



Improved Attitudes Toward Maths In A Flipped Class

Peter Joseph Esperanza
Barstow High School

peter_esperanza@busdk12.com

Outline

- What is flipped classroom?
- What motivated the use of the flipped classroom?
- What is the Fizz model?
- Why measure attitude?
- What is ATMI?
- Data Collection
- Results: Overall, Gender, Subject
- Conclusion

What is Flipped Classroom?

A flipped classroom model inverts traditional teaching model by delivering instruction outside of class and doing “homework” inside the classroom.



What motivated the use of Flipped Classroom Model?

Class Schedule Shift

SY: 2012-2013

SY: 2013-2014

6 Periods

7 Periods

60 minutes/class

50 minutes/class

lesson time lost

50mins/week

3hrs 20mins/month

16hrs 40mins/sem

The Fizz Model

Pin it

Performing the Order of Operations

ALGEBRA: Order of Operations

“LEFT TO RIGHT METHOD”

ADDITION / SUBTRACTION : MULTIPLICATION / DIVISION

EXAMPLE:

1) $2 + 3 - 5 + 7 - 20 = \square$ 2) $25 \div 5 \times 9 \div 15 \times 2$

$5 - 5$
 $0 + 7$
 $6 + 7$
 $13 - 20$
 $\square = -7$

5×9
 45

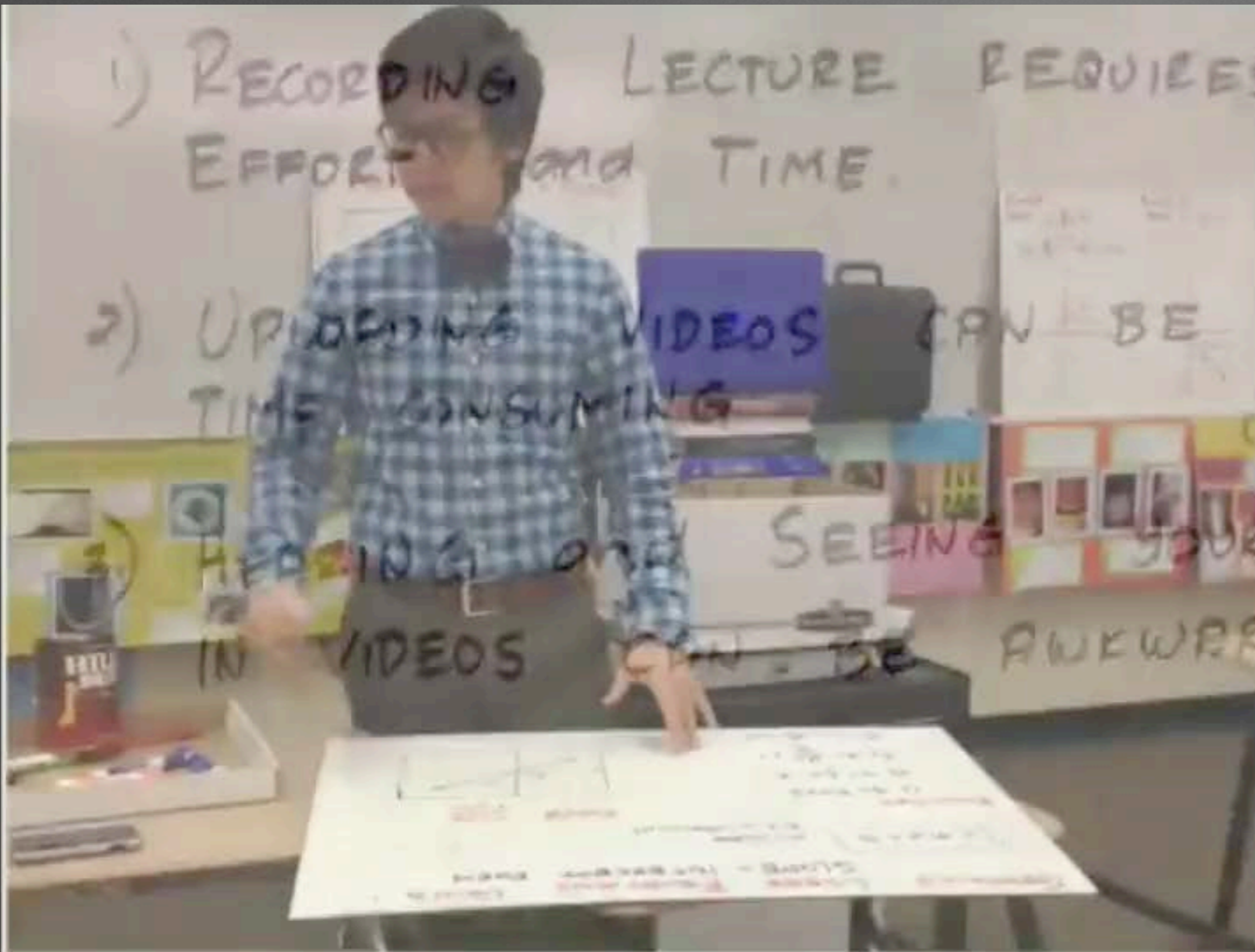
0:14 / 7:03

“Teacher must be in the video because the use of facial cues, eye contact, and gesturing are the key elements in this particular style of publishing lectures online”

Dr. Lodge McCammon

How I Flipped My Maths Classes?

Preparation: 10-20 minutes



- markers
- whiteboards
- microphone
- built-in camera

- Upload videos in YouTube
- Embed Videos in numberbender.com
- microphone
- built-in camera

Differentiated Instruction



More time for classroom activities

Project Supervision

Differentiated Instruction

Math Flipped Classes

AP Statistics

AP Calculus

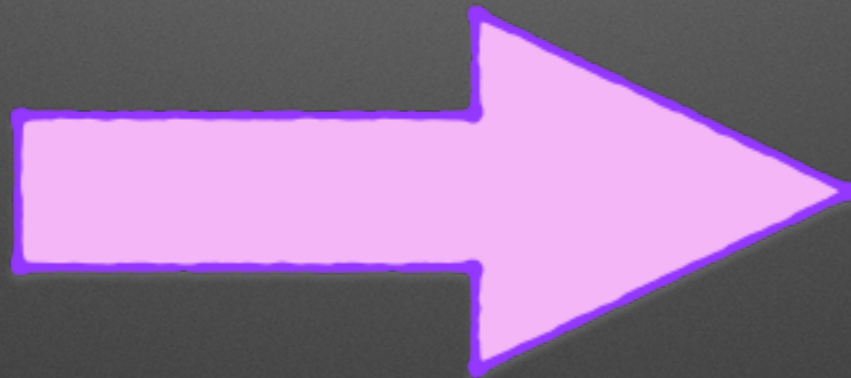
Precalculus

Algebra 2

The screenshot shows the homepage of the Numberbender website. At the top, there is a navigation bar with links for Home, Subjects, Aralin, Blog, Testimonials, About, and Contact Us. A search bar and a 'Sign Out' button are also present. The main header features the 'NUMBERBENDER' logo with a cartoon character. Below the logo, a section titled 'What is Numberbender?' explains that it is an elite group of math ninjas who create flipped classroom content. To the right of this text is an illustration of three ninjas. A red 'Get Started' button is located below the text. The central part of the page features a video player with the title 'How I Flipped My Classroom' and a thumbnail showing a classroom scene. To the right of the video player is a search bar and social media icons for Twitter, Facebook, YouTube, and RSS. Below these are sections for 'Last Tweets' and 'Recent Posts'. At the bottom, there is a 'Courses' section with three featured course cards: 'Statistics in Filipino Language', 'Calculus in Filipino Language', and 'Trigonometry in Filipino Language'. Each card includes a cover image, title, author name, and a star rating.

