lacking still in the area of flipped classrooms for math and stem education and that more study is still needed, but that the results of this study were encouraging for the future. In all my research on flipped math classrooms, this was the most interesting, reliable and useful to me.


This was a limited research study. The authors collected the responses of 60 college Math students at a Canadian College on a survey of their perceptions about flipped classrooms. About 50% of the students reported positive attitudes toward flipped classrooms. This study was small and did not include any data from specific math classes. The students surveyed were not currently using a flipped classroom for their math studies. So the value and usefulness of this study is limited for my purposes. To be helpful to me professionally, the authors should have studied math students currently using a flipped classroom as well as data about student learning.

The author presents a one page article summarizing the Khan Academy approach to education. In their opinion, students are leading the movement to adopt Khan’s approach which entails learning new material at night or at home, while practicing and applying that learning during the day, at school. The author has found Khan’s science videos to be helpful to his college students and he likes the spontaneous nature of Salman Khan’s videos.

Khan asserts that traditional models of teaching force teachers to teach to the middle, which does a disservice to high achieving and low achieving students. In the flipped model, the teacher becomes the “guide on the side,” rather than “the sage on the stage.”

The reason I included this article is that the author included one math educator’s opinion that the Khan approach is not the “answer” to teaching math. This is the first article I read that challenges the current support for flipped classrooms and it is the only one I’ve found so far that does so. I did not learn anything new from this article, but wanted to include it as a balance to the positive articles about flipped classrooms.

These authors conducted a detailed and rigorous experiment using three statistics classes for engineering students. They studied not only before and after test scores, but also student attitudes and perceptions. They kept one of the three statistics classes in the traditional model so that they could compare the results with the flipped classrooms. In the two flipped classrooms, only part of the semester was conducted using a flipped approach. One disadvantage of using both flipped and traditional approaches in the same class, over the same semester, was likely the confusion of using both ways, instead of one consistent way. This may have affected the results.

Though each teacher developed and used their own exams in their courses, two questions on each exam were consistent in all classes, so that they could compare. Quizzes were given before class to assess whether the students in the flipped classes watched the videos before coming to class. Only 9-12% of students found it difficult to learn from the videos and some students found the video quality to be low.

In this study, freshman had less benefit from the flipped classroom approach because of less engagement. However, sophomores through seniors, were more engaged and took more responsibility for their learning. Some students found the flipped approach to be more time consuming than a traditional classroom. However, there was more student questioning and active problem solving during class time. Students and teachers interacted more than with a traditional classroom.

When final tests were given, the authors found that pre- and post-course concept knowledge was the same in flipped and traditional classes. The students in the flipped classrooms did not seem as satisfied with this model of learning as other studies I have
read. And this could be because in the semester, they experienced both flipped and
traditional models. It did seem that this study pointed to value of introducing flipped
classroom learning in freshman level math classes, so that the students would be more
familiar with it in their higher level classes. I would also say that it points to the
possible value of using it at the high school and middle school level as well.