

High School Students' Attitude toward Math and Their Self-reported Identity Measures

Preliminary Findings



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NSF Funded Project

► We do MathShows!



NSF Funded Project

- We do MathShows!

The graphic features a black header bar at the top and bottom. In the center, there's a white background with a faint, swirling orange and yellow pattern. On the left, the NSF logo is shown with the text "Award #: 2005067" below it. On the right, there are two stylized lightbulbs with gears inside. The main title "Follow Me Into Math" is in large, bold, orange letters. Below it, the subtitle "Impacting High Schools with Near-Peer-Centric Informal Learning." is in smaller, orange and black text. At the bottom left, the text "The University of Texas Rio Grande Valley" is visible.

NSF
Award #: 2005067

Follow Me Into Math

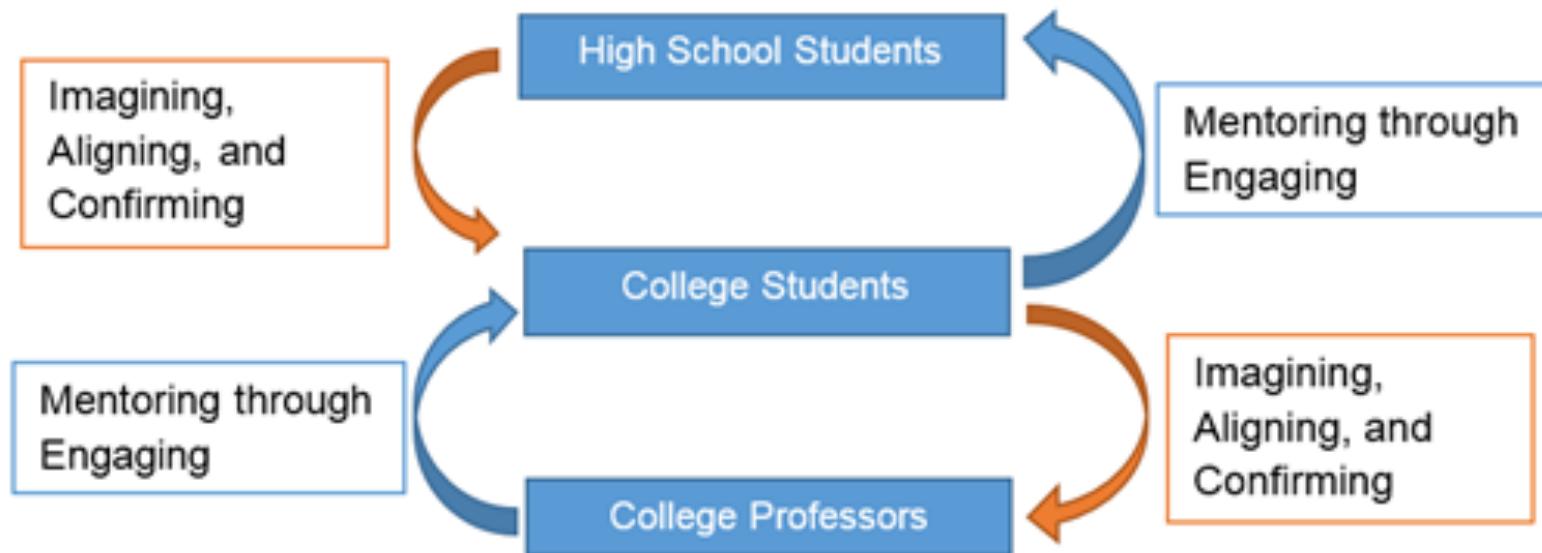
Impacting High Schools with
Near-Peer-Centric Informal Learning.

The University of Texas
Rio Grande Valley

NSF Funded Project

- And we test the

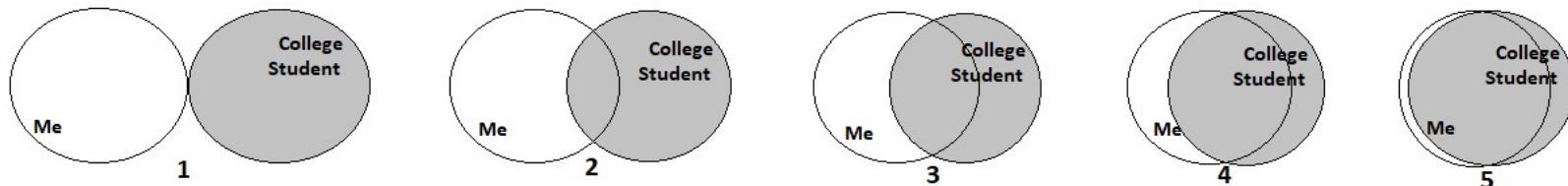
Near-peer Mathematical Mentoring Cycle



Wilson & Grigorian (2019)

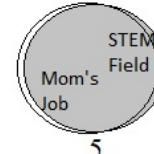
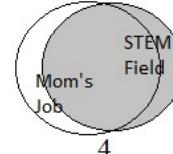
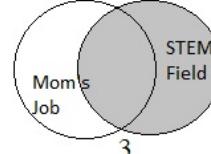
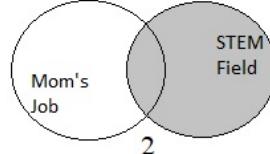
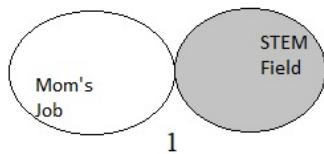
Baseline Data

- ◆ Attitude toward Math (19-item ATMI, Lim and Chapman 2013): total score and four constructs: Enjoyment, Motivation, Self-confidence, Value.
- ◆ 4 Identity Alignment Measures (survey questions: How does your self image overlap with your image of being a ____? Select 1 through 5)
 - ✓ College Student
 - ✓ Mathematician
 - ✓ Scientist
 - ✓ STEM Professional



Baseline Data cont'd

- ◆ Mother/female guardian education (10 levels)
- ◆ Mother/female guardian's job overlap with STEM fields
 - (Survey question: Select the number of the picture that best describes the overlap of your mom's (or female guardian's) job with STEM fields (Science, Technology, Engineering, Mathematics).)
- ◆ Mother impact on attitude toward math and science (7-point likert scale) (Survey question: How has your mother (or female guardian) impacted your interest in Mathematics? Select from negative impact to positive impact, with no impact (or neutral) being the middle point.)
- ◆ Same questions for Father