Why measure attitude?

Positive
Attitude



Achievement
Success

ATTITUDES TOWARD MATHEMATICS INVENTORY

Name _____

School _____

Teacher _____

Directions: This inventory consists of statements about your attitude toward mathematics. There are no correct or incorrect responses. Read each item carefully. Please think about how you feel about each item. Enter the letter that most closely corresponds to how each statement best describes your feelings. Please answer every question.

PLEASE USE THESE RESPONSE CODES:

- A – Strongly Disagree
- B – Disagree
- C – Neutral
- D – Agree
- E – Strongly Agree

1.	Mathematics is a very worthwhile and necessary subject.	
2.	I want to develop my mathematical skills.	
3.	I get a great deal of satisfaction out of solving a mathematics problem.	
4.	Mathematics helps develop the mind and teaches a person to think.	
5.	Mathematics is important in everyday life.	
6.	Mathematics is one of the most important subjects for people to study.	
7.	High school math courses would be very helpful no matter what I decide to study.	
8.	I can think of many ways that I use math outside of school.	
9.	Mathematics is one of my most dreaded subjects.	
10.	My mind goes blank and I am unable to think clearly when working with mathematics.	
11.	Studying mathematics makes me feel nervous.	
12.	Mathematics makes me feel uncomfortable.	
13.	I am always under a terrible strain in a math class.	
14.	When I hear the word mathematics, I have a feeling of dislike.	
15.	Mathematics is dull and boring.	
16.	Mathematics does not scare me at all.	
17.	I have a lot of self-confidence when it comes to mathematics.	
18.	I am able to solve mathematics problems without too much difficulty.	
19.	I expect to do fairly well in any math class I take.	
20.	I am always confused in my mathematics class.	
21.	I feel a sense of insecurity when attempting mathematics.	
22.	I learn mathematics easily.	
23.	I am confident that I could learn advanced mathematics.	
24.	I am confident that I could live without studying mathematics in school.	
25.	Mathematics is dull and boring.	
26.	I like to solve new problems in mathematics.	
27.	I would prefer to do an assignment in math than to write an essay.	
28.	I would like to avoid using mathematics in college.	
29.	I really like mathematics.	
30.	I am happier in a math class than in any other class.	
31.	Mathematics is a very interesting subject.	
32.	I am willing to take more than the required amount of mathematics.	
33.	The challenge of math appeals to me.	
34.	I think studying advanced mathematics is useful.	
35.	I believe studying math helps me with problem solving in other areas.	
36.	I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in math.	
37.	I am comfortable asking questions in math class.	
38.	I am comfortable asking questions in math class.	
39.	A strong math background could help me in my professional life.	
40.	I believe I am good at solving math problems.	

Attitudes

(ATMI)

40-item survey questionnaire which quantify students' attitude towards mathematics:

1. Value (10)

2. Enjoyment (10)

3. Self Confidence (15)

4. Motivation (5)

1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree

ATTITUDES TOWARD MATHEMATICS INVENTORY

Name _____

School _____

Teacher _____

Directions: This inventory consists of statements about your attitude toward mathematics. There are no correct or incorrect responses. Read each item carefully. Please think about how you feel about each item. Enter the letter that most closely corresponds to how each statement best describes your feelings. Please answer every question.

PLEASE USE THESE RESPONSE CODES:

- A – Strongly Disagree
- B – Disagree
- C – Neutral
- D – Agree
- E – Strongly Agree

1.	Mathematics is a very worthwhile and necessary subject.	
2.	I want to develop my mathematical skills.	
3.	I get a great deal of satisfaction out of solving a mathematics problem.	
4.	Mathematics helps develop the mind and teaches a person to think.	
5.	Mathematics is important in everyday life.	
6.	Mathematics is one of the most important subjects for people to study.	
7.	High school math courses would be very helpful no matter what I decide to study.	
8.	I can think of many ways that I use math outside of school.	
9.	Mathematics is one of my most dreaded subjects.	
10.	My mind goes blank and I am unable to think clearly when working with mathematics.	
11.	Studying mathematics makes me feel nervous.	
12.	Mathematics makes me feel uncomfortable.	
13.	I am always under a terrible strain in a math class.	
14.	When I hear the word mathematics, I have a feeling of dislike.	
15.	It makes me nervous to even think about having to do a mathematics problem.	
16.	Mathematics does not scare me at all.	
17.	I have a lot of self-confidence when it comes to mathematics.	
18.	I am able to solve mathematics problems without too much difficulty.	
19.	I expect to do fairly well in any math class I take.	
20.	I am always confused in my mathematics class.	
21.	I feel a sense of insecurity when attempting mathematics.	
22.	I learn mathematics easily.	
23.	I am confident that I could learn advanced mathematics.	
24.	I have usually enjoyed studying mathematics in school.	
25.	Mathematics is dull and boring.	
26.	I like to solve new problems in mathematics.	
27.	I would prefer to do an assignment in math than to write an essay.	
28.	I would like to avoid using mathematics in college.	
29.	I really like mathematics.	
30.	I am happier in a math class than in any other class.	
31.	Mathematics is a very interesting subject.	
32.	I am willing to take more than the required amount of mathematics.	
33.	I plan to take as much mathematics as I can during my education.	
34.	The challenge of math appeals to me.	
35.	I think studying advanced mathematics is useful.	
36.	I believe studying math helps me with problem solving in other areas.	
37.	I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in math.	
38.	I am comfortable answering questions in math class.	
39.	A strong math background could help me in my professional life.	
40.	I believe I am good at solving math problems.	

