

**Dissemination and Assessment
of the MAC Project:
Are We Seeing Any Changes Yet?**

Preliminary Results

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Who Are We Talking About?

Total 96 students had both pre- and post-test scores

Sex 25 Men (26%)
 71 Women (74%)
 96 Total

Ethnicity 66 White (69%)
 27 Minority (28%)
 3 No Answer (3%)

*Minority = African-American/Black, Asian/Pacific Islander, Latino/Hispanic, Native American, Other, & Caucasian/White PLUS Another Category

Age 16 – 58 years old

 average age: 26.9 years
 median age: 21.0 years

Grade Level

37	1 st Year
26	Sophomores
11	Juniors
17	Seniors
2	Grad Students
2	Other
1	No Answer

66% are 1st and 2nd year students

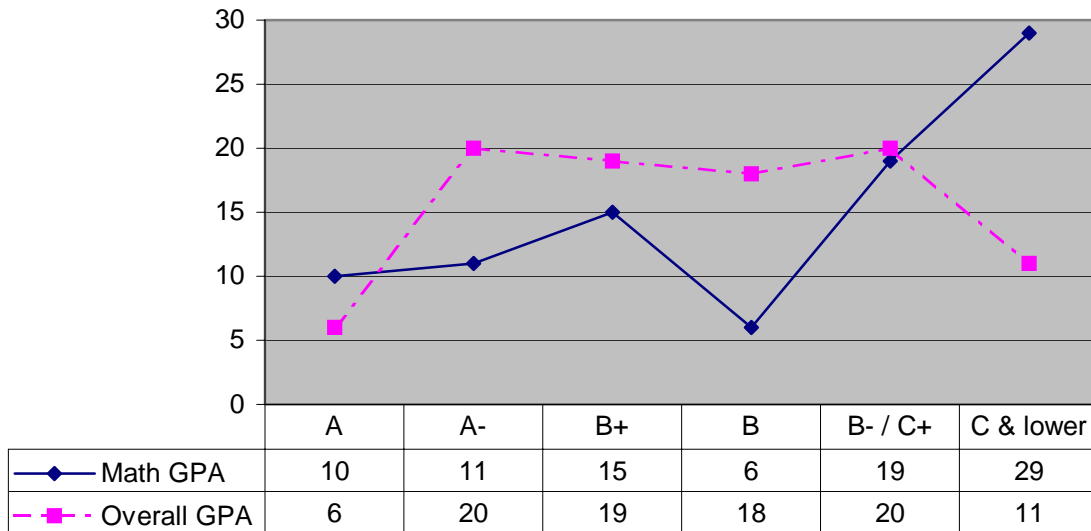
Reported Previous Math Courses (72 responses)