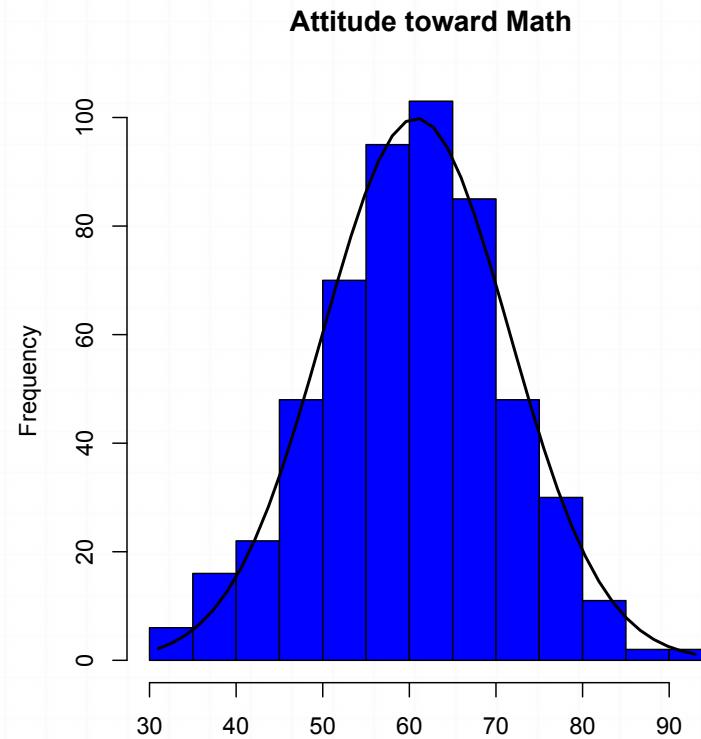
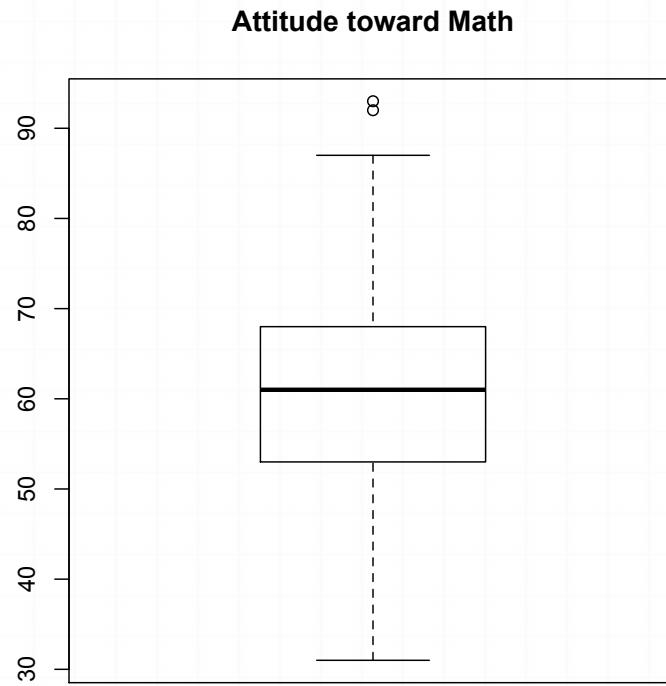
Baseline Data cont'd

- ◆ Self-report ranking on who impact their attitudes toward math and science more.

Survey question: How much have the following people impacted your attitude toward math and science. Drag them into the proper order, from 1 (BIGGEST IMPACT) down to 5 (LEAST IMPACT).

- ✓ Parents (or guardians)
- ✓ Teachers
- ✓ Siblings
- ✓ Other Relatives
- ✓ Friends

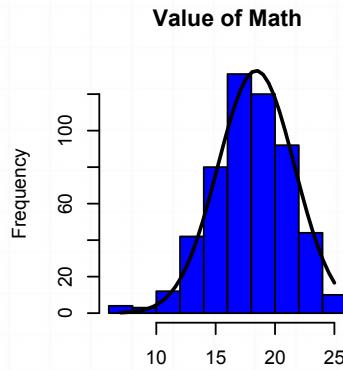
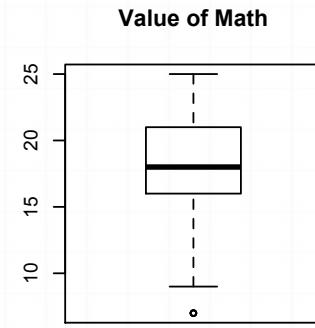
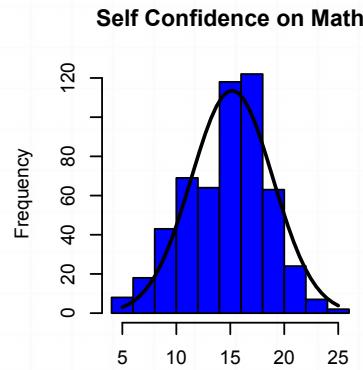
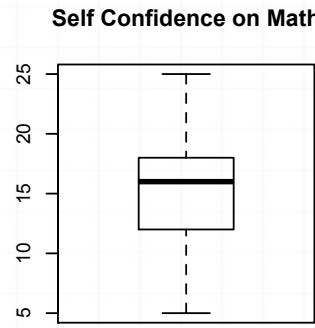
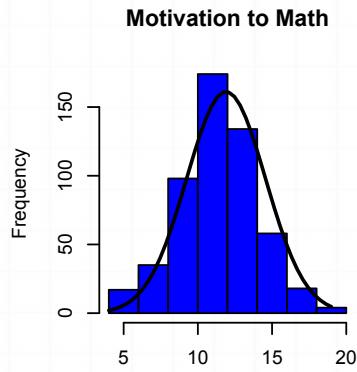
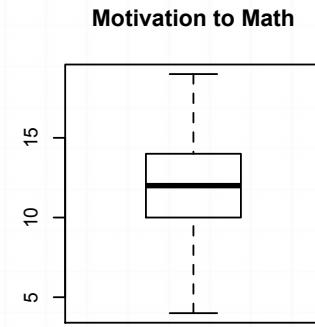
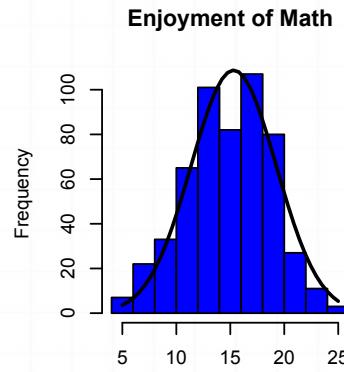
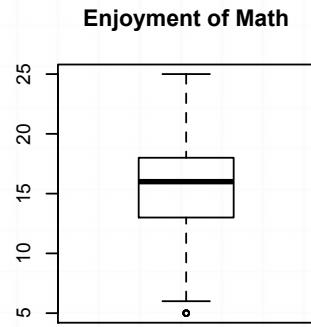
Results: Attitude toward Math



N	Min	Mean/SD	Median	Max	Range	95% CI of the mean
538	31	60.79 (10.75)	61	93	62	(59.88, 61.7)

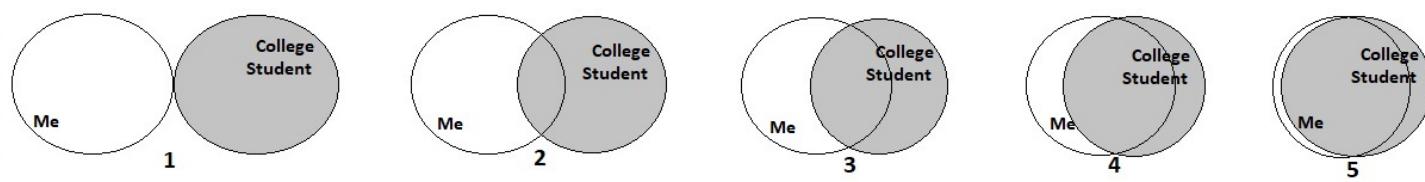
The full score of ATM is 95. Convert it to full scale of 100, 61 is equivalent to 64.