Value

#39 Mat

Enjoyment

#26 I like

Self-Confid

#16 Mat

Motivation

#34 The

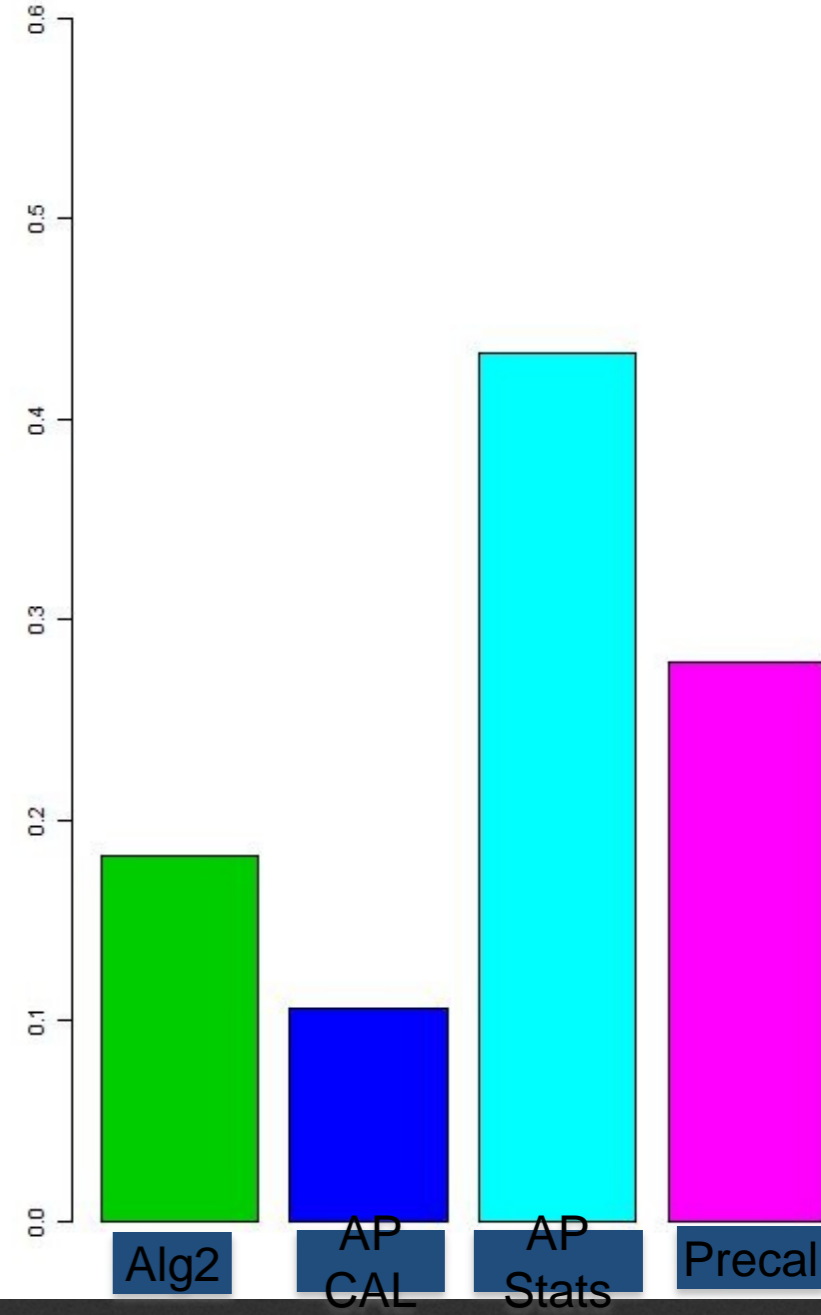
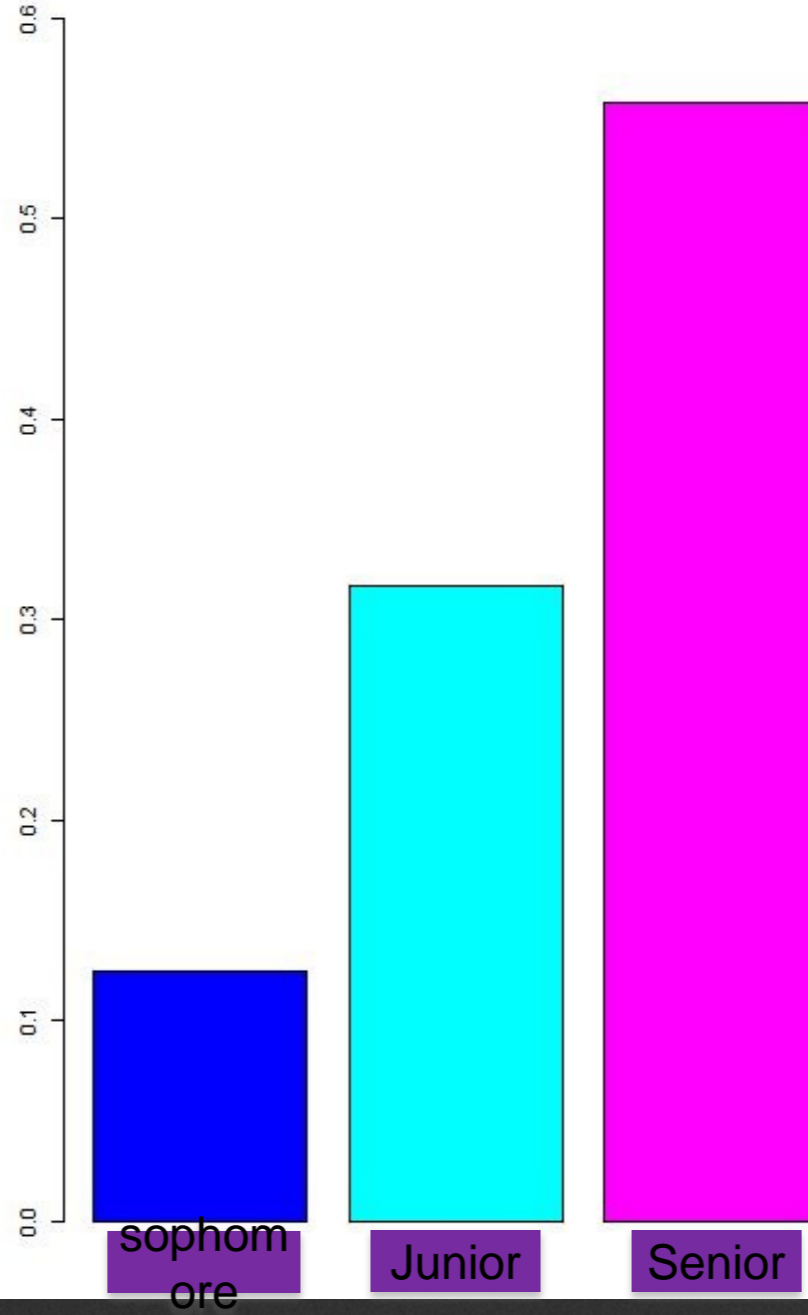
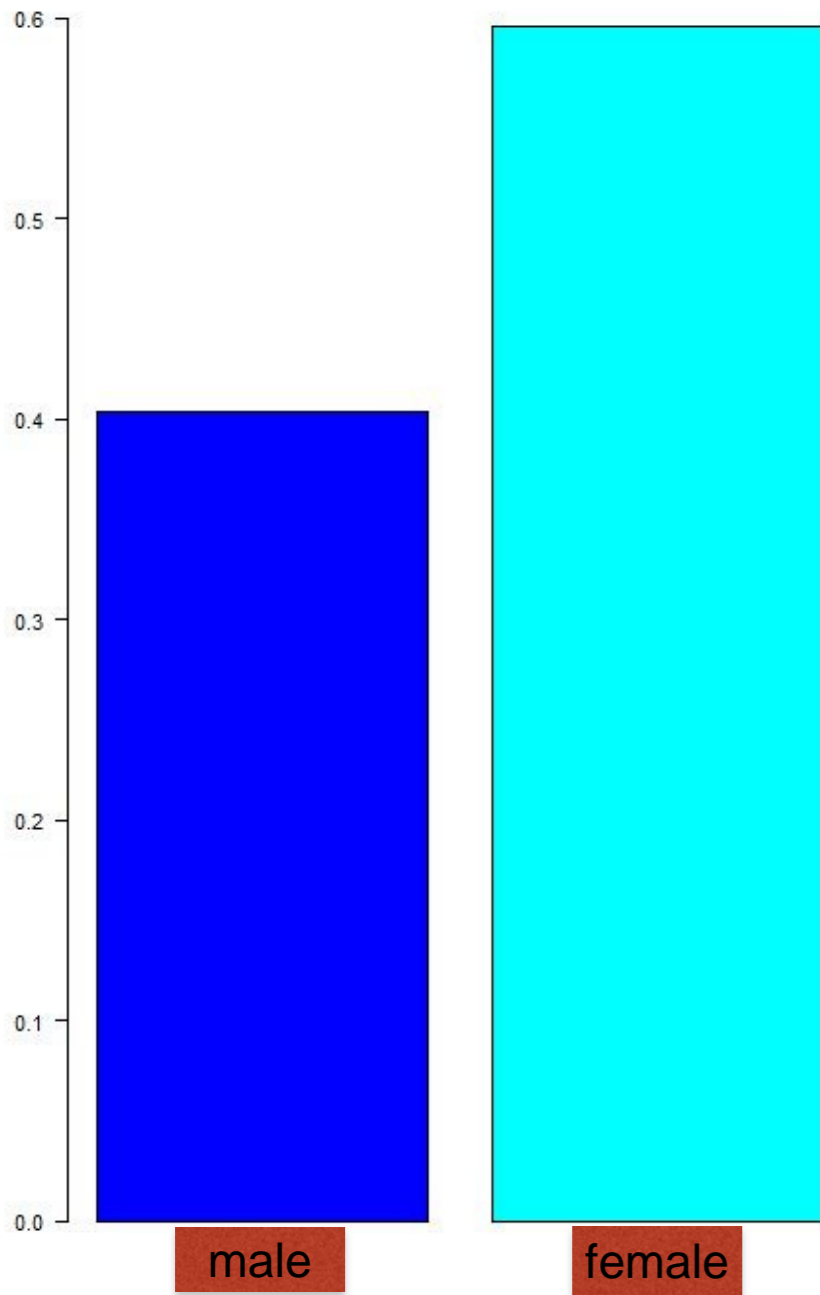
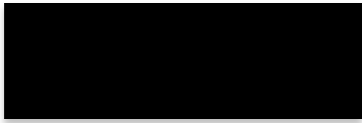
y life.

matics.

ll.

ne.

