

# **EDUCATOR'S EQUITY IN STEM: A PLAN TO RECRUIT STUDENTS TO STEM FIELDS.**

**Sarah Miller**

**CCBC Essex, Mathematics.**



Project began with my participation in....



EE-STEM



Micromessaging To Reach and Teach Every Student Program

Beginning in January 2012



# REFINED THROUGH MY PARTICIPATION IN PROJECT ACCESS COHORT 9



is a mentoring and professional development initiative for two-year college mathematics faculty. The project's goal is to provide experiences that will help new faculty become more effective teachers and active members of the broader mathematical community.

**Sponsored by**

***The American Mathematical Association of Two-Year Colleges***

Beginning in October 2012

**LOOKING TO PERHAPS FURTHER  
DEVELOP THIS RESEARCH THROUGH  
THE MORGAN STATE  
COMMUNITY COLLEGE LEADERSHIP  
DOCTORAL PROGRAM  
– COHORT 36**



Project began with my participation in....



EE-STEM



Micromessaging To Reach and Teach Every Student Program



# Sponsors...



## THE FINE PRINT

- *Micromessaging to Reach and Teach Every Student, a professional development program for teachers, is designed to increase the participation and success of their students in Science, Technology, Engineering and Mathematics (STEM), with an emphasis on underrepresented populations, including women. Educators, including secondary and post-secondary faculty, learn how they can use the power of micro-messages (small and often subtle, yet powerful messages) to improve classroom pedagogy and increase the enrollment, retention, performance and completion of students in STEM.*

# Micromessaging

## Micromessages

- Small, subtle, semi-conscious messages we send and receive when we interact with others

## Micro-inequities

- Negative micro-messages we send other people that cause them to feel devalued, slighted, discouraged or excluded

## Micro-affirmations

- Positive micro-messages that cause people to feel valued, included, or encouraged





## Class Premise:

Little Changes Can Make a Big  
Difference in Attracting and  
Retaining Women in STEM

## My Premise:

Little Changes can make a big  
difference in attracting more  
students (in general) to STEM  
fields.



# THE PROBLEMS....

- ▶ Nationwide deficit to meet demands for skilled workers in STEM fields
- ▶ In Maryland, projected 40% deficit in STEM labor force



# THE PROBLEMS ARE EVEN WORSE FOR FEMALES IN THE STEM PIPELINE.

- ▶ The number of women and underrepresented groups in STEM is declining
- ▶ Elementary, Middle, and High School
  - Girls and boys take Math and science in equal numbers
- ▶ High school graduates prepared to major in STEM: males  $\approx$  females



# THE PROBLEMS CONTINUED....

- ▶ First-year college STEM majors: males > females
- ▶ College graduation in nearly every STEM field: males > females
  - Engineering, physics, computer science only 20% of the degrees awarded to women
- ▶ Women's representation declines even further in graduate school
- ▶ And yet again in the workplace

# MY DIFFERENTIAL EQUATIONS STUDENTS:

	# Females	Total	Percent
Fall 09	2	21	10%
Sp 10	5	29	17%
Fall 10	5	15	33%
Sp 11	5	26	19%
Sp 12	5	24	21%
Fall 12	4	18	22%
Sp 13	4	23	17%
Fall 13	2	24	8%
Sp 14	3	24	13%
Fall 14	4	24	17%
Totals	39	228	17%





**Amy Francetic** Become a fan



CEO of Clean Energy Trust, science junkie, clean energy evangelist, mom, runner, dog lover

# We Need More Women in Energy and STEM

Posted: 09/16/2014 11:17 am EDT | Updated: 09/16/2014 11:59 am EDT



- “A 2012 report by President Obama’s Council of Advisors on Science and Technology stated that over the next decade, nearly two million additional STEM graduates will be needed.

- <http://spectrum.ieee.org/at-work/education/the-stem-crisis>

- Georgetown's Center on Education and the Workforce predicts that the total number of STEM jobs will grow 26 percent between 2010 now 2020

[http://www.huffingtonpost.com/linda-rosen/the-truth-hurts-the-stem-\\_b\\_3900575.html](http://www.huffingtonpost.com/linda-rosen/the-truth-hurts-the-stem-_b_3900575.html)





# America Desperately Needs More STEM Students. Here's How to Get Them

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*This article is by Rodney C. Adkins, senior vice president of [IBM](#)'s Systems & Technology Group. He is a National Academy of Engineering inductee and serves on the national board of the Smithsonian Institution.*



MY OWN PLAN

TO RECRUIT STUDENTS


TO STEM FIELDS



**Why are you a  
general studies  
major when the  
STEM fields  
need you?????**



# PROJECT DESIGN HIGHLIGHTS

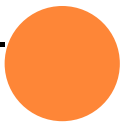
- First day survey including, “What is your major?”
- Design and use worksheets, one for each chapter covered in the course, and also a mid-term project. Each to:
  - a) Reinforce the importance of STEM.
  - b) Introduce a different STEM career.
- At the end of each chapter, give short video “commercials” which encourage students to continue to the next higher math course along a STEM track and also to consider STEM related majors.
- Last day survey including, “What is your major?” 