Results: 4 constructs of ATM



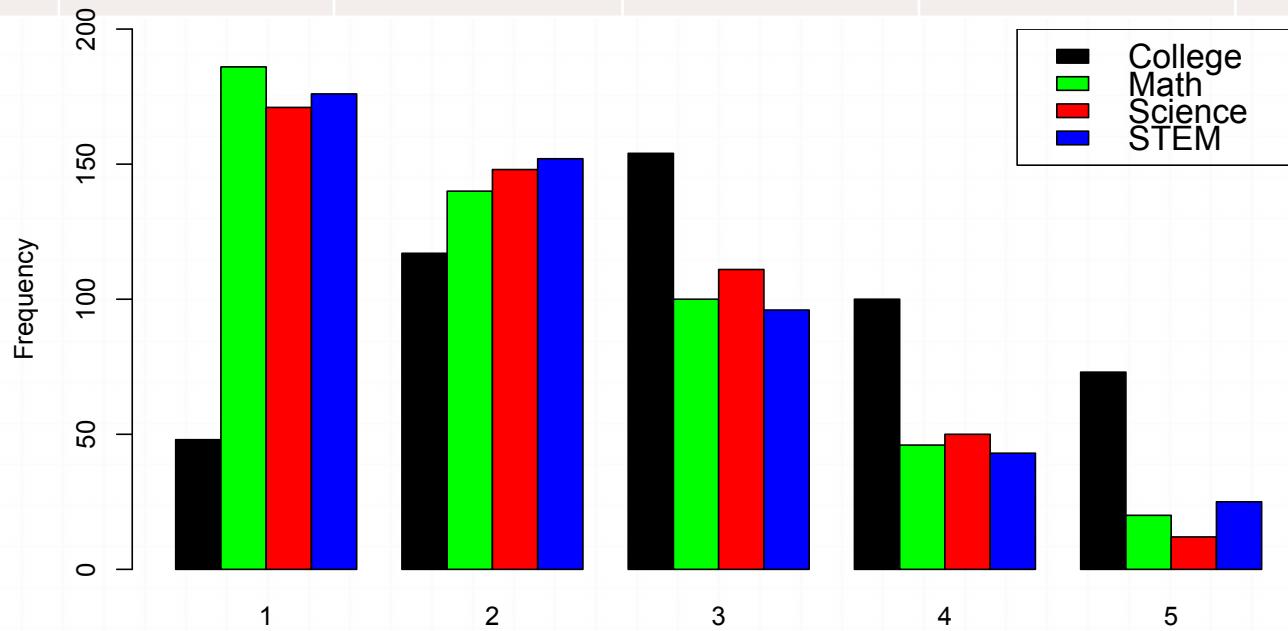
Construct	Min	Mean/SD	Median	Max	Range	95% CI of the mean
Enjoyment	5	15.31 (3.95)	16	25	20	(14.98, 15.64)
Motivation	4	11.9 (2.66)	12	19	15	(11.68, 12.13)
Self-Conf	5	15.17 (3.78)	16	25	20	(14.85, 15.49)
Value	7	18.41 (3.23)	18	25	18	(18.14, 18.69)

Results: Self-reported Identity Alignments

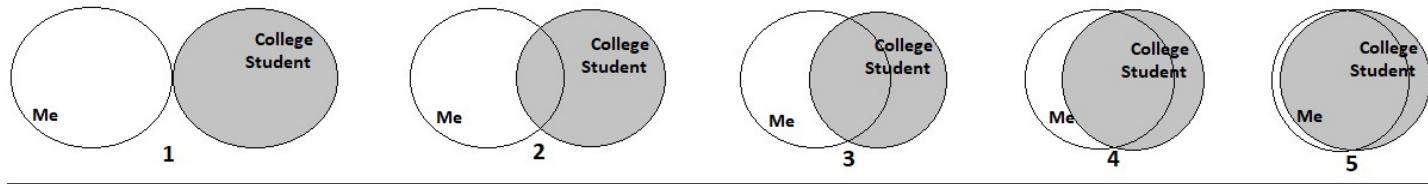


Alignments	1	2	3	4	5
College Student	48 (9.8%)	117 (23.8%)	154 (31.3%)	100 (20.3%)	73 (14.8%)
Mathematician	186 (37.8%)	140 (28.5%)	100 (20.3%)	46 (9.3%)	20 (4.1%)
Scientist	171 (34.8%)	148 (30.1%)	111 (22.6%)	50 (10.2%)	12 (2.4%)
STEM Professional	176 (35.8%)	152 (30.9%)	96 (19.5%)	43 (8.7%)	25 (5.1%)

Valid
N=492

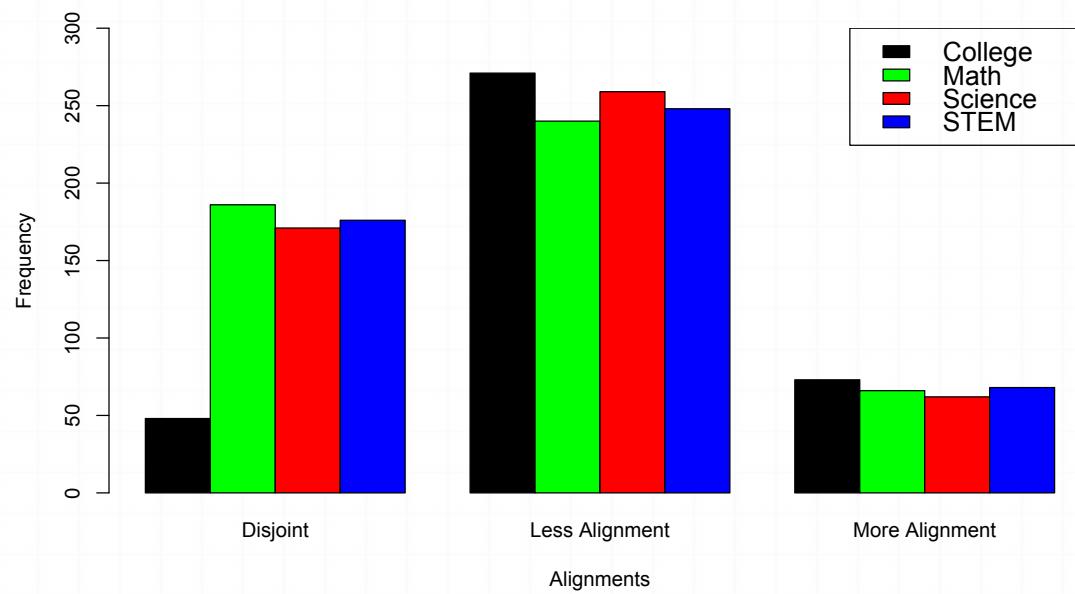


Results: Self-reported Identity Measures



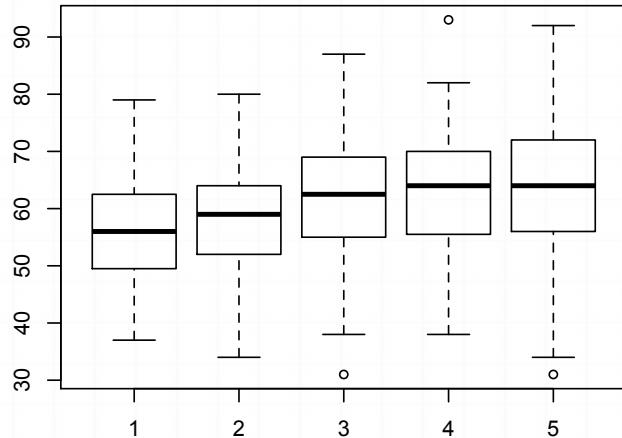
Measures	Disjoint 1	Some Overlap 2,3	Big Overlap 4,5
College Student	48 (9.8%)	271 (55.1%)	73 (35.2%)
Mathematician	186 (37.8%)	240 (48.8%)	66 (13.4%)
Scientist	171 (34.8%)	259 (52.6%)	62 (12.6%)
STEM Professional	176 (35.8%)	248 (50.4%)	68 (13.8%)

