

# Draft

## MAC SURVEY RESULTS, DECEMBER 2003

N = 487 (with both pre and post data)

Age Range: 14 – 58      Average Age = 23.1

### Gender

<i>Gender</i>	<i>N</i>	<i>Percentage</i>
Men	210	43.1%
Women	269	55.2%
No Answer	8	1.6%
TOTAL	487	100%

### School Level

<i>School Level</i>	<i>N</i>	<i>Percentage</i>
High School	115	23.6%
2 Year	273	56.1%
4 Year	99	20.3%
TOTAL	487	100%

### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	347	71.3
Under-Represented*	121	24.8
No Answer	19	3.9%
TOTAL	487	100%

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	12
Asian-Pacific Islander	64
Hispanic	14
Native American	14
White	368
Other	30
TOTAL*	502

\*Total exceeds 487 since respondents could select more than one ethnic category.

### Statistical Analysis

All matched pre and post data was analyzed by one way repeated measures ANOVA. Wilks' Lambda results were used to determine whether there were statistically significant changes for each item. These results are listed in the (p<) column in following tables. Eta Squared results which provides insight into effect size are also included in the results. Using commonly used guidelines proposed by Cohen (1988), a small effect size is .01 - .05, a medium effect size is .06 - .13, and a large effect size is .14 and above.

#### Statistically Significant Shifts for ALL Respondents on the MAC Survey (n = 487)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
1. To understand math I sometimes think about my personal experiences.	3.19	3.02	.001	.03
2. I am good at math.	2.65	2.55	.01	.02
10. Math helps me understand the world around me.	2.85	2.73	.01	.02
11. Mathematics has been an important tool to help me learn other subjects.	2.71	2.60	.05	.01
12. I have taken some math courses in high school and college that were taught in a very interesting way.	2.80	2.64	.01	.02
24. Writing about mathematics makes it easier to learn.	3.34	3.21	.001	.02
32. Mathematical thinking helps me make intelligent decisions about my life.	3.05	2.93	.05	.01
<b>Statistically Significant Shift in the "Wrong" Direction</b>				
35. I don't need a good understanding of math to achieve my career goals.	3.62	3.48	.05	.01

#### Statistically Significant Shifts for All MALE Respondents on the MAC Survey (n = 210)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
1. To understand math I sometimes think about my personal experiences.	3.25	2.97	.001	.06
12. I have taken some math courses in high school and college that were taught in a very interesting way.	2.74	2.51	.01	.04
14. I like exploring problems using real data and computers.	2.76	2.61	.05	.02
32. Mathematical thinking helps me make intelligent decisions about my life.	3.05	2.93	.05	.01
<b>Statistically Significant Shift in the "Wrong" Direction</b>				
4. Most subjects interest me more than math.	2.46	2.31	.05	.01

## Statistically Significant Shifts for All FEMALE Respondents on the MAC Survey (n = 269)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
2. I am good at math.	2.79	2.67	.01	.02
4. Most subjects interest me more than mathematics.	2.18	3.14	.01	.03
5. Mathematics is essentially an accumulation of facts, rules, and formulas to be memorized and used.	2.37	2.53	.05	.02
10. Math helps me understand the world around me.	2.97	2.81	.01	.02
11. Mathematics has been an important tool to help me learn other subjects.	2.76	2.59	.05	.03
24. Writing about mathematics makes it easier to learn.	3.32	3.18	.01	.02
26. After I've forgotten all the formulas, I'll still be able to use the ideas I've learned in math.	2.62	2.50	.05	.02
29. Learning mathematics makes me nervous.	2.89	3.03	.05	.02

Some thoughts on what I see in the results:

1. Men had fewer shifts, but they were the group reporting the change in using personal experiences for understanding math. I haven't reviewed the literature, but that seems contrary to what I'd expect to find, especially since the starting (pre) mean was higher than women's (3.12)
2. Men also had a significant shift on liking to use computers and real data (#14). What makes this interesting is that women's pre mean (3.01) was higher to begin with (their post mean of 3.03) shows little shift.

Together these seem to indicate that men were less likely to use personal experience and real data (things they can identify with) than women were at the outset. This makes sense in that men are often considered to be better at analytical (and detached) thinking than women. MAC seems to personalize math more for them, even down to their significant shift on enjoying math courses.

