Improved Attitudes Toward Maths In A Flipped Class

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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?

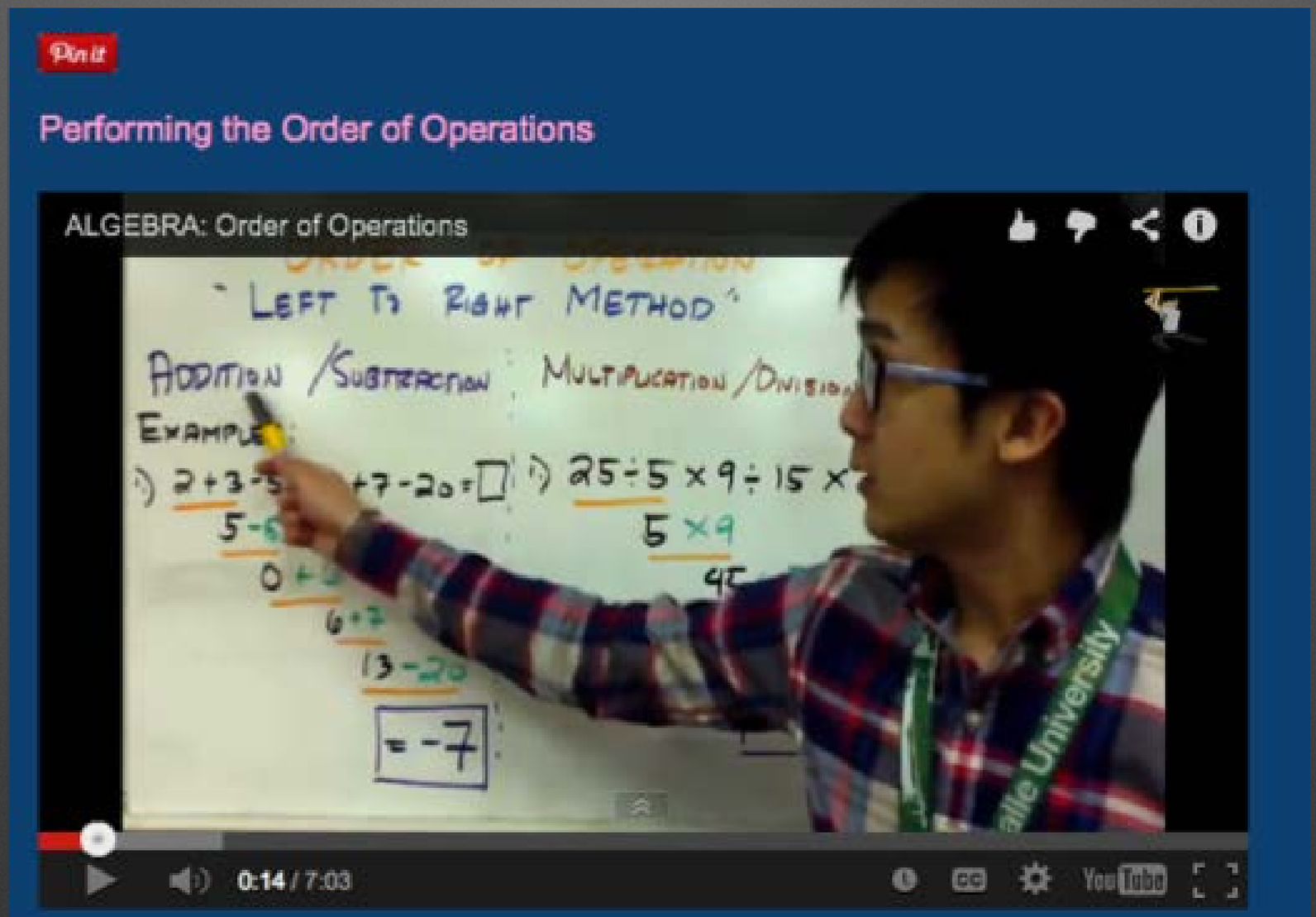
A flipped classroom model inverts traditional teaching model by delivering instruction outside of class and doing “homework” inside the classroom.