Valid
N=492

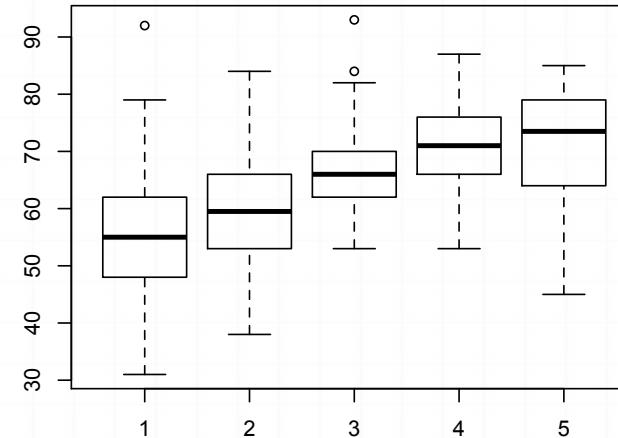


Results: ATM & Self-reported Identity Alignments

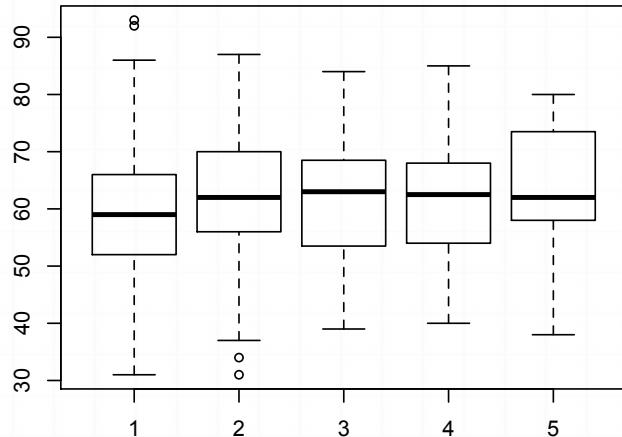
ATM by College Identity



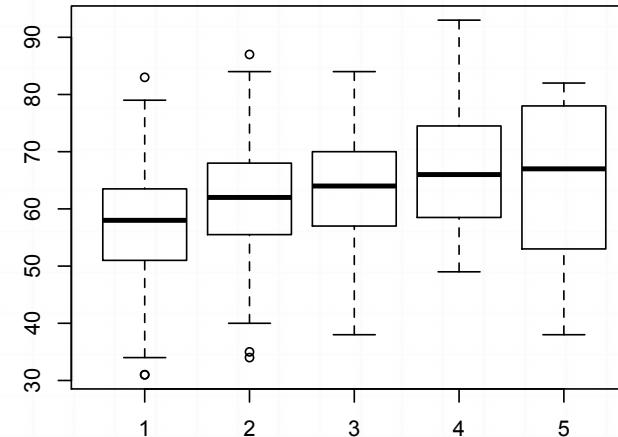
ATM by Math Identity



ATM by Science Identity



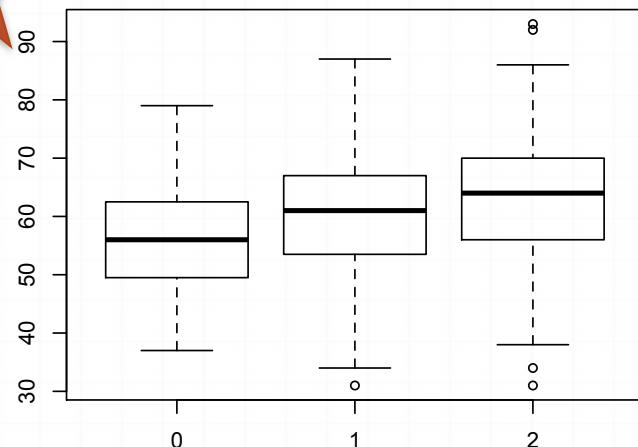
ATM by STEM Identity



Results: ATM & Self-reported Identity Alignments

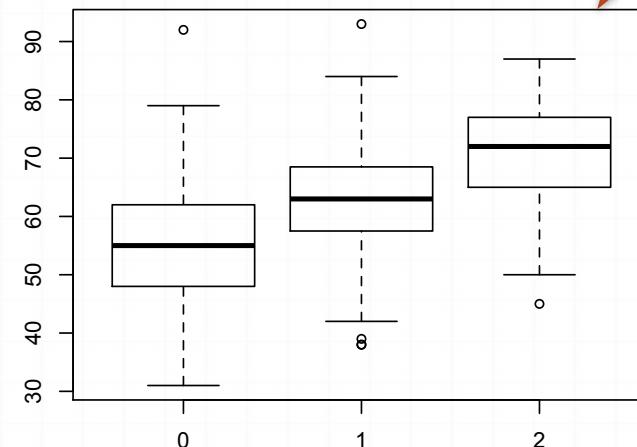
Means:
56.12
60.49
62.95
 $(0,1)^*$
 $(0,2)***$
 $(1,2)$

ATM by College Identity



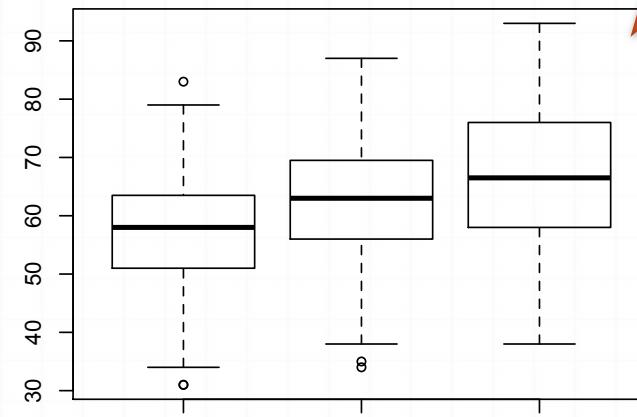
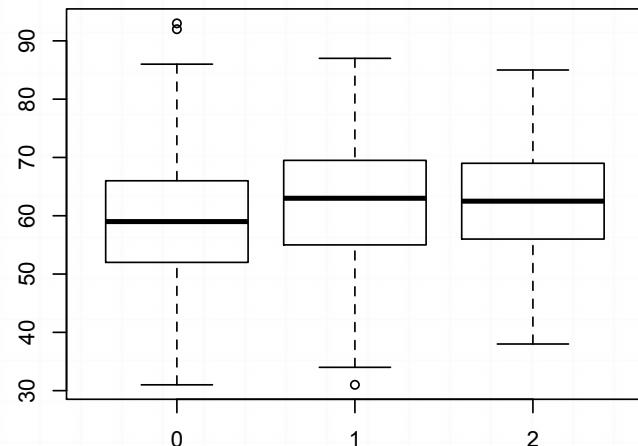
$F=8.36, df=(2, 489), p<.001, \eta^2=0.03$