3. Women report more desirable attitudinal shifts, including agreeing more with the statement that they are good in math. Consistent with what I've read about women and the math self-esteem, their starting pre mean on item 2, I am good at math, was 2.79 (worse) than the men's mean of 2.50.
4. Many of the women's attitudinal shifts are "practical" in nature and application – item 5 could indicate believing math is usable, not just facts and formulas. Item 26 indicates a deeper understanding of math beyond the need to recall the specifics of formulas. This seems consistent with item 29 indicating reduced levels of anxiety about learning math. Perhaps it's less anxiety provoking if the concepts can be used while looking up formulas when needed, thus reducing the pressure of memorizing formulas. Items 10 and 11 indicate math is useful in daily life and outside math classrooms.

Overall, I think the women's results are very encouraging!

5. Item 35 (careers and math) is going to come up repeatedly. My interpretation is that the usual shift indicating feeling less need for planned careers reflects students' lack of knowledge about what their careers will actually entail. My classic examples include future and current psychology and sociology majors who don't realize that they're going to need a decent understanding of statistic, plus culinary arts or nursing students who don't realize that they will use fractions a lot in their work.

## MAC Survey Responses by School Type

### HIGH SCHOOL

**N = 115**

**Age Range: 14 – 17**

**Average Age = 15.3**

#### Gender

<i>Gender</i>	<i>N</i>	<i>Percentage</i>
Men	46	40%
Women	61	53%
No Answer	8	7%
<b>TOTAL</b>	<b>115</b>	<b>100%</b>

#### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	85	73.9%
Under-Represented*	19	16.5%
No Answer	11	9.6%
<b>TOTAL</b>	<b>115</b>	<b>100%</b>

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

#### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	4
Asian-Pacific Islander	10
Hispanic	3
Native American	3
White	91
Other	3
<b>TOTAL*</b>	<b>114</b>

\*Total does not equal 115 because some students did not respond while others selected more than one ethnic category.

#### Statistically Significant Shifts for High School Students (n = 115)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
17. Math helps me understand the world around me.	2.92	2.70	.05	.05
<b>Statistically Significant Shift in the “Wrong” Direction</b>				
22. When I get stuck on a math problem, I can usually find my way out.	2.51	2.71	.05	.05

#### Statistically Significant Shifts on MAC Survey for HIGH SCHOOL BOYS (n = 46)

Note: The lower the mean score, the more respondents agreed with the statement and the lower the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
6. Good math teachers show students the exact way to answer questions they'll be tested on.	2.16	2.56	.05	.11
<b>Statistically Significant Shift in the "Wrong" Direction</b>				
22. When I get stuck on a math problem, I can usually find my way out.	2.34	2.70	.01	.15

### Statistically Significant Shifts on MAC Survey for HIGH SCHOOL GIRLS (n = 61)

Note: The lower the mean score, the more respondents agreed with the statement and the lower the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
4. Most subjects interest me more than mathematics	2.47	2.75	.05	.10
13. For me, mathematics rarely involves exploration, investigation, or experimentation.	3.54	3.28	.05	.07
20. Doing math helps me understand myself.	3.85	3.60	.05	.07

Some things to notice:

I don't want to over-emphasize effect size, but while there were few statistically significant shifts, notice that effect sizes were all medium or large. This could indicate students having stronger reactions (when they have them) OR it could simply say the numbers of boys and girls were small. Hence a few students with more sizeable shifts in attitude can have larger impacts on the results overall.

The shifts for boys may reflect developmental stages in thinking. They show more independence, i.e. understanding that teachers don't just give the right answers for testing purposes, but they strongly say they're not able to dig themselves out when they are stuck.

There are only three statistically significant shifts for girls, but they seem important. They're expressing more interest in math (though the post of 2.75 means they haven't hit the "half way" mark of 3.0). They're saying they're starting to understand that math can be a means of exploration and experimentation, and they've made a connection to math helping them understand themselves. Again, that last one is still "worse" than the halfway mark of 3, but it may indicate an ability to do more analytical thinking about oneself.

It may be very important that these results not only come from one high school but also from only one teacher. There's no way to balance out (or control for) the effect of only one teacher. Therefore, these results, though small, are interesting but must be used VERY cautiously. It would be helpful to have data from additional teachers and from additional high schools.