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

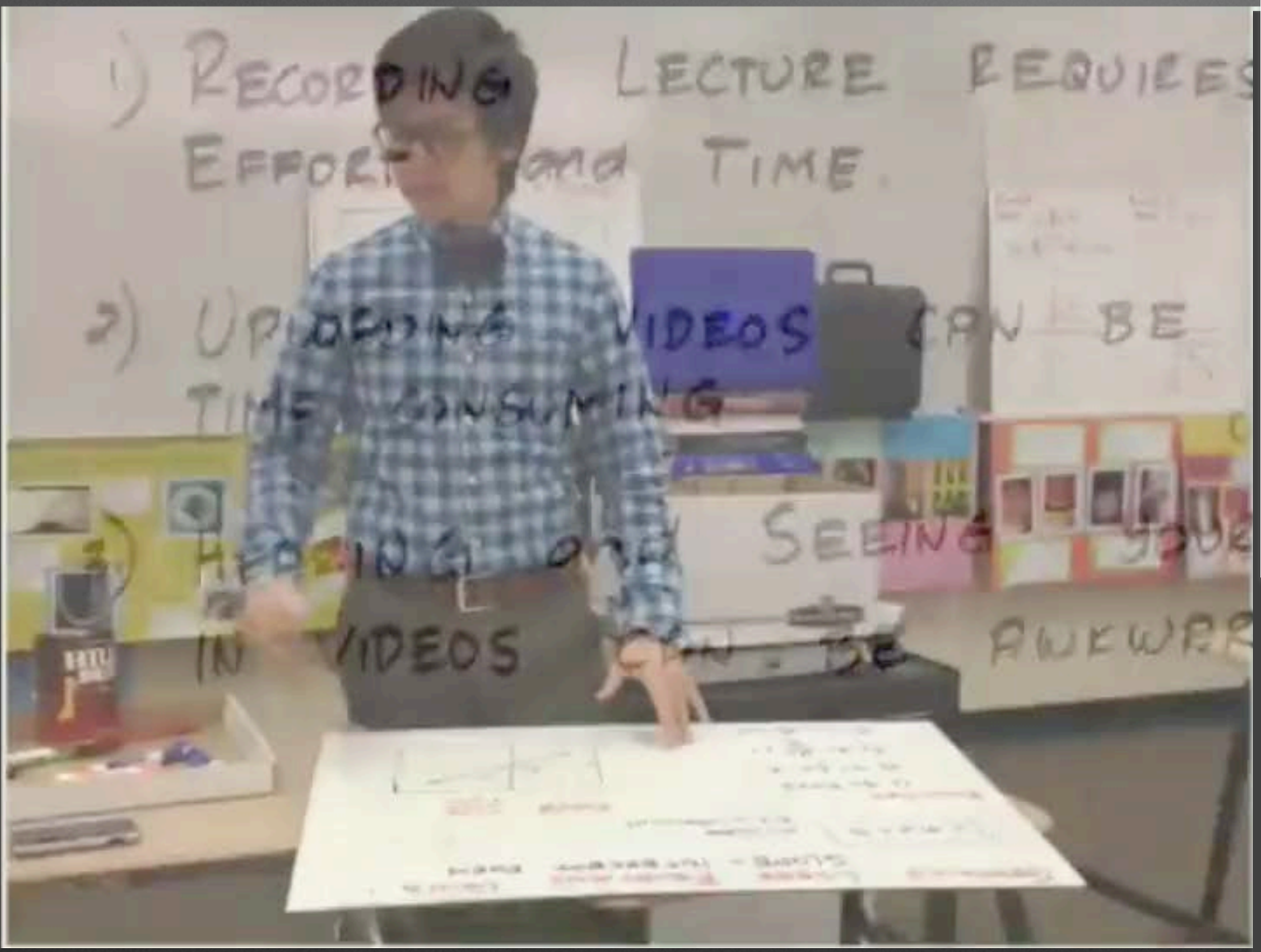
The Fizz Model



“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 Classses?



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

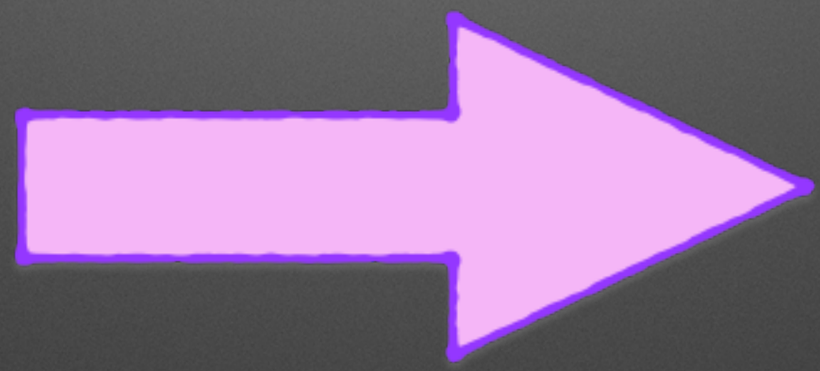
AP Calculus

Precalculus

Algebra 2

Why measure attitude?

Positive Attitude



Achievement
Success

Attitudes … (ATMI)

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 would like to avoid taking 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 confident that I can learn mathematics.	
39.	A strong math background could help me in my professional life.	
40.	I believe I am good at solving math problems.	

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

Value

Enjoyment

Self-Confid

Motivation

#39 Mat y life.

#26 I like atics.

#16 Matl ll.

#34 The e.