# WORKSHEETS

- Have you ever considered a career as an Actuary?
- Have you ever considered a career as a Pharmacist?
- Have you ever considered a career as an Natural Resources Engineer?
- Have you ever considered a career in CyberSecurity?
- Have you ever considered a career in Transportation Engineering?

(Listed on the 2012 Forbes Report on Best Paying College Majors

<http://www.forbes.com/pictures/lml45edfef/civil-engineering-majors/>




# A Midterm Project on Meteorology

There were 9,640 atmospheric and space scientists employed in the United States as of May 2011, according to the Bureau of Labor Statistics. The average salary paid to the workers was \$90,860 a year.

<http://work.chron.com/average-national-salaries-meteorologists-8831.html>

In an 2011 article entitled 10 JOBS WITH REALLY LOW UNEMPLOYMENT, published by U-T San Diego, atmospheric sciences / meteorology placed second behind actuarial science.

<http://www.utsandiego.com/news/2011/Nov/07/10-science-jobs-really-low-unemployment/>



# VIDEOS USED:

1<sup>st</sup> Day: <http://www.youtube.com/watch?v=3bnMBhO0LnU>

After Chapter 1:

<http://www.youtube.com/watch?v=R8twBGoGRqc&feature=related>

After Chapter 2:

<http://www.youtube.com/watch?v=dfeBQxmx1kY>

After Chapter 3:

<http://www.youtube.com/watch?v=ZwitRltCfyc>

After Chapter 4:

<http://www.youtube.com/watch?v=biWQZlUI-vE>

After Chapter 5:

<http://www.youtube.com/watch?v=UILRrE72wVc>

Last Day:

<http://www.youtube.com/watch?v=WlnLAOCZDWI>



## THE MORAL OF THE STORY!!!!

“All college majors  
are not created  
equal!”





- “STEM majors earn \$500,000 more than non-STEM majors over a lifetime.”

[http://www.huffingtonpost.com/linda-rosen/the-truth-hurts-the-stem-\\_b\\_3900575.html](http://www.huffingtonpost.com/linda-rosen/the-truth-hurts-the-stem-_b_3900575.html)



# The 20 Best- and Worst-Paid College Majors

## Highest-Earning Majors

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- Mining and Mineral Engineering
- Metallurgical Engineering
- Mechanical Engineering
- Naval Architecture and Marine Engineering
- Electrical Engineering
- Chemical Engineering
- Aerospace Engineering
- Mathematics and Computer Sciences
- Pharmacy and Pharmaceutical Sciences and Administration
- Petroleum Engineering