69	High School Algebra
58	Geometry
29	Advanced Algebra
17	Trig
8	Statistics
2	Finite Math
18	Pre-Calculus
7	Calculus

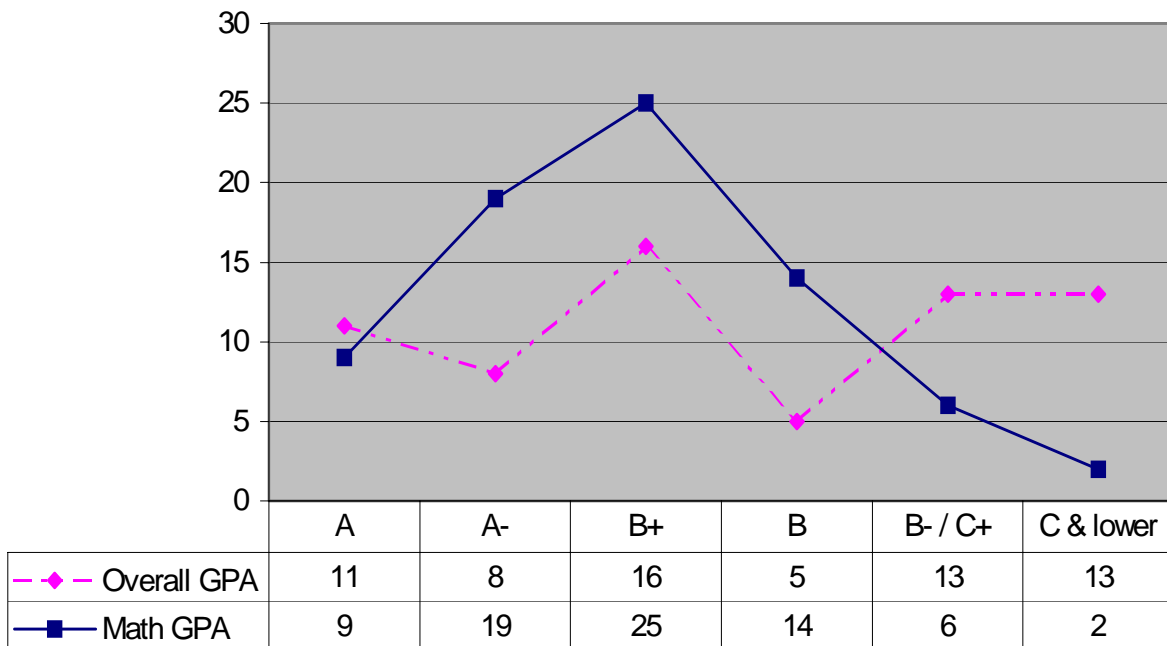
Major Fields

27	<i>Undecided</i>
26	Social Sciences
18	Humanities
11	Natural Sciences
9	No Answer
5	Other

Number of Students Reporting Their High School Math and Overall GPAs Were:



Number of Students Reporting Their College Math and Overall GPAs Were:



MAC Survey Questions

1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree

1. To understand math, I sometimes think about my personal experiences.
2. I am good at math.
3. If I work at it, I can do well in math.
4. Most subjects interest me more than math.
5. Mathematics is basically an accumulation of facts, rules, and formulas to be memorized and used.
6. Good math teachers show students the exact way to answer questions they'll be tested on.
7. Using a computer makes learning math more complicated than it needs to be.
8. People who are good at math can do math quickly.
9. I enjoy learning new things in math.
10. Math helps me understand the world around me.
11. Mathematics has been an important tool to help me learn other subjects.
12. I have taken some math courses in high school and college that were taught in a very interesting way.
13. For me, mathematics rarely involves exploration, investigation, or experimentation.
14. I like exploring problems using real data and computers.
15. Many situations in the world around me can be modeled mathematically.
16. I often feel like I'm missing something important in class.
17. I want to study more mathematics.
18. Working in groups helps me learn math.
19. I rarely encounter situations that are mathematical in nature outside school.
20. Doing math helps me understand myself.
21. I try to avoid classes that involve mathematics.
22. When I get stuck on a math problem, I can usually find my way out.
23. Becoming more proficient in math prepares you for the next math class, but that's about it.
24. Writing about mathematics makes it easier.
25. In mathematics you can be creative and discover things for yourself.
26. After I've forgotten all the formulas, I'll still be able to use the ideas I've learned in math.
27. I'm never sure my answer is right until I'm given the solution.
28. Doing mathematics raises interesting new questions about the world.
29. Learning mathematics makes me nervous.
30. I often see familiar mathematical concepts in courses outside math.
31. Doing math helps me think clearly and logically.
32. Mathematical thinking helps me make intelligent decisions about my life.
33. I don't really understand math until I work it out for myself.
34. Expressing scientific concepts in mathematical equations just makes them more confusion.
35. I don't need a good understanding of math to achieve my career goals.