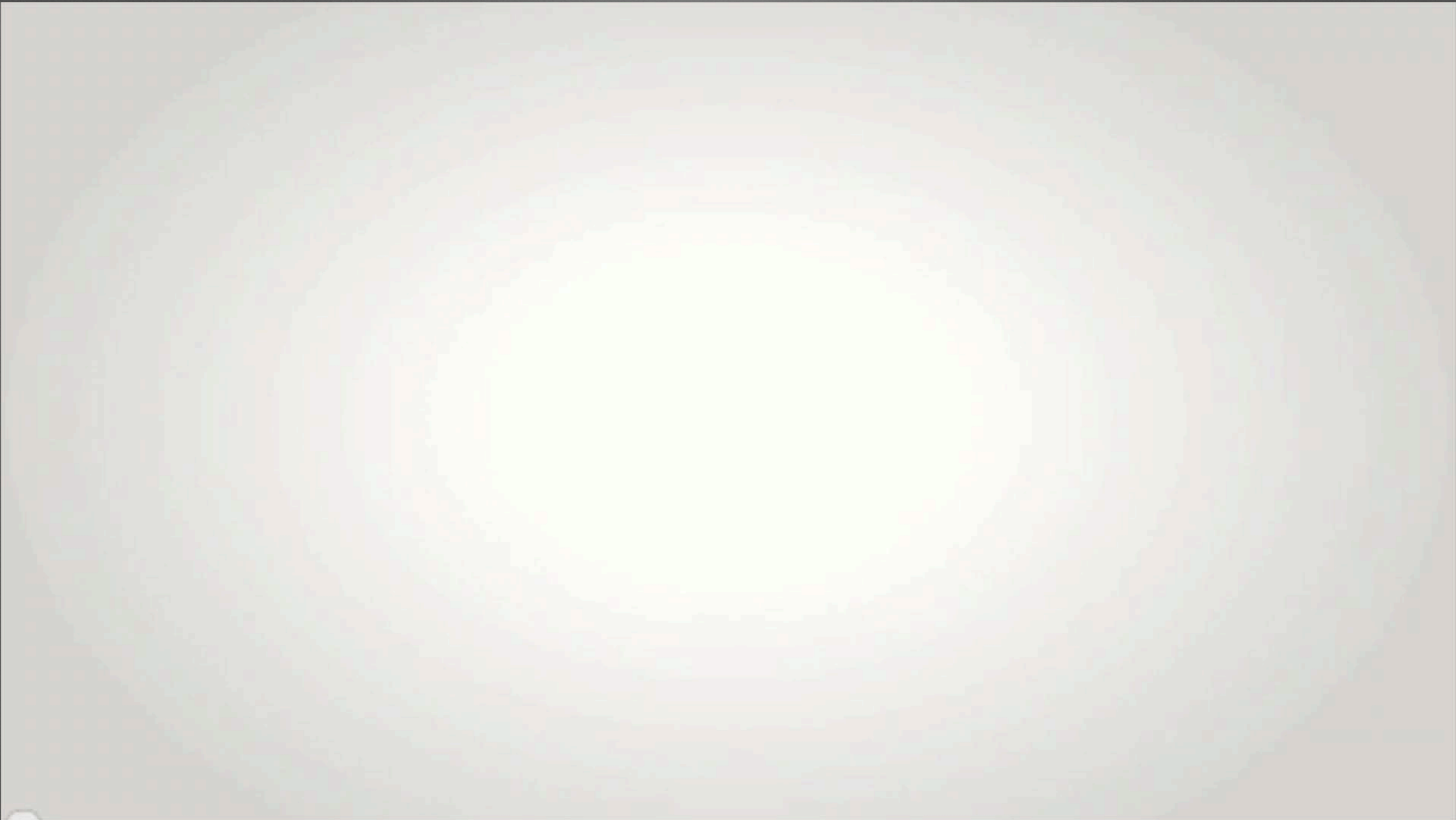
Data collection



Goal of the Study

To determine if the use of flipped classroom model causes a change in the students' **attitude** towards Mathematics

What a student thinks about being in a flipped classroom model?



Results of the study

Baseline Attitude Scores

SUBSCALES OF ATTITUDE TOWARDS MATHEMATICS	Before Implementation of the Flipped Classroom Model	
	Mean	SD
<i>Value of Mathematics</i>	3.985	0.6494
<i>Enjoyment of Mathematics</i>	3.719	0.8030
<i>Self-Confidence in Mathematics</i>	3.803	0.7861
<i>Motivation in Mathematics</i>	3.763	0.7960

Before implementing the flipped classroom model, the mean scores on the four ATMI subscales showed that students have positive attitude towards mathematics

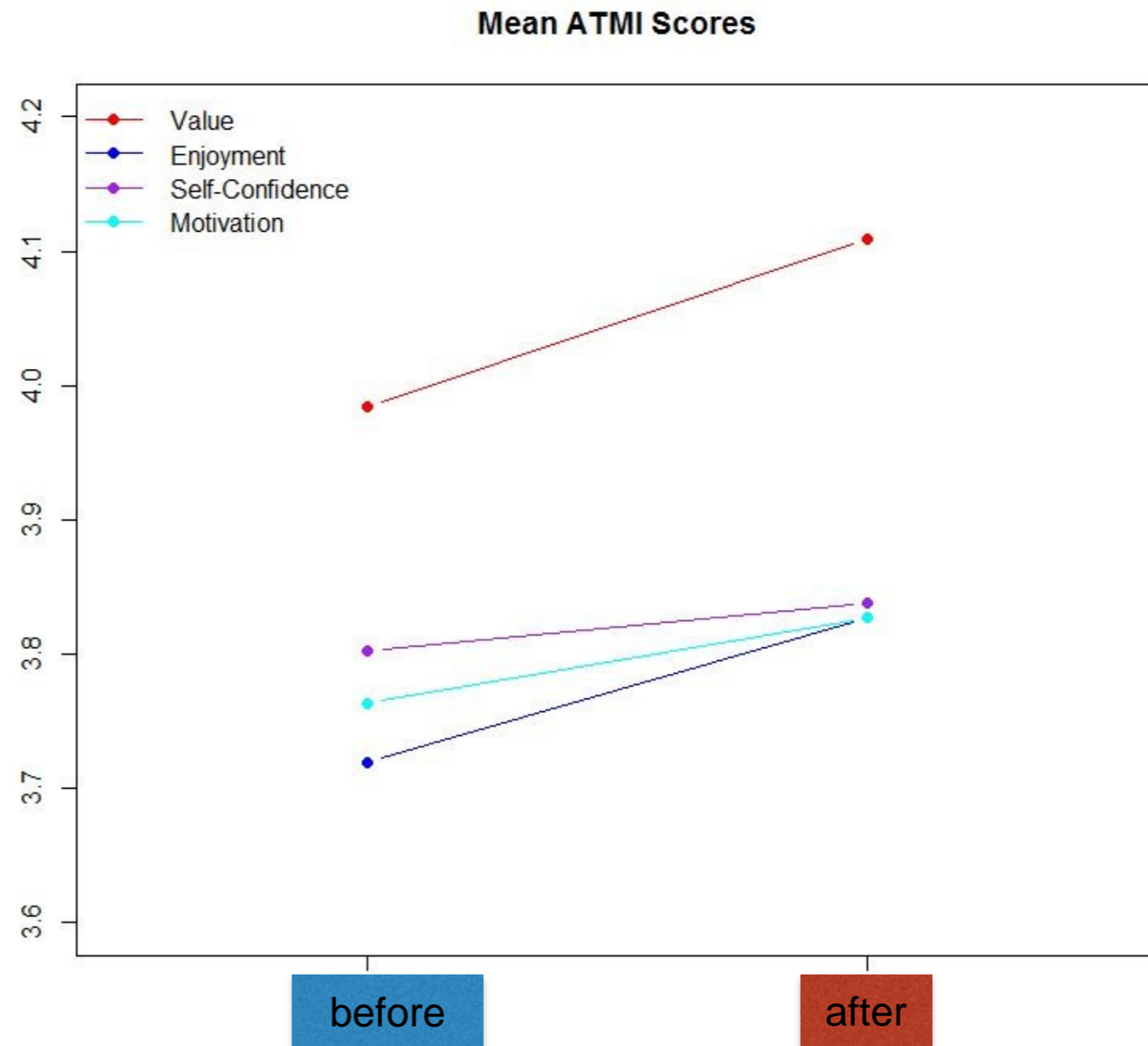
Comparison of ATMI Mean Scores for all students