ATTITUDES TOWARD MATHEMATICS INVENTORY

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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.	
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14.	When I hear the word mathematics, I have a feeling of dislike.	
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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.	
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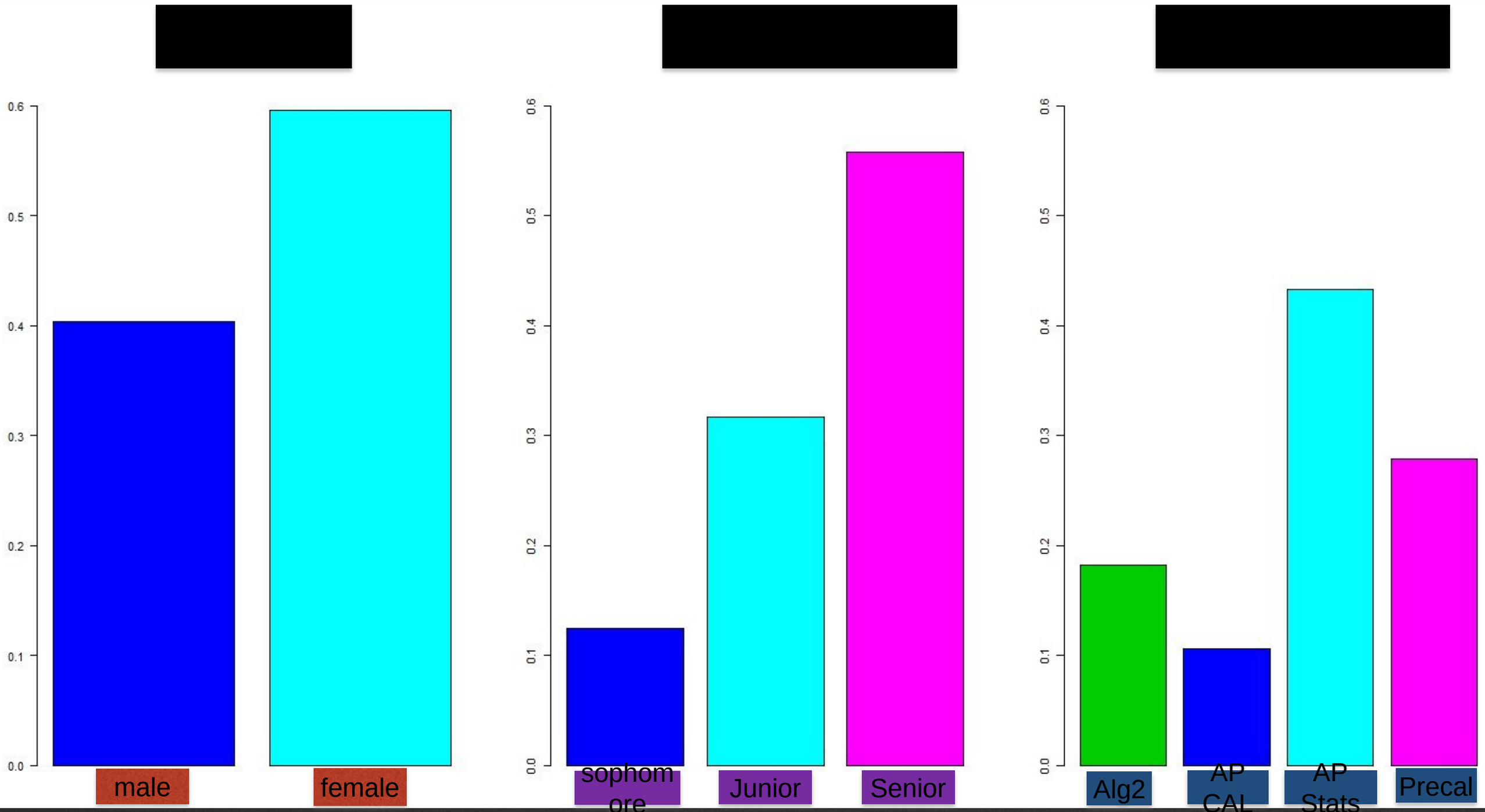
37.	I am comfortable expressing my own ideas on how to look for solutions to a difficult problem in math.	
38.	I am comfortable answering questions in math class.	
39.	A strong math background could help me in my professional life.	
40.	I believe I am good at solving math problems.	

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
Value of Mathematics	3.985	0.6494
Enjoyment of Mathematics	3.719	0.8030
Self-Confidence in Mathematics	3.803	0.7861
Motivation in Mathematics	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