Mean Test Scores for All Examinees with Pre and Post-Test Scores (n = 96)

(1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree)

Question	Pre-Test	Post-Test	Sig.	p	Eta Squared
1	3.21	2.88	*	0.01	0.088
2	3.07	2.88	*	0.02	0.051
3	2.11	2.09			
4	2.00	2.20			
5	2.24	2.54	*	0.01	0.076
6	2.55	2.88	*	0.00	0.099
7	3.07	3.19			
8	2.64	2.80			
9	2.81	2.75			
10	2.90	2.68	*	0.04	0.048
11	2.88	2.75			
12	2.91	2.71			
13	3.16	3.23			
14	2.96	3.04			
15	2.43	2.48			
16	2.80	2.90			
17	2.91	2.83			
18	2.58	2.41			
19	3.33	3.42			
20	3.60	3.33	*	0.02	0.057
21	2.90	2.87			
22	2.89	2.73			
23	3.15	3.08			
24	3.11	3.07			
25	2.89	2.72			
26	2.64	2.48			
27	2.82	2.78			
28	2.91	2.76			
29	2.73	2.88			
30	2.63	2.88			
31	2.66	2.62			
32	3.05	2.85			
33	2.50	2.65			
34	2.98	3.03			
35	3.46	3.38			

Statistical Test: One-Way Repeated Measures ANOVA (Wilks' Lambda)

Statistically Significant Changes

Moderate Effect Size*

- Q6. (*From pre to post, students disagreed more that*) Good math teachers show students the exact way to answer the questions they'll be tested on.
(pre 2.55 – post 2.88, Eta Squared = .099)
- Q1. (*Students agreed more that*) To understand math I sometimes think about my personal experiences.
(pre 3.21 – post 2.88, Eta Squared = .088)
- Q5. (*Students disagreed more that*) Mathematics is essentially an accumulation of facts, rules, and formulas to be memorized and used.
(pre 2.24 –post 2.54, Eta Squared = .076)

Small Effect Size*

- Q2. (*Students agreed more that*) I am good at math.
(pre 3.07 – post 2.88, Eta Squared = .058)
- Q.20 (*Students agreed more that*) Doing math helps me understand myself.
(pre 3.60 – post 3.33, Eta Squared .057)
- Q10. (*Students agreed more that*) Math helps me understand the world around me.
(pre 2.90 – post 2.68, Eta Squared = .048)

* Per commonly used guidelines proposed by Cohen (1998) where moderate effect size is greater than .06 and smaller than .14.

Mean Test Scores for Women & Men with Pre and Post-Test Scores

(1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree)

Q #	WOMEN (n = 71)					MEN (n = 25)				
	Pre	Post	Sig.	p	Eta Sq.	Pre	Post	Sig.	p	Eta Sq.
1	3.21	2.88	*	0.01	0.087					
2	{3.07}	{2.90}		{0.06}						
3										
4										
5	2.00	2.11	*	0.01	0.117					
6	2.58	2.96	*	0.02	0.079	2.45	2.64	*	0.01	0.304
7	3.00	3.19	*	0.01	0.138					
8										
9										
10										
11	2.86	2.58	*	0.01	0.109					
12	2.85	2.72	*	0.02	0.081					
13						3.30	3.00	*	0.01	0.159
14	2.94	3.07	*	0.01	0.272	3.09	2.96	*	0.01	0.434
15										
16										
17										
18	2.52	2.42	*	0.01	0.412	2.74	2.39	*	0.1	0.260
19										
20	3.59	3.31	*	0.01	0.108					
21	2.86	2.75	*	0.02	0.086					
22										
23										
24	3.06	3.09	*	0.01	0.125					
25										
26										
27										
28	2.85	2.75	*	0.01	0.090					
29										
30										
31	2.71	2.50	*	0.01	0.242					
32	3.11	2.79	*	0.01	0.117					
33	2.43	2.55	*	0.01	0.173					
34	2.96	3.10	*	0.01	0.180					
35										

Statistical Test: One-Way Repeated Measures ANOVA (Wilks' Lambda)

Results for Women (n = 76)

Large Effect (Eta Squared > .14)