SUBSCALES OF ATTITUDE TOWARDS MATHEMATICS	Before Implementation of the Flipped Classroom Model		After Implementation of the Flipped Classroom Model	
	Mean	SD	Mean	SD
<i>Value of Mathematics</i>	3.985	0.6494	4.109	0.6340
<i>Enjoyment of Mathematics</i>	3.719	0.8030	3.827	0.7274
<i>Self-Confidence in Mathematics</i>	3.803	0.7861	3.838	0.8076
<i>Motivation in Mathematics</i>	3.763	0.7960	3.827	0.8884

The increase on the ATMI mean scores indicate a **POSITIVE CHANGE** in the students' attitude after the implementation of the flipped classroom model.

Mean Difference : (ALL STUDENTS)

SUBSCALES OF ATTITUDE TOWARDS MATHEMATICS	Differences of the Scores
	Mean
<i>Value of Mathematics</i>	0.123
<i>Enjoyment of Mathematics</i>	0.108
<i>Self-Confidence in Mathematics</i>	0.035
<i>Motivation in Mathematics</i>	0.063



Statistical Test on ATMI Mean Difference

SUBSCALES OF ATTITUDE TOWARDS MATHEMATICS	Differences of the Scores		t	p-value
	Mean	SD		
<i>Value of Mathematics</i>	0.123	0.5046	2.507	0.0138*
<i>Enjoyment of Mathematics</i>	0.108	0.5125	2.143	0.0345*
<i>Self-Confidence in Mathematics</i>	0.035	0.5115	0.703	0.4837
<i>Motivation in Mathematics</i>	0.063	0.6302	1.027	0.3068

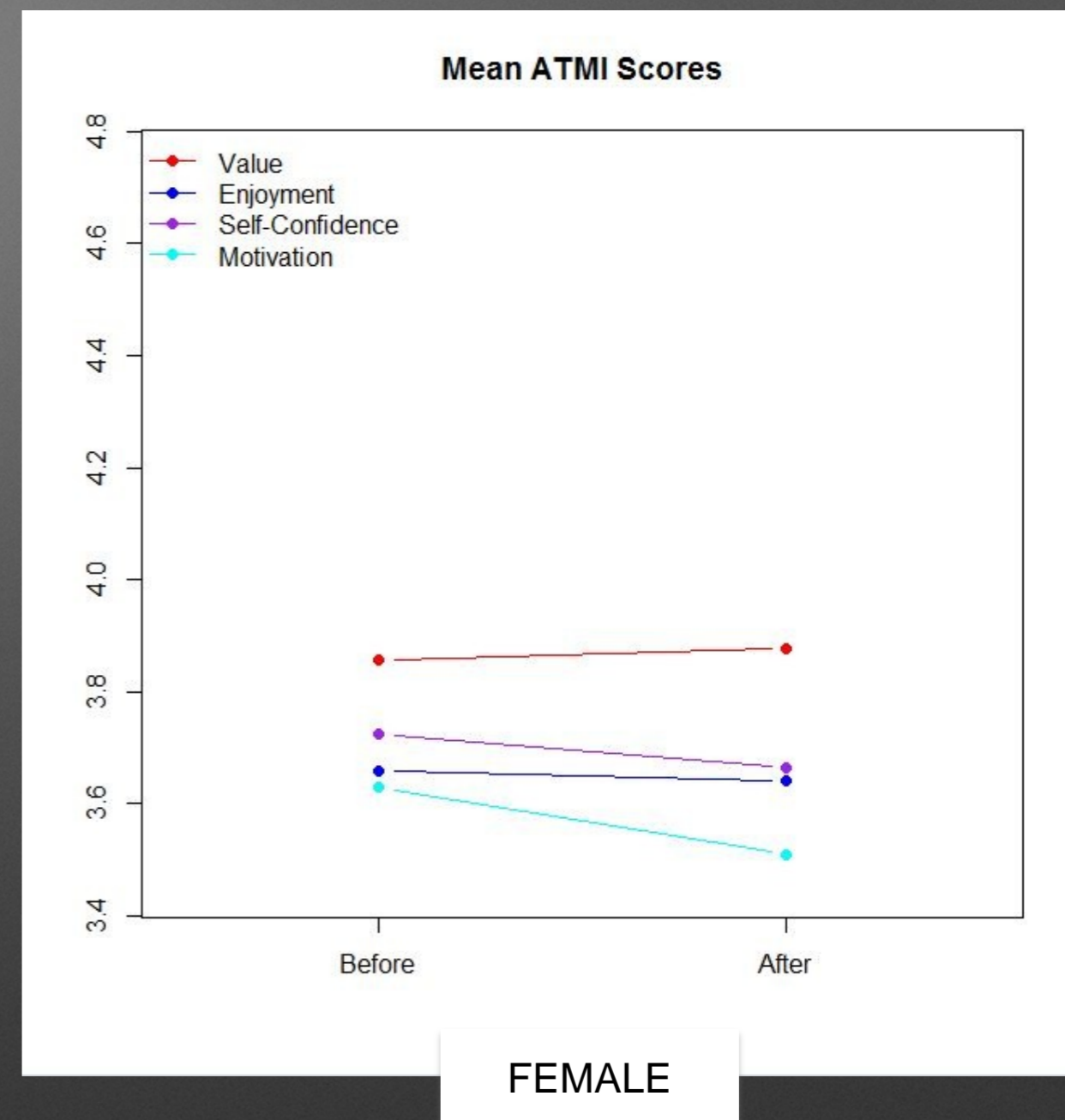
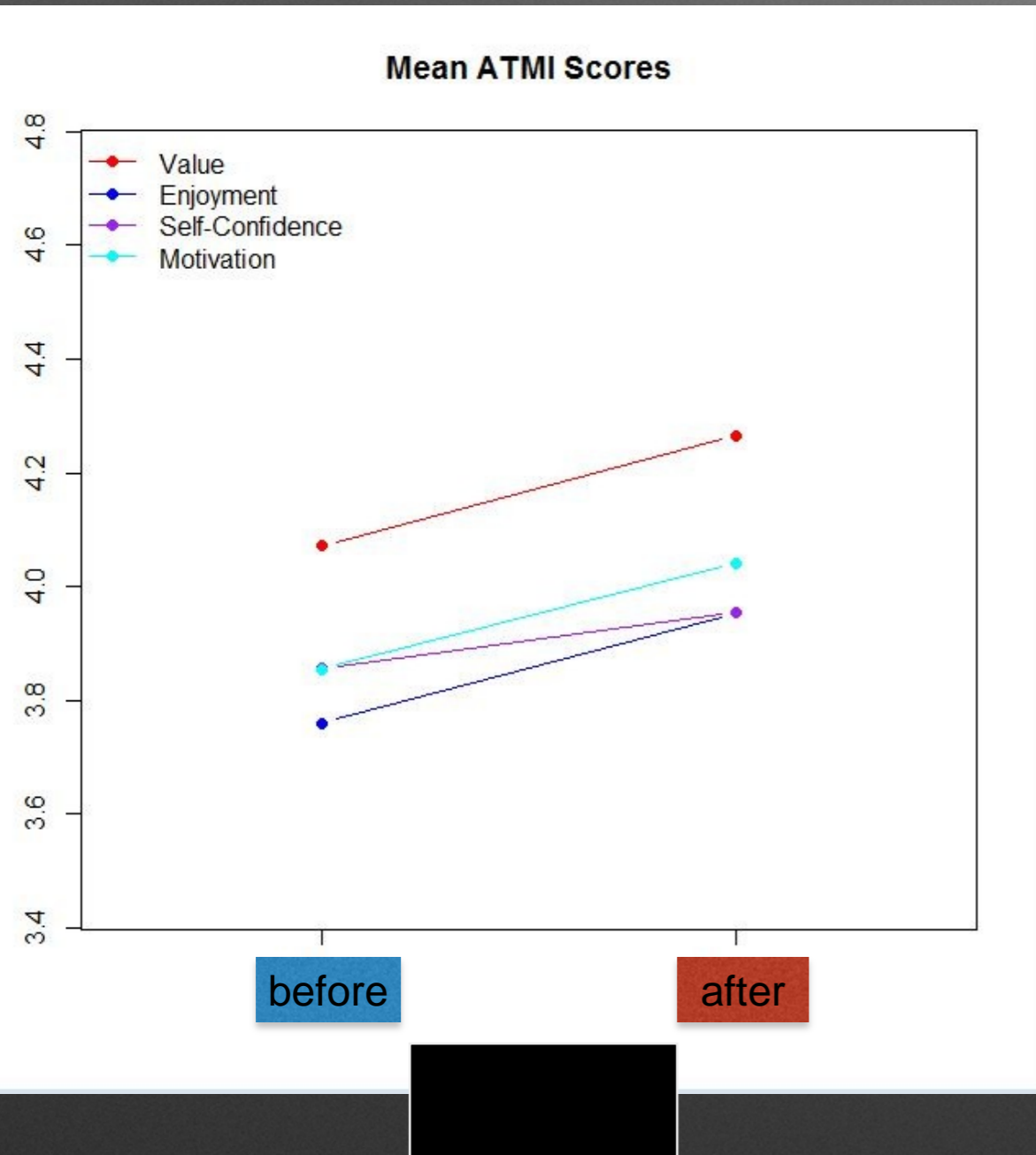
Based on the t-test results ($p < 0.05$), there is a statistically significant difference in the scores before and after implementation of flipped classroom for the “Value of Mathematics” and “Enjoyment of Mathematics”