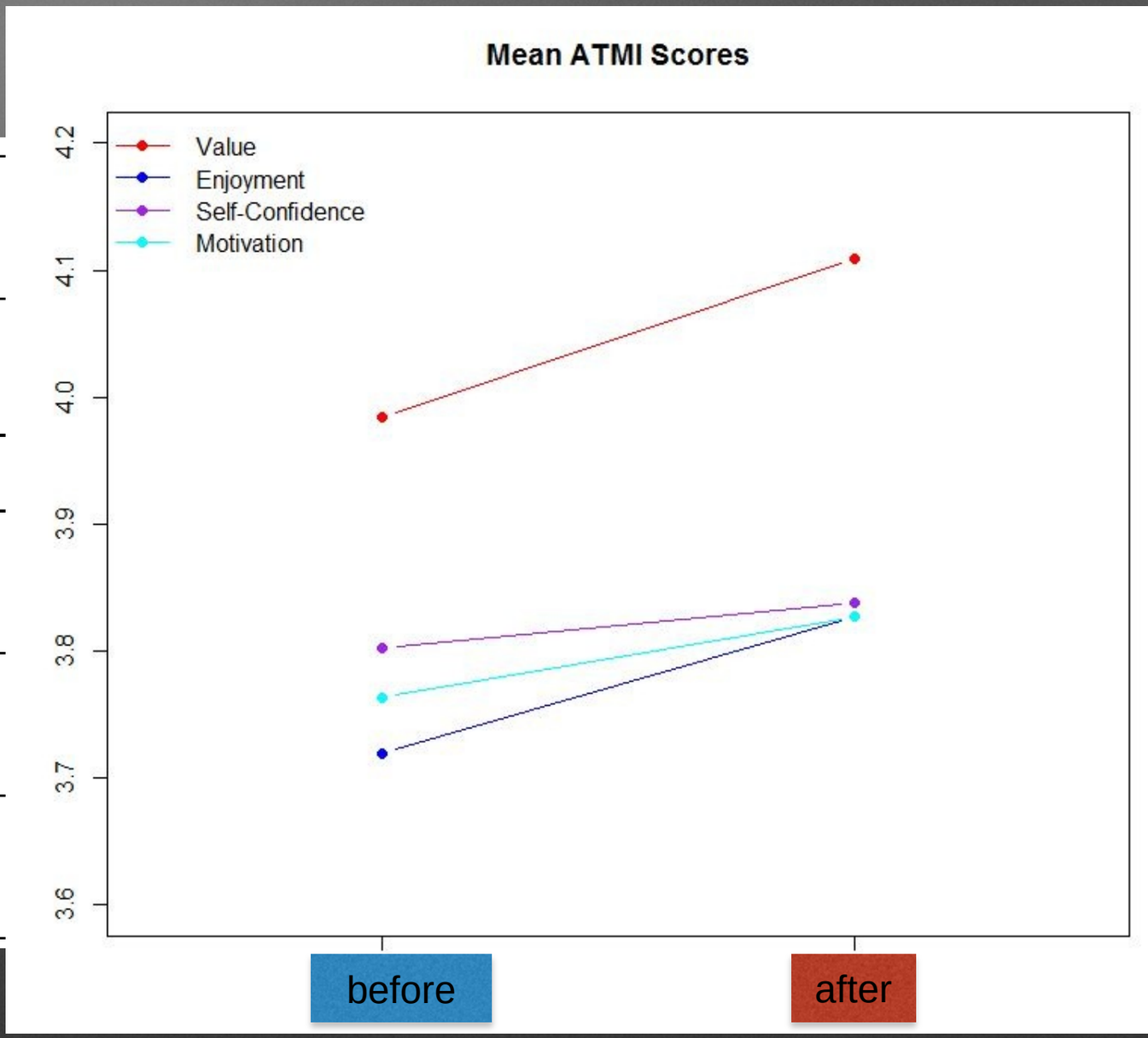
Comparison of ATMI Mean Scores for all students

SUBSCALES OF ATTITUDE TOWARDS MATHEMATICS	Before Implementation of the Flipped Classroom Model		After Implementation of the Flipped Classroom Model	
	Mean	SD	Mean	SD
Value of Mathematics	3.985	0.6494	4.109	0.6340
Enjoyment of Mathematics	3.719	0.8030	3.827	0.7274
Self-Confidence in Mathematics	3.803	0.7861	3.838	0.8076
Motivation in Mathematics	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