ATM by Math Identity



$F=74.49, df=(2, 489), p<.001, \eta^2=0.23$

ATM by Science Identity



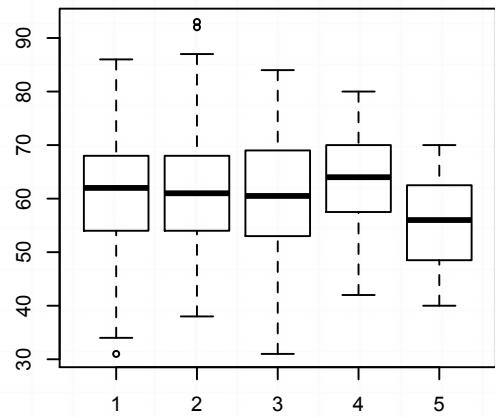
$F=24.32, df=(2, 489), p<.001, \eta^2=0.09$

Means:
55.18
62.71
70.67
 $(0,1)***$
 $(0,2)***$
 $(1,2)***$

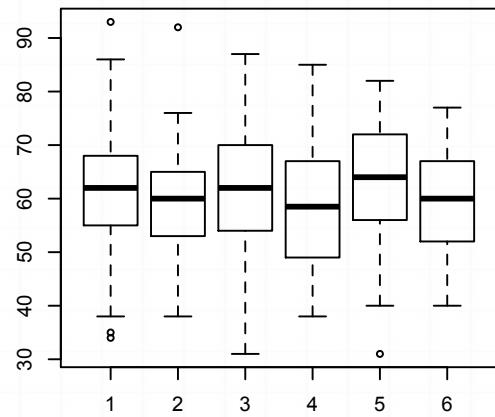
Means:
57.03
62.2
66.38
 $(0,1)***$
 $(0,2)***$
 $(1,2)**$

Results: ATM and Parents' STEM Identity, Edu, Impact

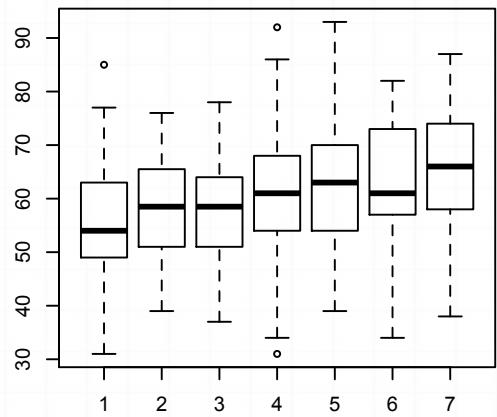
ATM by Mother STEM Identity



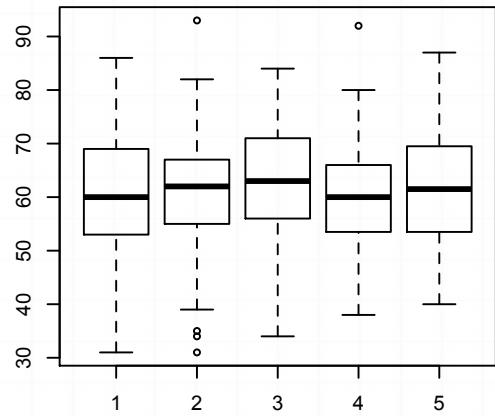
ATM by Mother Edu



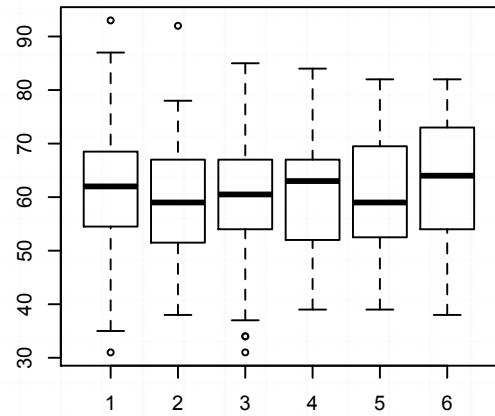
ATM by Mother Impact



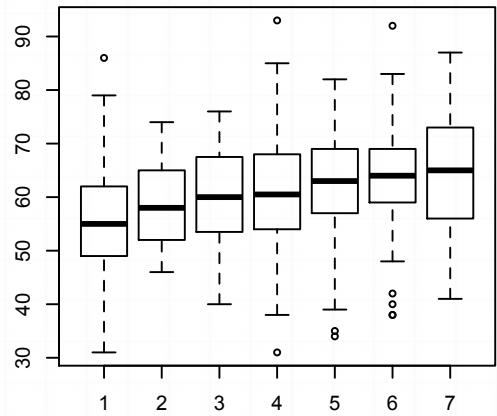
ATM by Father STEM Identity



ATM by Father Edu



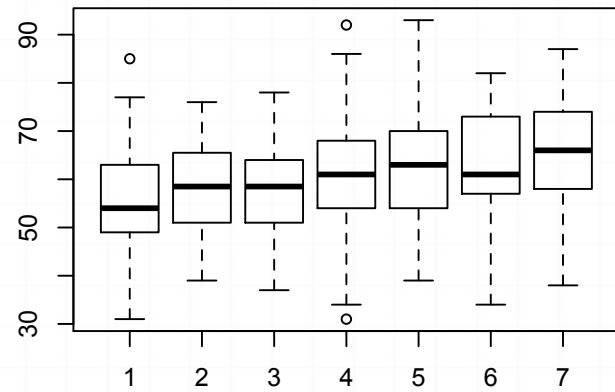
ATM by Father Impact



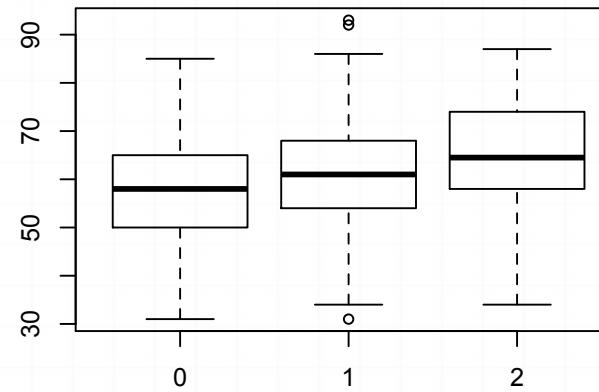
Results: ATM and Parents' Impacts (regrouping)

(1,2) (3,4,5) (6,7)