## ALL COLLEGE STUDENTS (2 Year and 4 Year)

N = 372

Age Range: 16 – 58

Average Age = 22.4

### Gender

<i>Gender</i>	<i>N</i>	<i>Percentage</i>
Men	164	44.1%
Women	208	55.9%
TOTAL	372	100%

### School Level

<i>School Level</i>	<i>N</i>	<i>Percentage</i>
2 Year	273	73.4%
4 Year	99	26.6%
TOTAL	372	100%

### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	262	70.4%
Under-Represented*	102	27.4%
No Answer	8	2.2%
TOTAL	372	100%

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	8
Asian-Pacific Islander	54
Hispanic	11
Native American	11
White	277
Other	27
TOTAL*	388

\*Total does not equal 372 because some students did not respond while others selected more than one ethnic category.

## Statistically Significant Shifts for All 2 and 4 Year College Students (n = 372)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
1. To understand math I sometimes think about my personal experiences.	3.13	2.90	.001	.05
2. I am good at math.	2.74	2.62	.05	.02
10 Math helps me understand the world around me.	2.75	2.65	.05	.01
11. Mathematics has been an important tool to help me learn other subjects.	2.68	2.56	.06	.02
12. I have taken some math courses in high school and college that were taught in a very interesting way.	2.80	2.63	.01	.02
24. Writing about mathematics makes it easier to learn.	3.27	3.16	.05	.01
26. After I've forgotten the formulas, I'll still be able to use ideas I've learned in math.	2.52	2.40	.05	.01
32. Mathematical thinking helps me make intelligent decisions about my life.	3.0	2.89	.05	.01
<b>Statistically Significant Shift in the "Wrong" Direction</b>				
35. I don't need a good understanding of math to achieve my career goals.	3.67	3.45	.001	.03

### MALE 2 and 4-Year College Students

N = 164      Age Range: 17 – 54      Average Age = 25.1

#### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	117	71.3%
Under-Represented*	44	26.8%
No Answer	3	1.8%
<b>TOTAL</b>	<b>164</b>	<b>100%</b>

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

#### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	2
Asian-Pacific Islander	24
Hispanic	5
Native American	5
White	124
Other	13
<b>TOTAL*</b>	<b>173</b>

\*Total does not equal 164 because some students did not respond while others selected more than one ethnic category.

## Statistically Significant Shifts for All 2 and 4 Year MALE College Students (n = 164)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
1. To understand math I sometimes think about my personal experiences..	3.24	2.88	.001	.10
12. I have taken some math courses in high school and college that were taught in a very interesting way.	2.74	2.49	.01	.04
14. I like exploring problems using real data and computers.	2.72	2.55	.05	.03
<b>Statistically Significant Shift in the “Wrong” Direction</b>				
35. I don’t need a good understanding of math to achieve my career goals.	3.62	3.42	.05	.03

## FEMALE 2 and 4-Year College Students

N = 208

Age Range: 16 - 58                      Average Age = 25.7

### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	145	69.7%
Under-Represented*	58	27.9%
No Answer	3	1.4%
TOTAL	208	100%

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	6
Asian-Pacific Islander	30
Hispanic	6
Native American	6
White	153
Other	14
TOTAL*	215

\*Total does not equal 208 because some students did not respond while others selected more than one ethnic category.

## Statistically Significant Shifts for All 2 and 4 FEMALE Year College Students (n = 208)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
2. I am good at math.	2.74	2.62	.05	.02
5. Mathematics is essentially an accumulation of facts, rules, and formulas to be memorized and used.	2.37	2.55	.05	.03
11. Mathematics has been an important tool to help me learn other subjects.	2.72	2.55	.01	.04
24. Writing about mathematics makes it easier to learn.	3.26	3.10	.05	.03
29. Learning mathematics makes me nervous.	2.72	2.93	.01	.04
<b>Statistically Significant Shift in the “Wrong” Direction</b>				
35. I don’t need a good understanding of math to achieve my career goals.	3.70	3.48	.05	.03

Comments: My comments here are the same as what I said for the overall results earlier. The men again have fewer statistically significant shifts, but the power for the first item is high. They seem to be getting turned on to using their own experiences when they do math instead of relying just on disconnected concepts.

## ALL TWO YEAR COLLEGE STUDENTS

N = 273      Age Range: 16 – 55      Average Age = 25.7

### Gender

<i>Gender</i>	<i>N</i>	<i>Percentage</i>
Men	114	41.8%
Women	159	58.2%
TOTAL	273	100%

### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	196	71.8%
Under-Represented*	70	25.6%
No Answer	7	2.6%
TOTAL	273	100%

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	7
Asian-Pacific Islander	32
Hispanic	8
Native American	8
White	206
Other	19
TOTAL*	280

\*Total does not equal 273 because some students did not respond while others selected more than one ethnic category.