Value of Mathematics	0.123
Enjoyment of Mathematics	0.108
Self-Confidence in Mathematics	0.035
Motivation in Mathematics	0.063



Statistical Test on ATMI Mean Difference

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

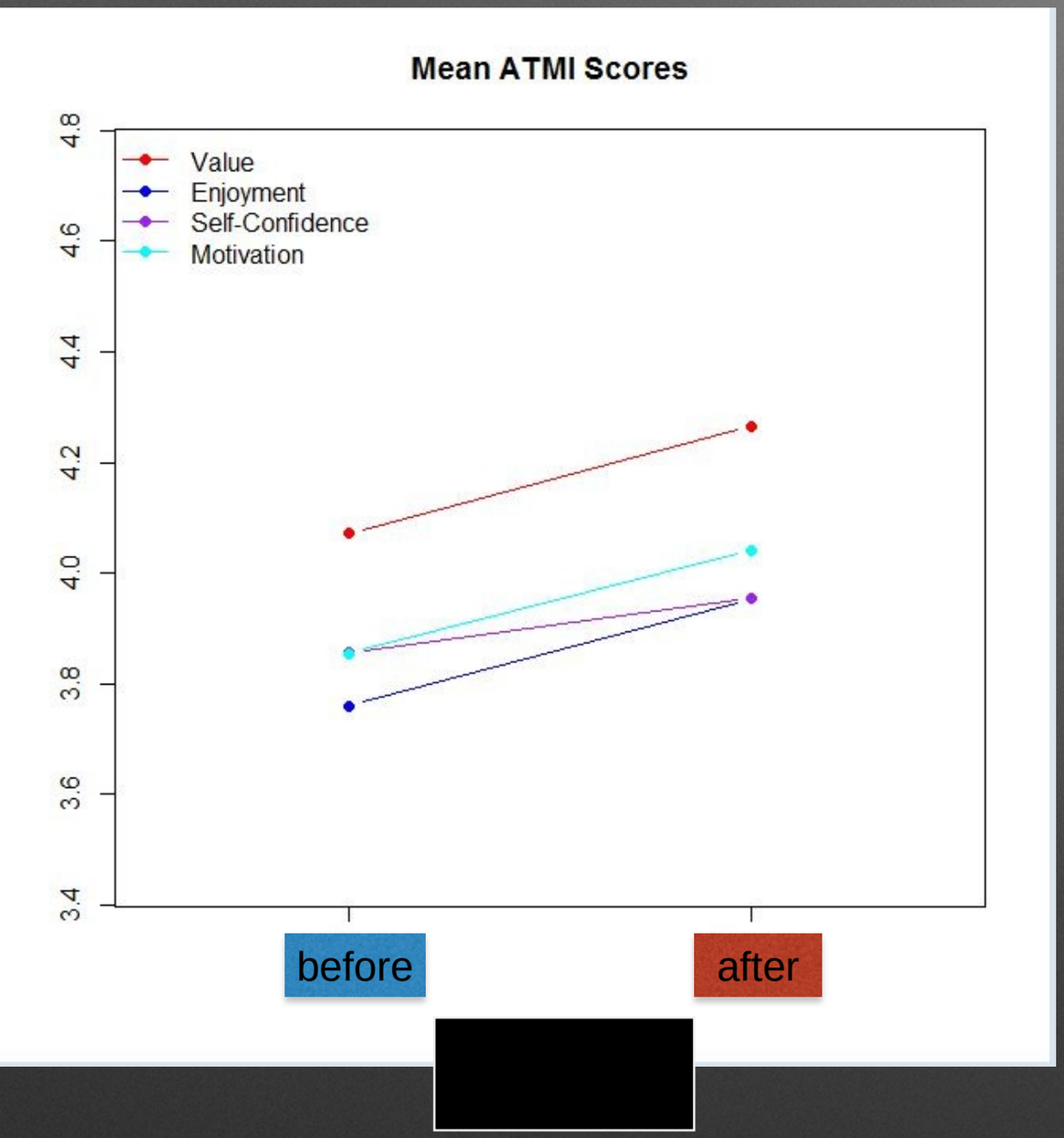
Based on the t-test results ($p < 0.05$), there is a statistically significant difference in the scores before and after implementation of flipped classroom for the “Value of Mathematics” and “Enjoyment of Mathematics”