ATM by MotherImpact Original



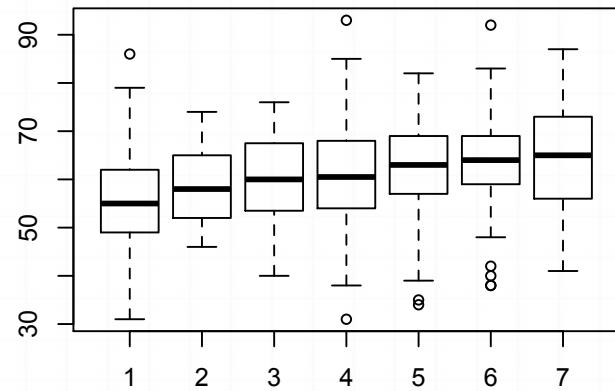
ATM by MotherImpact gp1



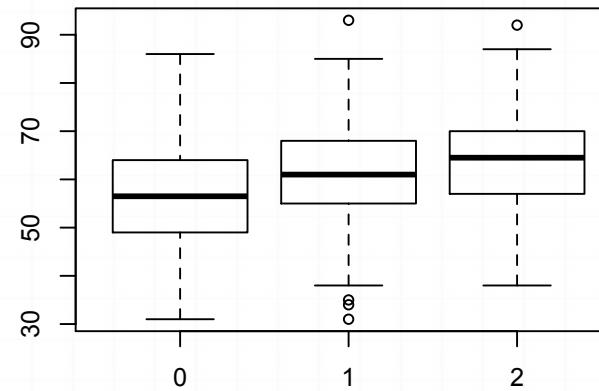
Means:
57.83
60.6
64.59
(0,1)
(0,2)***
(1,2)**

$F=8.14, df=(2, 489), p<.001, \eta^2=0.03$

ATM by FatherImpact Original



ATM by FatherImpact gp1



Means:
57.05
60.96
63.91
(0,1)**
(0,2)***
(1,2)*

$F=11.47, df=(2, 489), p<.001, \eta^2=0.04$

Results: impacts ranking

(valid N=493)	Biggest impact 1	2 nd Biggest impact 2	Middle impact 3	Less impact 4	Least impact 5
Parents	192 (38.9%)	176 (35.7%)	59 (12%)	44 (8.9%)	22 (4.5%)
Teachers	252 (51.1%)	130 (26.4%)	66 (13.4%)	30 (6.1%)	15 (3%)
siblings	27 (5.5%)	91 (18.5%)	181 (36.7%)	123 (24.9%)	71 (14.4%)
Other Relatives	9 (1.8%)	47 (9.5%)	90 (18.3%)	151 (30.6%)	196 (39.8%)
Friends	13 (2.6%)	49 (9.9%)	97 (19.7%)	145 (29.4%)	189 (38.3%)

162 (32.9%) students reported rankings “**Parents 2 & Teachers 1**”.

110 (22.3%) of students reported rankings “Parents 1 & Teachers 2”.

280 (56.8%) students reported **Teachers having more impact than Parents**.

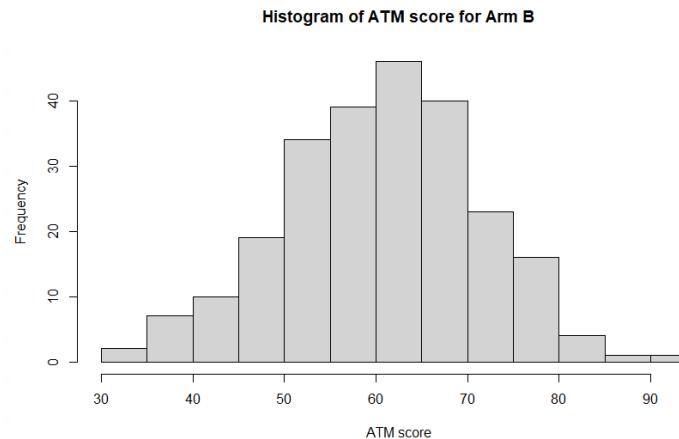
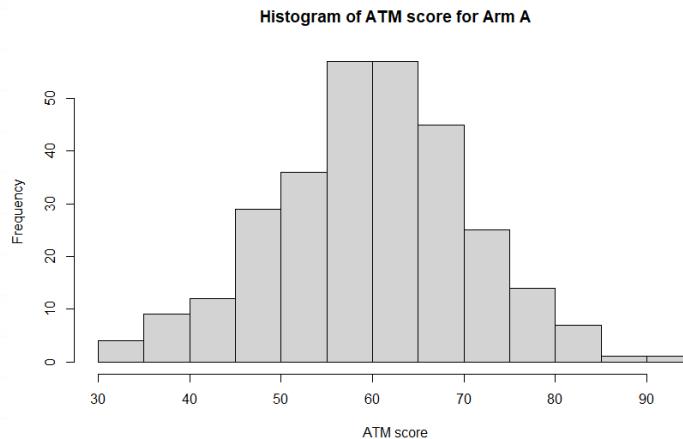
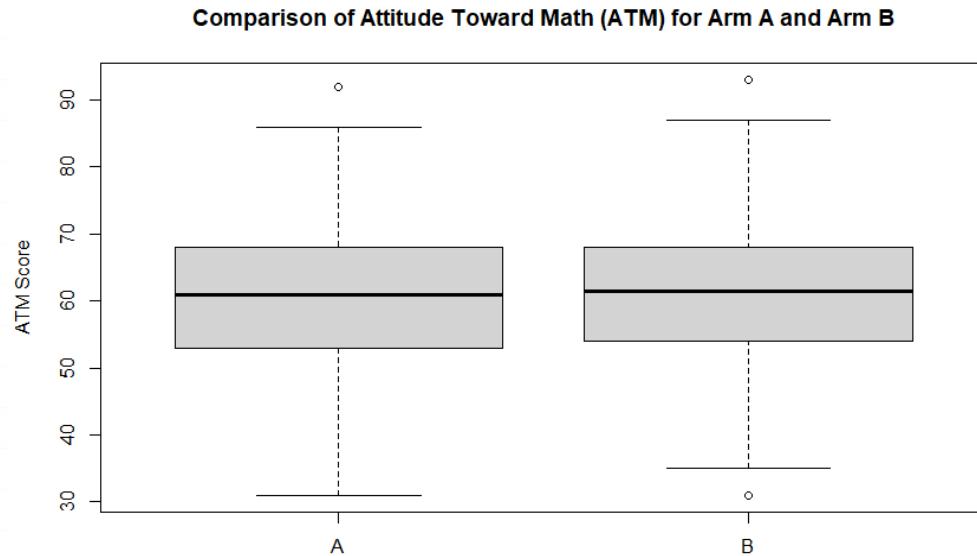
213 (43.2%) students reported Parents having more impact than Teachers.

Teachers matters more!!