Mean pre and post scores and Eta Squared in parenthesis

- Q18. (*From pre to post, women agreed more that*) Working in groups helps me learn math.
(pre 2.52 – post 2.42, ES = .412)
- Q14. (*Women disagreed more that*) I like exploring problems using real data and computers.
(pre 2.94 – post 3.07, ES = .272)
- Q31. (*Women agreed more that*) Doing math helps me think clearly and logically.
(pre 2.71 – post 2.50, ES = .242)
- Q34. (*Women disagreed more that*) Expressing scientific concepts in mathematical equations just makes them more confusing.
(pre 2.96 – post 3.10, ES = .180)
- Q33. (*Women disagreed more that*) I don't really understand math until I work it out for myself.
(pre 2.43 – post 2.55, ES = .173)
- Q7. (*Women disagreed more that*) Using a computer makes learning math more complicated than it needs to be.
(pre 3.00 – post 3.19, ES = .138)

Moderate Effect Size (Eta Squared > .06)

- Q24. (*Women disagreed more that*) Writing about mathematics makes it easier to learn.
(pre 3.06 – post 3.09, ES = .125)

Moderate Effect Size (Eta Squared > .06) (women)

- Q5. (*Women disagreed more that*) Mathematics is essentially an accumulation of facts, rules, and formulas to be memorized and used.
(pre 2.00 – post 2.11, ES = .117)
- Q32. (*Women agreed more that*) Mathematical thinking helps me make intelligent decisions about my life.
(pre 3.11 – post 2.79, ES = .117)
- Q11. (*Women agreed more that*) Mathematics has been an important tool to help me learn other subjects.
(pre 2.86 – post 2.58, ES = .109)
- Q20. (*Women agreed more that*) Doing math helps me understand myself.
(pre 3.59 – post 3.31, ES = .108)
- Q28. (*Women agreed more that*) Doing mathematics raises interesting new questions about the world.
(pre 2.85 – post 2.75, ES = .090)
- Q1. (*Women agreed more that*) To understand math I sometimes think about my personal experiences.
(pre 3.21 – post 2.88, ES = .087)
- Q21. (*Women agreed more that*) I try to avoid courses that involve math.
(pre 2.86 – post 2.75, ES = .086)
- Q12. (*Women agreed more that*) I have taken some math courses in high school and college that were taught in a very interesting way.
(pre 2.85 – post 2.72, ES = .081)
- Q6. (*Women disagreed more that*) Good math teachers show students the exact way to answer the questions they'll be tested on.
(pre 2.58 – post 2.96, ES = .079)

Results for Men (n = 25)

Large Effect Size (Eta Squared > .14)

Mean pre and post scores and Eta Squared in parenthesis

- Q14. *(From pre to post, men agreed more that)* I like exploring problems using real data and computers.
(pre 3.09 – post 2.96, ES = .434)
- Q6. *(Men disagreed more that)* Good math teachers show students the exact way to answer the questions they'll be tested on.
(pre 2.45 – post 2.64, ES = .304)
- Q18. *(Men agreed more that)* Working in groups helps me learn math.
(pre 2.74 – post 2.39, ES = .260)
- Q13. *(Men agreed more that)* For me, mathematics rarely involves exploration, investigation, or experimentation.
(pre 3.30 – post 3.00, ES = .159)

Regarding minority students....

While there were more statistically significant results for White students, it's too early to make any judgments about the impact of MAC on minority students.

Additionally,

- The group is small
- The group itself is quite diverse as it's composed of all African-American/Blacks, African/Pacific Islanders, Latino/ Hispanics, Native Americans, Other, and any student self-identified as Caucasian and another ethnicity
- The group is not equally distributed across the courses
- The group is not equally distributed across institutions

We need MORE minority students before doing meaningful analysis.

In a preliminary conclusion...

- The pattern is positive with most scales moving in the desired directions
- This remains true even when the results are not statistically significant
- Women show more changes than men, but remember the number of men is small.
- The low numbers and diverse ethnicities of minority students make meaningful analysis impossible.
- We need MORE data
- You are wonderful teachers!