Gender Comparison of ATMI Mean Scores Differences

Mean Difference : (by gender)

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

Mean Difference : (Gender)



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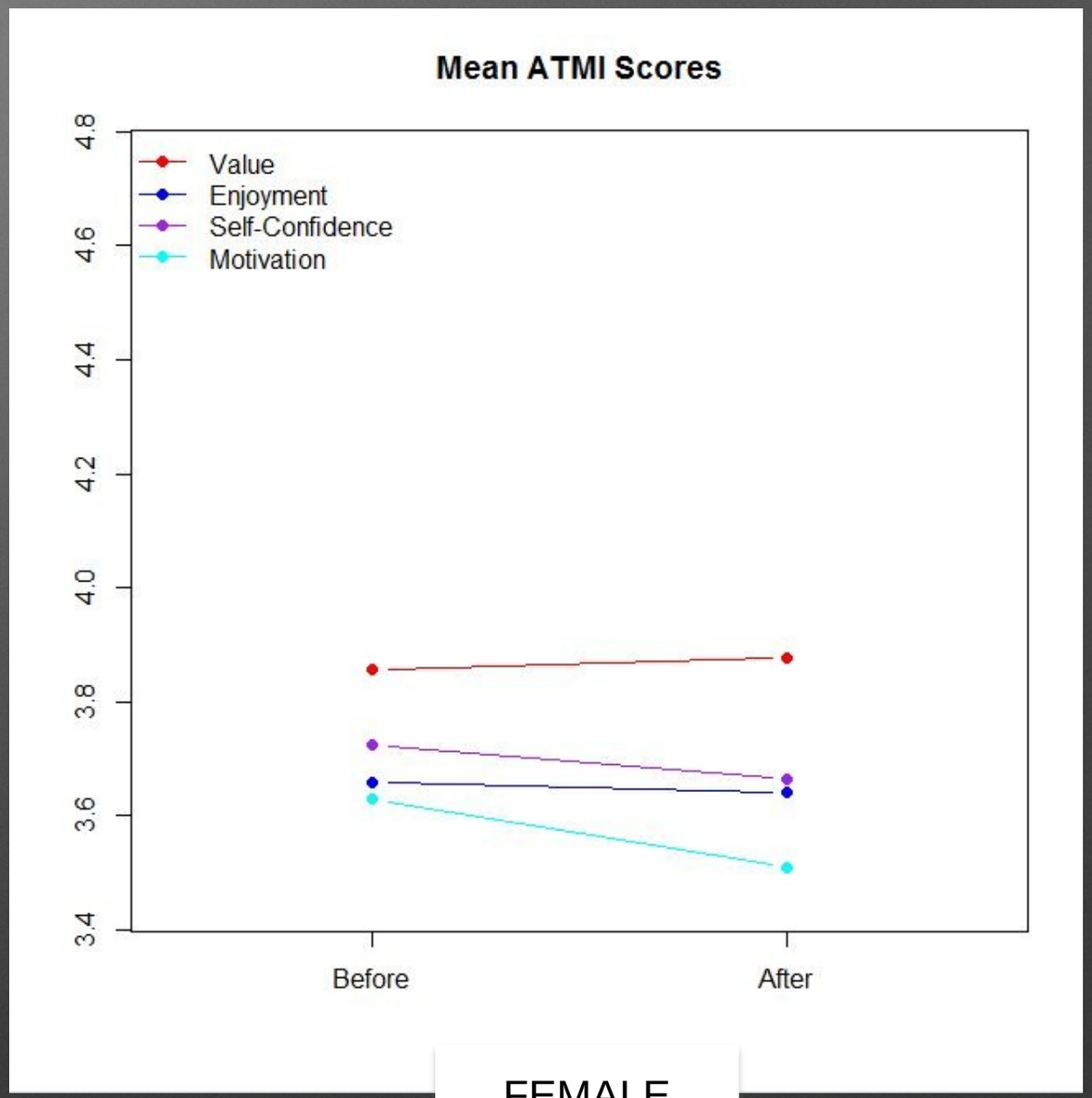
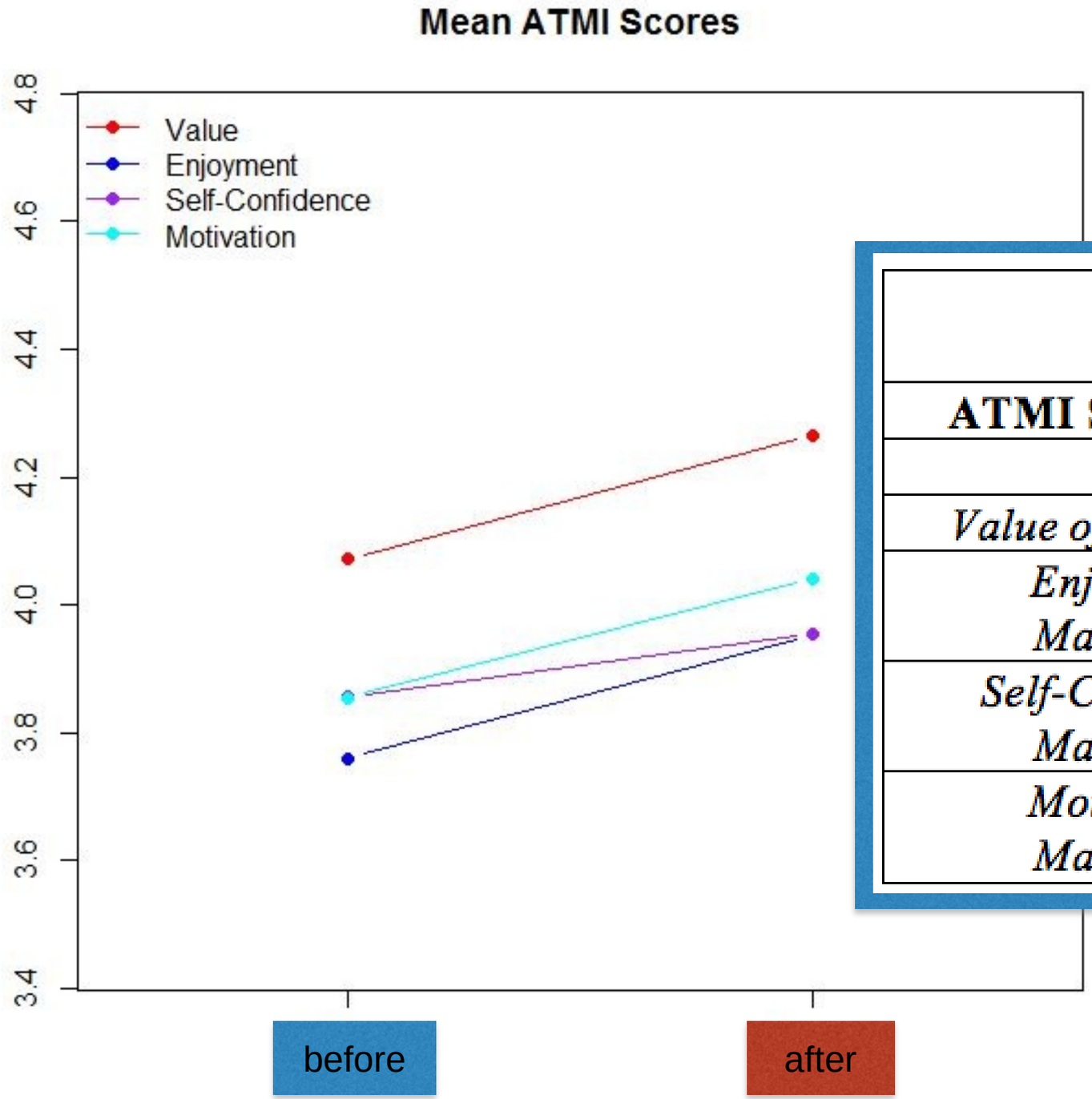


FEMALE

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

Mean Difference : (Gender)