### Statistically Significant Shifts for All 2-Year College Students (n = 273)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
1. To understand math I sometimes think about my personal experiences.	3.19	3.00	.05	.03
12. I have taken some math courses in high school and college that were taught in a very interesting way.	2.85	2.68	.01	.03
24. Writing about mathematics makes it easier to learn.	3.33	3.18	.05	.02
26. After I've forgotten all the formulas, I'll still be able to use the ideas I've learned in math.	2.56	2.43	.05	.02
<b>Statistically Significant Shift in the "Wrong" Direction</b>				
35. I don't need a good understanding of math to achieve my career goals.	3.63	3.36	.001	.05

### ALL MALE TWO YEAR COLLEGE STUDENTS

N = 114

Age Range: 17 – 54

Average Age = 26.4

### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	82	71.9%
Under-Represented*	29	25.4%
No Answer	3	2.6%
TOTAL	114	100%

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	1
Asian-Pacific Islander	15
Hispanic	3
Native American	2
White	84
Other	8
TOTAL*	113

\*Total does not equal 114 because some students did not respond while others selected more than one ethnic category.

## Statistically Significant Shifts for All 2 MALE Year College Students (n = 114)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
1. To understand math I sometimes think about my personal experiences.	3.25	2.95	.05	.06
<b>Statistically Significant Shift in the “Wrong” Direction</b>				
29. Learning mathematics makes me nervous.	3.22	3.16	.05	.03
31. Doing math helps me think clearly and logically.	2.37	2.54	.05	.05
35. I don’t need a good understanding of math to achieve my career goals.	3.63	3.36	.001	.05

## ALL FEMALE TWO YEAR COLLEGE STUDENTS

N = 159

Age Range: 16 – 55

Average Age = 25.1

### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	114	71.7%
Under-Represented*	41	25.8%
No Answer	4	2.5%
TOTAL	159	100%

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	6
Asian-Pacific Islander	17
Hispanic	5
Native American	6
White	122
Other	11
TOTAL*	167

\*Total does not equal 167 because some students did not respond while others selected more than one ethnic category.

## Statistically Significant Shifts for All FEMALE 2-Year College Students (n = 159)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
2. I am good at math.	2.90	2.72	.01	.04
11. Mathematics has been an important tool to help me learn other subjects.	2.75	2.60	.05	.03
12. I have taken some math courses in high school and college that were taught in a very interesting way.	2.94	2.76	.05	.03
24. Writing about mathematics makes it easier to learn.	3.35	3.15	.05	.04
26. After I've forgotten all the formulas, I'll still be able to use the ideas I've learned in math.	2.56	2.43	.05	.02
29. Learning mathematics makes me nervous.	2.73	2.91	.05	.04
<b>Statistically Significant Shift in the "Wrong" Direction</b>				
35. I don't need a good understanding of math to achieve my career goals.	3.63	3.36	.001	.05

## ALL FOUR YEAR COLLEGE STUDENTS

N = 99

Age Range: 17 – 58

Average Age = 24.7

### Gender

<i>Gender</i>	<i>N</i>	<i>Percentage</i>
Men	50	50.5%
Women	49	49.5%
TOTAL	99	100%

### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	66	66.6%
Under-Represented*	32	32.3%
No Answer	1	1.1%
TOTAL	99	100%

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	1
Asian-Pacific Islander	22
Hispanic	3
Native American	3
White	71
Other	8
TOTAL*	108

\*Total does not equal 99 because some students did not respond while others selected more than one ethnic category.

## Statistically Significant Shifts for All FOUR Year College Students (n = 99)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
5. Mathematics is essentially an accumulation of facts, rules, and formulas to be memorized and used.	2.84	3.11	.05	.06
7. Using a computer makes learning math more complicated than it needs to be.	3.34	3.61	.05	.06
10. Math helps me understand the world around me.	2.40	2.19	.05	.05
13. For me, mathematics rarely involves exploration, investigation, or experimentation.	3.26	3.56	.05	.06
20. Doing mathematics helps me understand myself..	3.38	3.12	.05	.05
<b>Statistically Significant Shift in the “Wrong” Direction</b>				
1. To understand math I sometimes think about my personal experiences.	2.97	3.02	.001	.01

### ALL MALE FOUR YEAR COLLEGE STUDENTS

N = 50

Age Range: 17 – 40

Average Age = 22.0

### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	35	70.0%
Under-Represented*	15	30.0%
TOTAL	50	100%

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	1
Asian-Pacific Islander	9
Hispanic	2
Native American	3
White	40
Other	5
TOTAL*	60

\*Total does not equal 50 because some students did not respond while others selected more than one ethnic category.