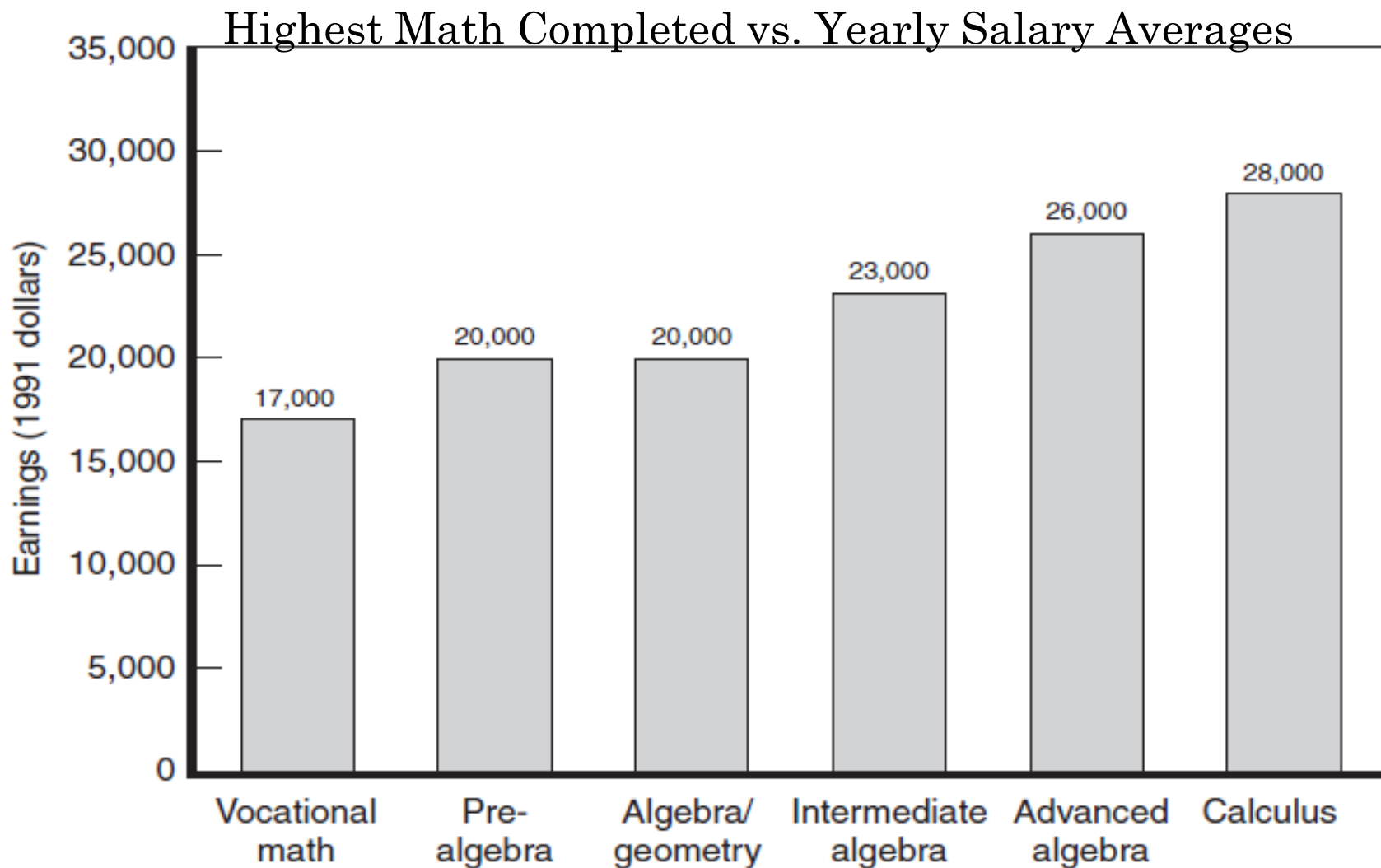
[http://content.time.com/time/specials/packages/article/0,28804,2073703\\_2073653\\_2073690,00.html](http://content.time.com/time/specials/packages/article/0,28804,2073703_2073653_2073690,00.html)



.... AND IF I CAN'T  
CONVINCE YOU TO  
CHANGE YOUR MAJOR,  
I'LL WORK TO CONVINCE  
YOU TO TAKE MORE  
MATH.



- **Students who take higher-level math courses earn higher salaries.**



- “The annual earnings of those who have taken calculus is about 65 percent higher than the earnings of those who have only completed basic math.”

<http://www.achieve.org/files/BuildingBlocksofsuccess.pdf>, 2010



# THERE ARE GOOD MAJORS OUTSIDE OF STEM TOO!

- Examples forensic science, health-sciences, finance etc...
- My favorite example from finance....



$$A = Pe^{rt}$$

Invest \$1200 at 7% annual interest rate. How much will your investment be worth in 40 years? (\$19,700)



○ Invest \$1200 at 7% every year for the next 40 years.  
How much will your investment be worth?





# RESULTS:

# STEM MAJORS

	Fa 12		Sp 13		Fa 13		Sp 14	
	1st Day	Last Day	1st Day	Last Day	1st Day	Last Day	1st Day	Last Day
<b>NON-STEM</b>								
physical education	1	1	0	1	0	0	0	0
nursing / medical	9	7	5	3	5	4	10	7
undecided, general	14	7	19	16	11	4	25	17
vet tech	1	1	2	1	1	1	1	1
primary / early child	1	2	0	1	1	1	1	1
fine arts	2	2	2	1	0	0	0	0
business / econ/ a	2	5	4	3	2	2	1	3
criminal justice	2	2	1	0	0	0	0	0
world languages /	0	0	2	1	0	0	0	0
psychology / social	0	0	1	1	0	1	1	1
<b>STEM</b>								
math	2	2	1	1	1	1	1	2
engineering	2	2	7	7	4	4	2	4
computer science	5	6	1	3	0	2	1	2
meteorology	0	1	0	0	0	0	0	0
chemistry	0	0	1	2	0	0	0	0
pharmacy	0	0	1	3	0	0	0	1
biology	6	7	4	3	1	0	1	2
Total STEM	15	18	15	19	6	7	5	11
Total Students	47	45	51	47	26	20	44	41
Percent STEM	32%	40%	29%	40%	23%	35%	11%	27%



# RESULTS:

## STEM MAJOR DECLARATIONS

**7 Pooled Sections**

**1st Day**

**24%**

**Last Day**

**36%**



# CONCLUSIONS:

12% increase in STEM Majors from beginning to end of term.

\*\*\* Results are significant???

These early statistics show that the chosen interventions **are probably** effective in recruiting students to STEM fields.



- Create “Small Measurable Changes”  
- Claudia Morrell
- “Teachers change the world... one student at a time.”
- "Any genuine teaching will result, if successful, in someone's knowing how to bring about a better condition of things than existed earlier."- John Dewey 