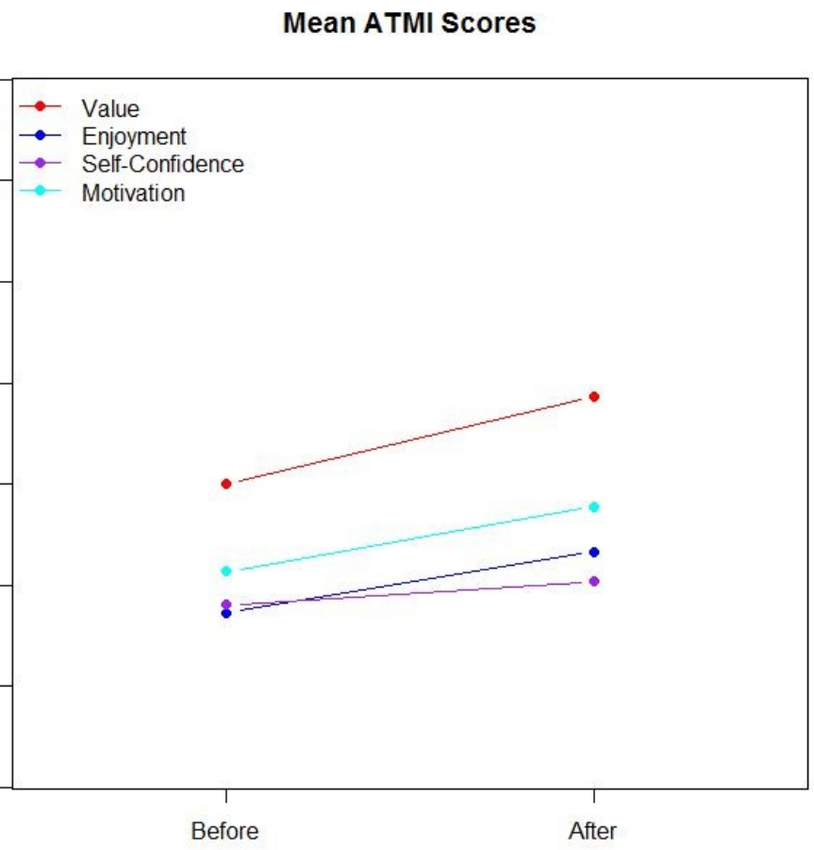
	Difference in Mean Scores	
ATMI SUBSCALES	Male (n = 62 students)	
	t	p-value
Value of Mathematics	2.78	0.008*
Enjoyment of Mathematics	2.92	0.005*
Self-Confidence in Mathematics	1.45	0.151
Motivation in Mathematics	2.33	0.023*

Subject Comparison of ATMI Mean Scores Differences

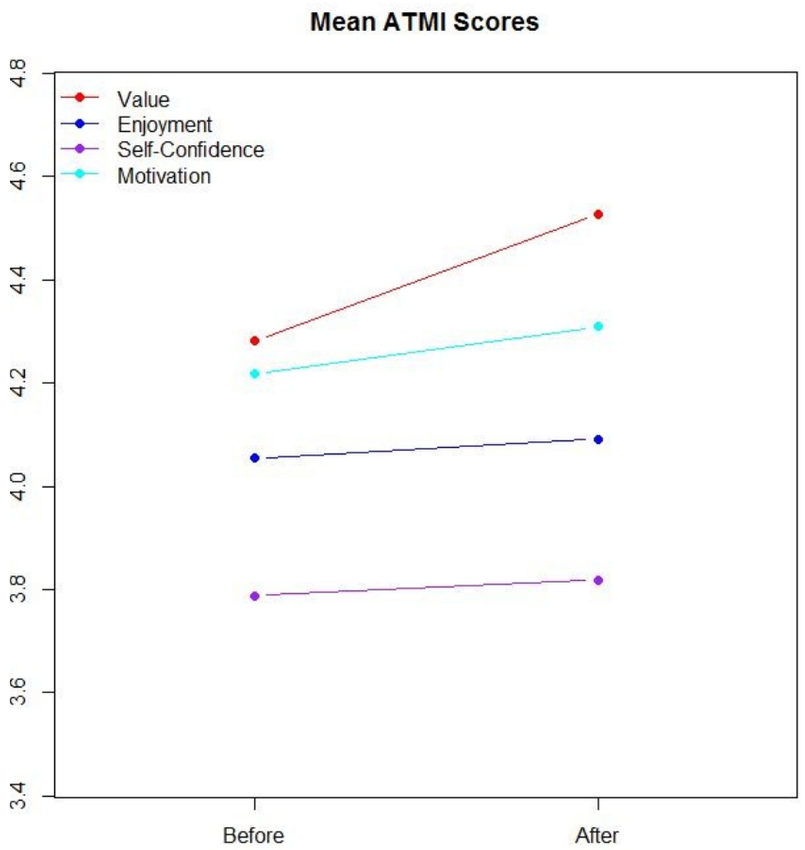
Mean Difference : (by Subjects)

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

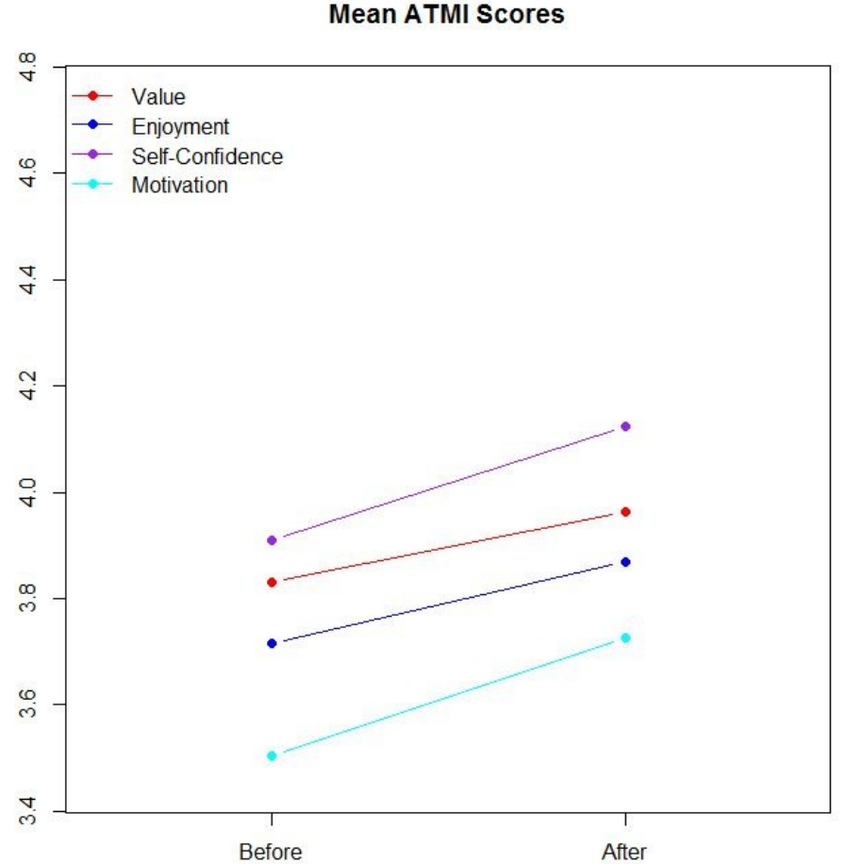
Mean Difference : (by Subjects)