## Statistically Significant Shifts for All MALE 4-Year College Students (n = 114)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
1. To understand math I sometimes think about my personal experiences.	3.23	2.70	.001	.23
12. I have taken some math courses in high school and college that were taught in a very interesting way.	2.80	2.35	.05	.12
14. I like exploring problems using real data and computers.	2.71	2.33	.01	.18
<b>Statistically Significant Shift in the “Wrong” Direction</b>				
35. I don’t need a good understanding of math to achieve my career goals.	2.57	2.29	.05	.11

Notice the Eta Squares – all show strong effect sizes. However, once again the N is small so a few extreme responses can have a big impact on the results.

## ALL FEMALE FOUR YEAR COLLEGE STUDENTS

N = 49

Age Range: 18 – 58

Average Age = 27.5

### Self-Reported Ethnic Membership

<i>Ethnicity</i>	<i>N</i>	<i>Percentage</i>
White	31	63.3%
Under-Represented*	17	34.7%
No Answer	1	2.0%
TOTAL	49	100%

\* Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.

### More Detailed Ethnicity Breakdown

<i>Selected Ethnicity</i>	<i>N</i>
African-American	0
Asian-Pacific Islander	13
Hispanic	1
Native American	2
White	31
Other	3
TOTAL*	50

\*Total does not equal 49 because some students did not respond while others selected more than one ethnic category.

## Statistically Significant Shifts for All FEMALE 4-Year College Students (n = 49)

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
5. Mathematics is essentially an accumulation of facts, rules, and formulas to be memorized and used.	2.63	3.16	.001	.19
8. People who are good at math can do math quickly.	2.76	3.10	.05	.09
10. Math helps me understand the world around me.	2.53	2.20	.05	.12
11. Mathematics has been an important tool to help me learn other subjects.	2.68	2.38	.05	.09
13. For me, mathematics rarely involves exploration, investigation, or experimentation.	3.13	3.58	.05	.10
20. Doing math helps me understand myself.	3.39	3.06	.05	.09

Note: Again the Eta Squares are strong and this could have to do with the small N.

Notice: Four year students comprise the only group where there are more men than women.

### ALL UNDER-REPRESENTED STUDENTS

(Under-represented students indicated they were African-American, Asian-Pacific Islander, Hispanic, Native American, any combination of these ethnicities, White plus at least one of these ethnicities, or Other.)

**N = 121**

**Age Range: 14 – 52**

**Average Age = 22.8**

#### Gender

<i>Gender</i>	<i>N</i>	<i>Percentage</i>
Men	52	43.0%
Women	68	56.2%
No Answer	1	0.8%
TOTAL	121	100%

#### Self- Reported Ethnic Background

<i>Selected Ethnicity</i>	<i>N</i>
African-American	12
Asian-Pacific Islander	62
Hispanic	14
Native American	14
White	22
Other	29
TOTAL*	153

\*Total does not equal 121 because some students did not respond while others selected more than one ethnic category.

**Statistically Significant Shifts for All UNDER-REPRESENTED Students (n = 121)**

Note: The lower the mean score, the more respondents agreed with the statement and the higher the score, the more they disagreed.

	Mean pre	Mean post	(p>)	Eta Squared
5. Mathematics is essentially an accumulation of facts, rules, and formulas to be memorized and used.	2.24	2.44	.05	.04

**Statistically Significant Shifts for MALE UNDER-REPRESENTED Students (n = 51)**

	Mean pre	Mean post	(p>)	Eta Squared
<b>Statistically Significant Shift in the “Wrong” Direction</b>				
21. I try to avoid courses that involve mathematics.	3.50	3.22	.05	.10

**Statistically Significant Shifts for FEMALE UNDER-REPRESENTED Students (n = 68)**

	Mean pre	Mean post	(p>)	Eta Squared
5. Mathematics is essentially an accumulation of facts, rules, and formulas to be memorized and used.	2.24	2.55	.05	.07
<b>Statistically Significant Shift in the “Wrong” Direction</b>				
18. Working in groups helps me learn math.	2.18	2.48	.01	.12

Very interesting result for women and groups, and it raises many other questions!