Gender Comparison of ATMI Mean Scores Differences

Mean Difference : (by gender)

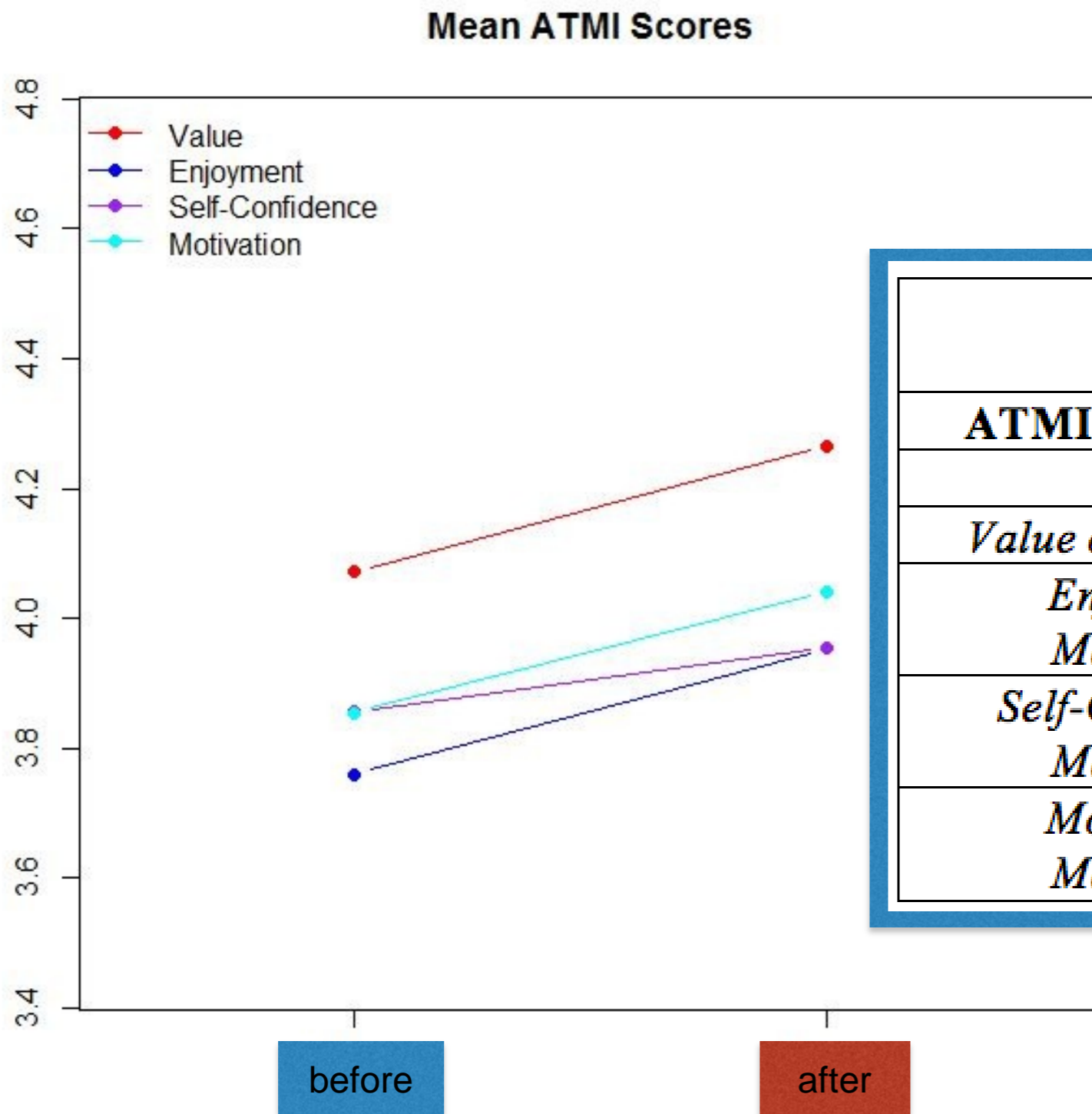
SUBSCALES OF ATTITUDE TOWARDS MATHEMATICS	Difference in Mean Scores			
	Male (n = 62 students)		Female (n = 42 students)	
	Mean	SD	Mean	SD
<i>Value of Mathematics</i>	0.195	0.557	0.019	0.398
<i>Enjoyment of Mathematics</i>	0.194	0.523	-0.019	0.475
<i>Self-Confidence in Mathematics</i>	0.099	0.536	-0.059	0.464
<i>Motivation in Mathematics</i>	0.187	0.632	-0.119	0.588

Mean Difference : (Gender)



Male students have positive change on their ATMI mean scores after the implementation of the flipped classroom model.