Compare Arms A and B

◆ Attitudes toward math ($N_A=297, N_B=241$)

	Arm A	Arm B
Min	31	31
Q1	53	54
Median	61	61.5
Mean	60.46	61.19
Q3	68	68
Max	92	93
Range	61	62
SD	10.62	10.89



Compare Arms A and B

◆ Identity alignments

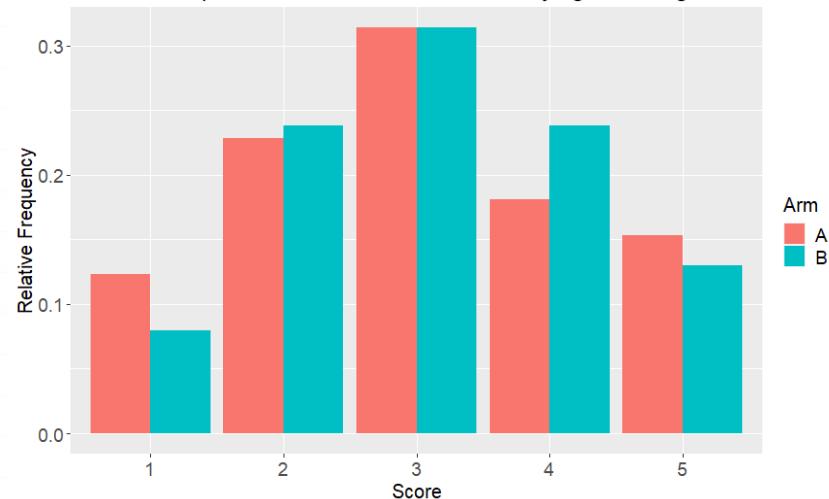
Self-Identify as College Student

Score	Arm A	Arm B
1	36 (12.3%)	19 (8.9%)
2	67 (22.9%)	57 (23.9%)
3	92 (31.4%)	75 (31.4%)
4	53 (18.1%)	57 (23.8%)
5	45 (15.4%)	31 (13.0%)
Total	293 (100%)	239 (100%)

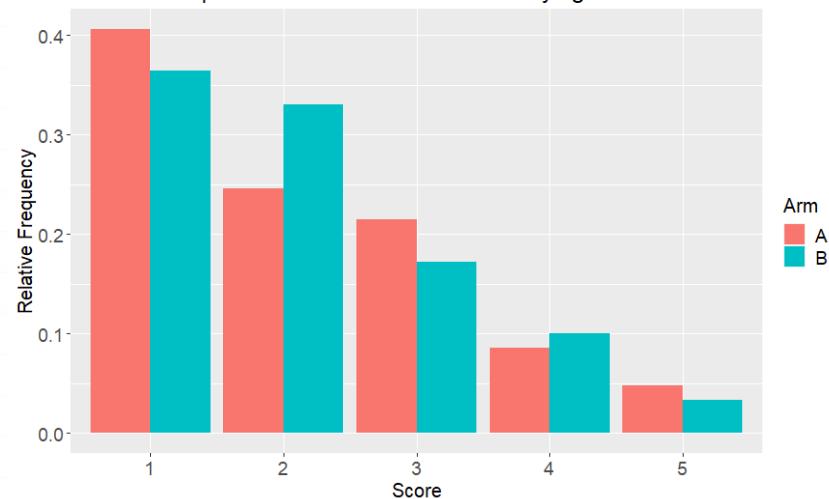
Self-Identify as Mathematician

Score	Arm A	Arm B
1	119 (40.6%)	87 (36.4%)
2	72 (24.6%)	79 (33.1%)
3	63 (21.5%)	41 (17.2%)
4	25 (8.5%)	24 (10.0%)
5	14 (4.8%)	8 (3.3%)
Total	293 (100%)	239 (100%)

Relative Frequencies of Scores for Self-Identifying as College Student



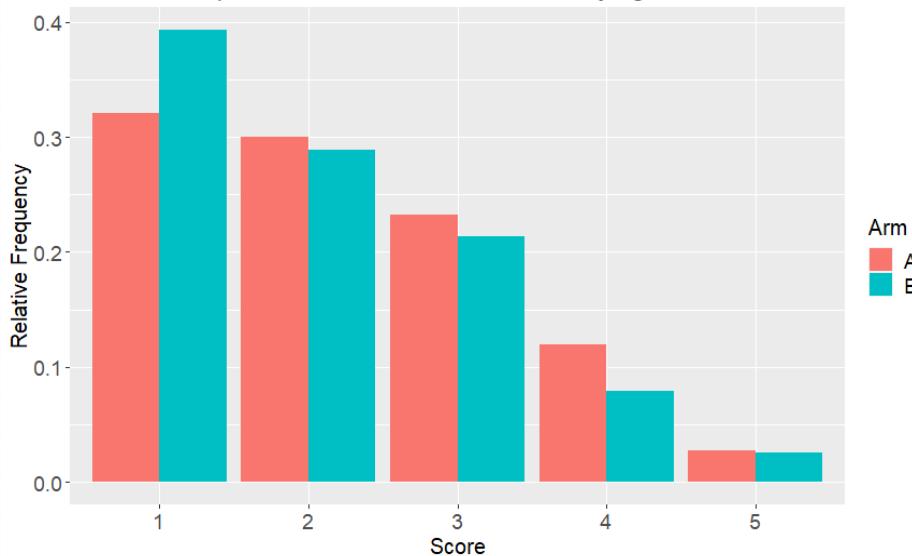
Relative Frequencies of Scores for Self-Identifying as Mathematician



Self-Identify as Scientist

Score	Arm A	Arm B
1	94 (32.1%)	94 (39.3%)
2	88 (30.0%)	69 (28.9%)
3	68 (23.2%)	51 (21.3%)
4	35 (11.9%)	19 (7.9%)
5	8 (2.7%)	6 (2.5%)
Total	293 (100%)	239 (100%)

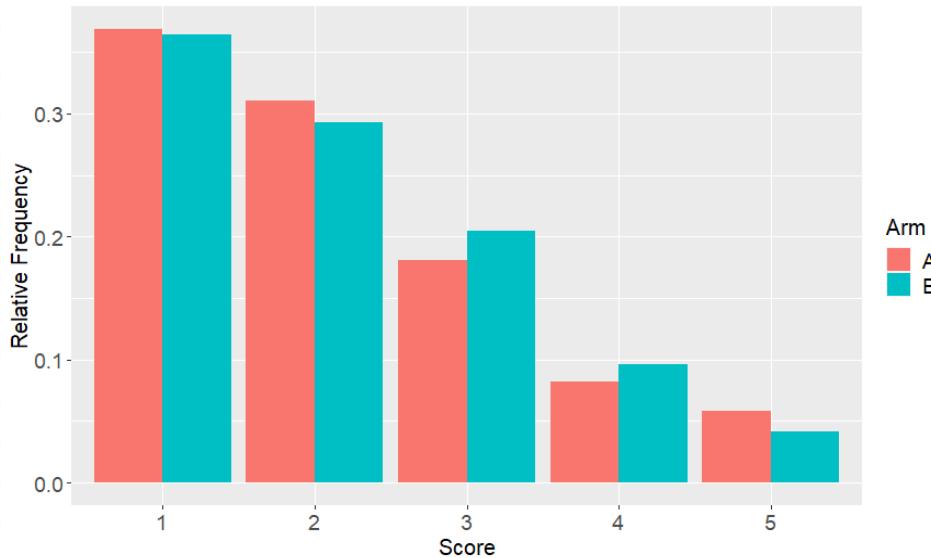
Relative Frequencies of Scores for Self-Identifying as Scientist



Self-Identify as STEM Professional

Score	Arm A	Arm B
1	108 (36.9%)	87 (36.4%)
2	91 (31.1%)	70 (29.3%)
3	53 (18.1%)	49 (20.5%)
4	24 (8.2%)	23 (9.6%)
5	17 (5.8%)	10 (4.2%)
Total	293 (100%)	239 (100%)