AP CALCULUS



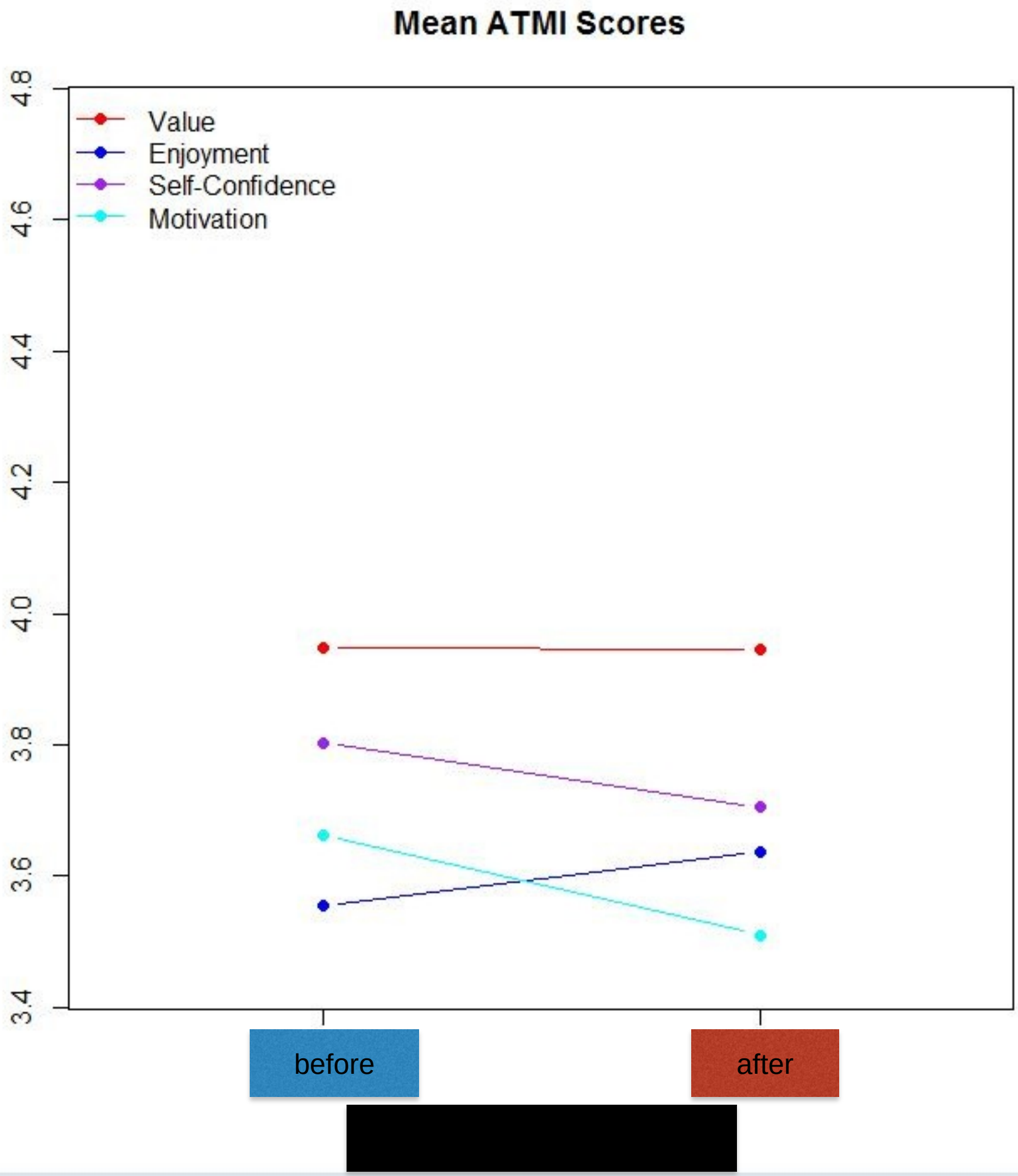
AP STATISTICS



ALGEBRA 2

RESULT: PRECALCULUS

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


Mean ATMI Scores
Value
Enjoyment
Self-Confidence
Motivation
4.8
4.6
4.4
4.2
4.0
3.8
3.6
3.4
before
after

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.

Students Flipped Classroom Feedback

What My Students Think About Flipped Classroom...

Thank You!

www.numberbender.com