Mean Difference : (Gender)



ATMI SUBSCALES	Difference in Mean Scores	
	Male (n = 62 students)	
	t	p-value
<i>Value of Mathematics</i>	2.78	0.008*
<i>Enjoyment of Mathematics</i>	2.92	0.005*
<i>Self-Confidence in Mathematics</i>	1.45	0.151
<i>Motivation in Mathematics</i>	2.33	0.023*

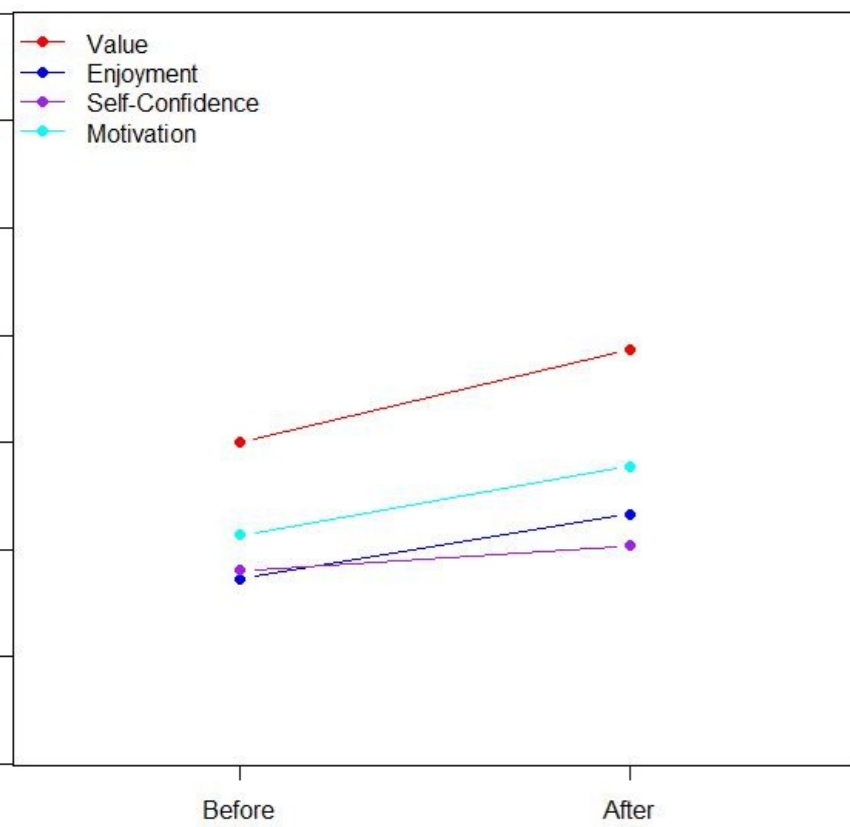
Subject Comparison of ATMI Mean Scores Differences

Mean Difference : (by Subjects)

SUBSCALES OF ATTITUDE TOWARDS MATHEMATICS	Difference in Mean Scores								
	AP-Statistics (n=45)			AP-Calculus (n=11)			Algebra 2 (n=19)		
	Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
<i>Value of Mathematics</i>	0.173	0.528	0.033*	0.245	0.311	0.028*	0.132	0.628	0.373
<i>Enjoyment of Mathematics</i>	0.122	0.559	0.149	0.036	0.344	0.733	0.153	0.565	0.254
<i>Self-Confidence in Mathematics</i>	0.046	0.543	0.573	0.030	0.336	0.771	0.214	0.584	0.128
<i>Motivation in Mathematics</i>	0.129	0.682	0.212	0.091	0.441	0.510	0.221	0.683	0.175

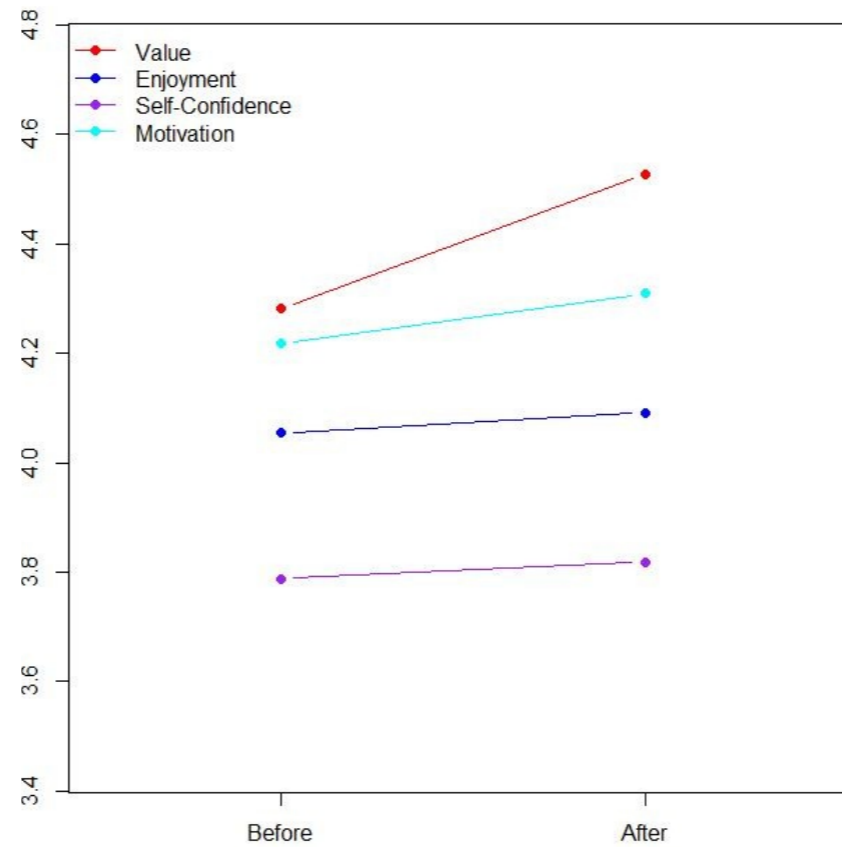
Mean Difference : (by Subjects)