Relative Frequencies of Scores for Self-Identifying as STEM Professional

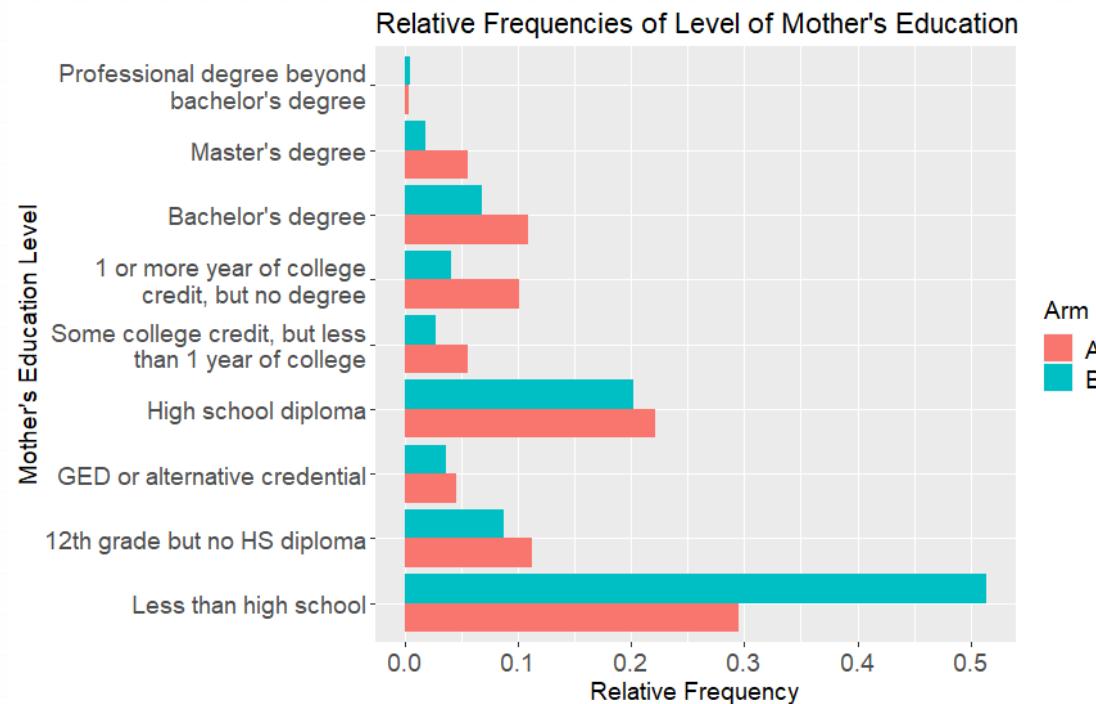


Compare Arms A and B

◆ Parents' education level

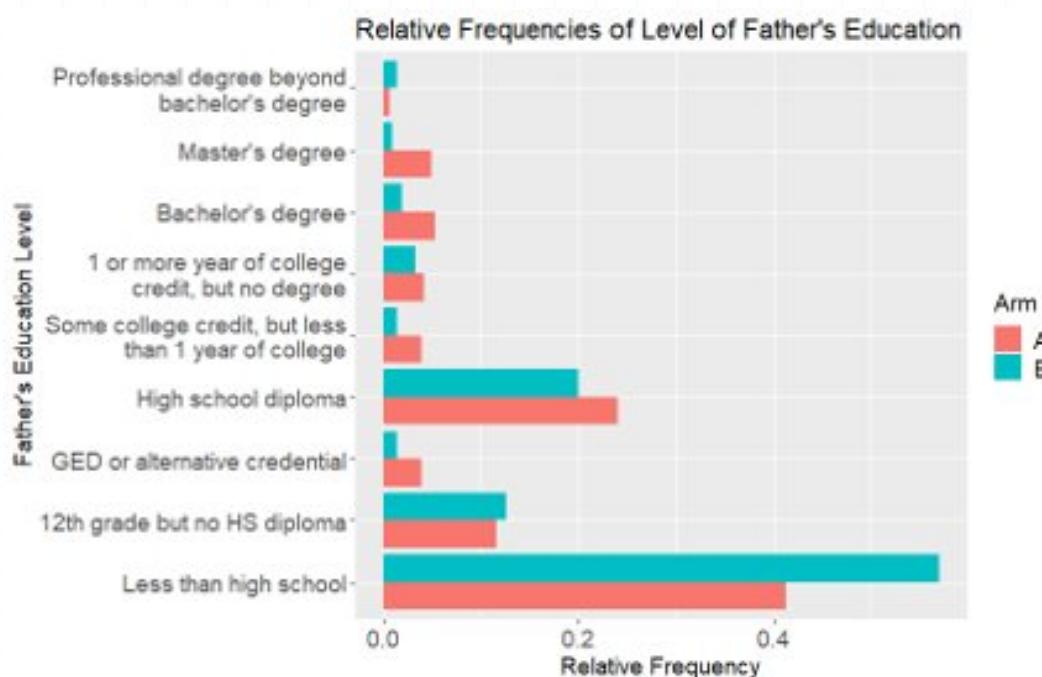
Mother's Education Level

Education level	Arm A	Arm B
Professional degree beyond bachelor's degree	1 (0.4%)	1 (0.5%)
Master's degree	16 (5.6%)	4 (1.8%)
Bachelor's degree	31 (10.9%)	15 (6.9%)
1 or more year of college credit, but no degree	29 (10.2%)	9 (4.1%)
Some college credit, but less than 1 year of college	16 (5.6%)	6 (2.7%)
High school diploma	63 (22.1%)	44 (20.2%)
GED or alternative credential	13 (4.6%)	8 (3.7%)
12th grade but no HS diploma	32 (11.2%)	19 (8.7%)
Less than high school	84 (29.5%)	112 (51.4%)
Total	285 (100%)	218 (100%)



Father's Education Level

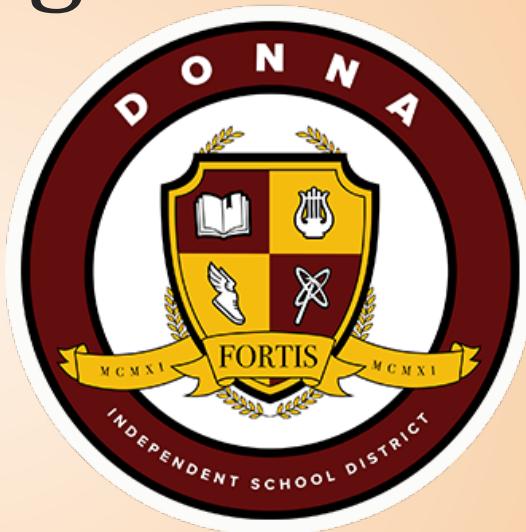
Education level	Arm A	Arm B
Professional degree beyond bachelor's degree	2 (0.7%)	3 (1.4%)
Master's degree	14 (4.9%)	2 (0.9%)
Bachelor's degree	15 (5.3%)	4 (1.9%)
1 or more year of college credit, but no degree	12 (4.2%)	7 (3.3%)
Some college credit, but less than 1 year of college	11 (3.9%)	3 (1.4%)
High school diploma	68 (24.0%)	43 (20.1%)
GED or alternative credential	11 (3.9%)	3 (1.4%)
12th grade but no HS diploma	33 (11.7%)	27 (12.6%)
Less than high school	117 (41.3%)	122 (57.0%)
Total	283 (100%)	214 (100%)



Acknowledgements



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Award ID: 2006067



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