Mean ATMI Scores



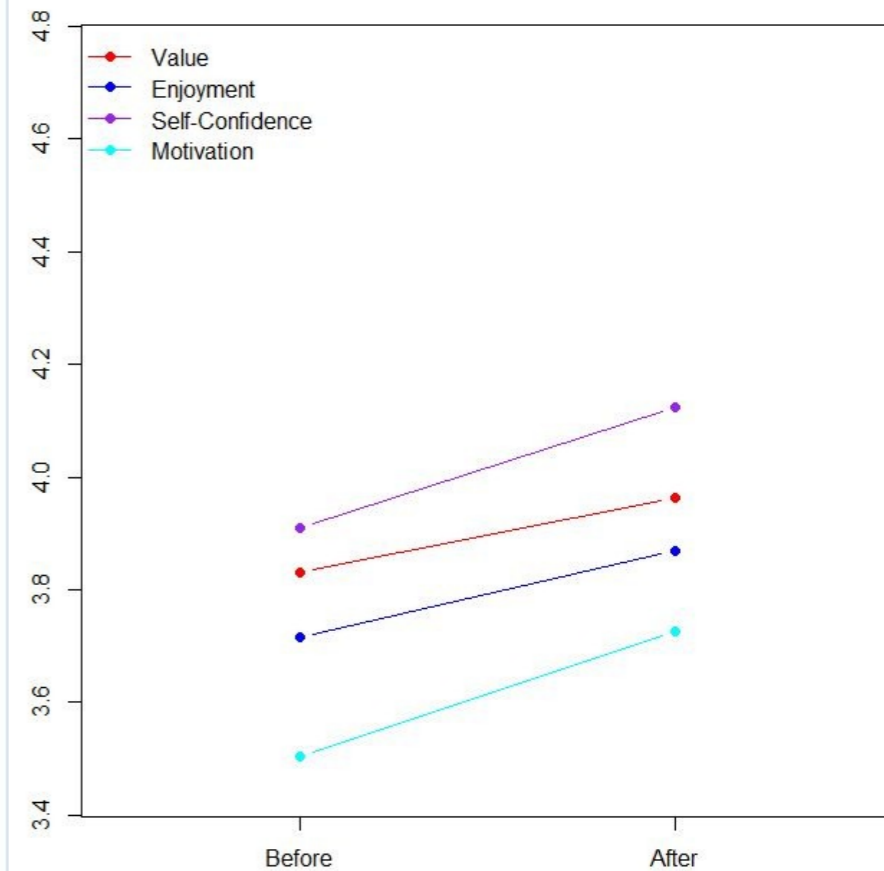
AP CALCULUS

Mean ATMI Scores



AP STATISTICS

Mean ATMI Scores

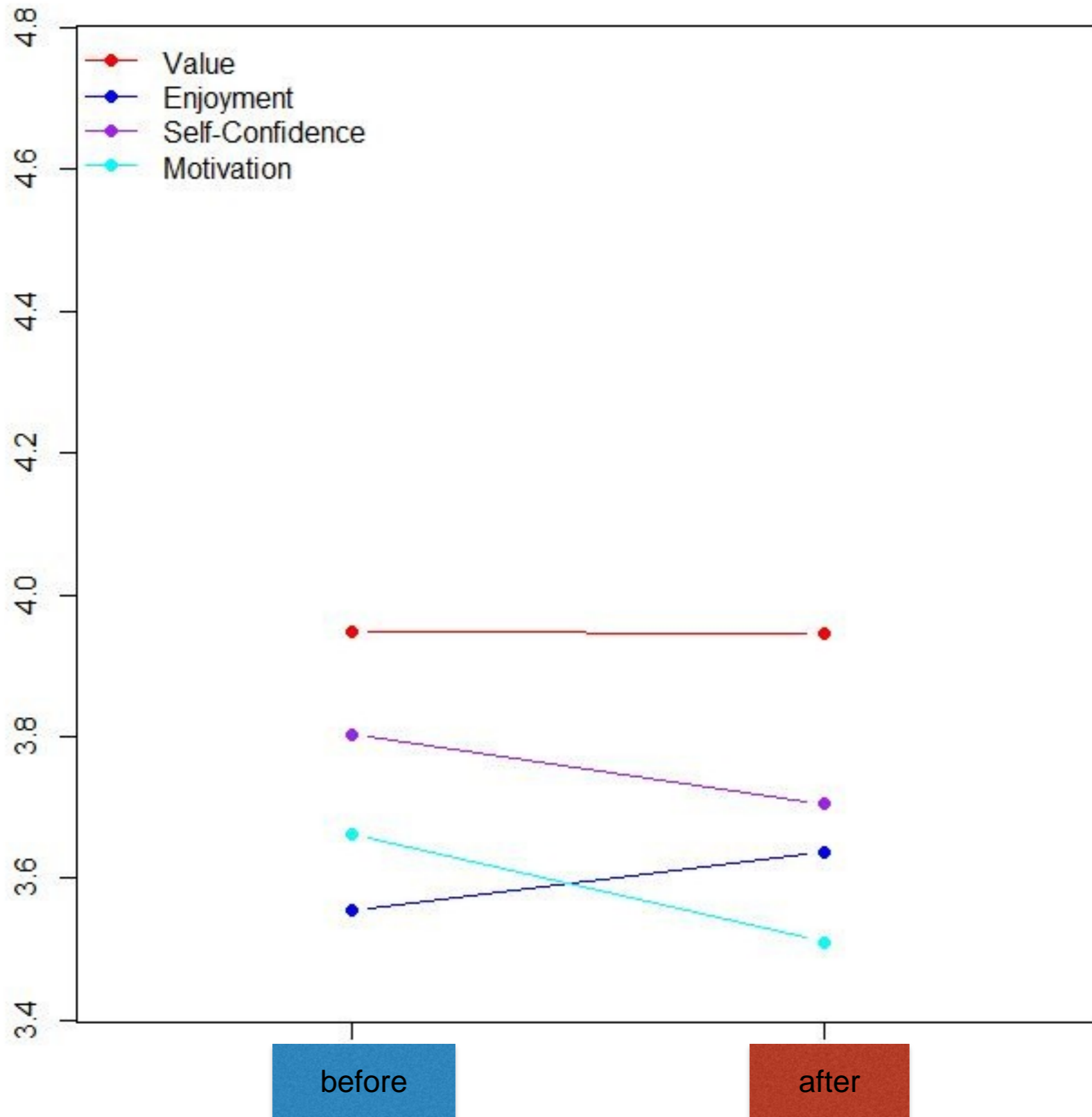


ALGEBRA 2

RESULT: PRECALCULUS

SUBSCALES OF ATTITUDE TOWARDS MATHEMATICS	Difference in Mean Scores			
	Pre-Calculus (n=29)			
	Mean	SD	t	p-value
<i>Value of Mathematics</i>	-0.003	0.429	-0.04	0.966
<i>Enjoyment of Mathematics</i>	0.083	0.473	0.94	0.354
<i>Self-Confidence in Mathematics</i>	-0.097	0.447	-1.16	0.255
<i>Motivation in Mathematics</i>	-0.152	0.536	-1.52	0.139

Mean ATMI Scores



Conclusion

After the implementation of the flipped classroom model...

There is an overall positive change in the students' attitudes toward mathematics in all four subscales.

The male students had a positive change in their attitude towards mathematics, but there is no change in the attitude towards mathematics on the female group.

There is a positive change in attitude towards mathematics among students in algebra 2, AP calculus, and AP statistics, but no change in the students attitude towards mathematics was observed in the students in precalculus.

What My Students Think About Flipped Classroom...

Thank You!



A screenshot of the Numberbender website homepage. The header features the "NUMBER BENDER" logo with a cartoon character, and a navigation menu with links for Home, Subjects, Aralin, Blog, Testimonials, About, and Contact Us. There are also search, sign in, and register buttons. The main content area is titled "Numberbender for Teachers" and includes a paragraph about the platform's features and a "Get Started" button. To the right is an illustration of a teacher with glasses holding a smartphone and a tablet, both displaying the Numberbender logo. Below this is a video player showing a classroom scene with a whiteboard that reads "WHAT ARE THE BENEFITS OF FLIPPING A CLASSROOM?". The video player has a progress bar at 0:00 / 8:07. On the right side of the page, there is a search bar, social media links for Twitter, Facebook, YouTube, and RSS, and a "Last Tweets" section with a tweet about a flipped classroom research presentation.