

A stylized, light-colored plant illustration with several leaves and small, round buds, positioned on the left side of the slide against a dark background.

# 2018 INTERNATIONAL FACULTY TRAINING CONFERENCE

STEM PROJECTS WITH SCHOOL DISTRICTS AND  
HIGHER EDUCATION  
INSTITUTIONS BOTH IN THE US AND IN ASIA  
THROUGH GRANTS  
PARTNERSHIP

JULY 27, 2018

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# The Beginning





A faint, grayscale background image showing a group of people in a meeting or conference setting, with some individuals standing and others seated.

# Project MIND started in Palm Beach, Florida

With the generous support from:

- The Community Foundation for Palm Beach and Martin Counties
- The South Florida Annenberg Challenge
- The National Science Foundation
- The Jim and Jan Moran Foundation and
- The School District of Palm Beach, Broward, and Miami-Dade County



# Spread to numerous states in the USA

Examples include:

- California
- Florida
- Georgia
- Massachusetts
- Nevada
- New Jersey
- New Mexico
- North Carolina
- Ohio
- South Carolina
- Tennessee
- Texas
- Utah



# Teacher Training





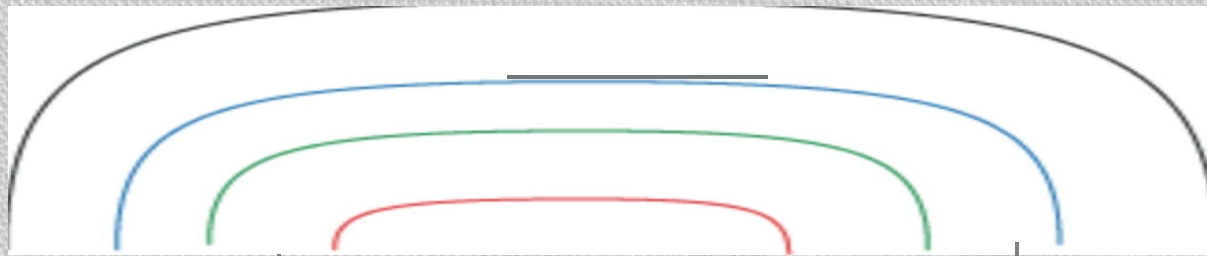
# College Professor Training





# Friedrich Gauss

**By Jane M. Wilburne, Posted October 10, 2014** - I love the story of Carl Friedrich Gauss—who, as an elementary student in the late 1700s, amazed his teacher with how quickly he found the sum of the integers from 1 to 100 to be 5,050. Gauss recognized he had fifty pairs of numbers when he added the first and last number in the series, the second and second-last number in the series, and so on. For example:  $(1 + 100)$ ,  $(2 + 99)$ ,  $(3 + 98)$ , . . . , and each pair has a sum of 101.

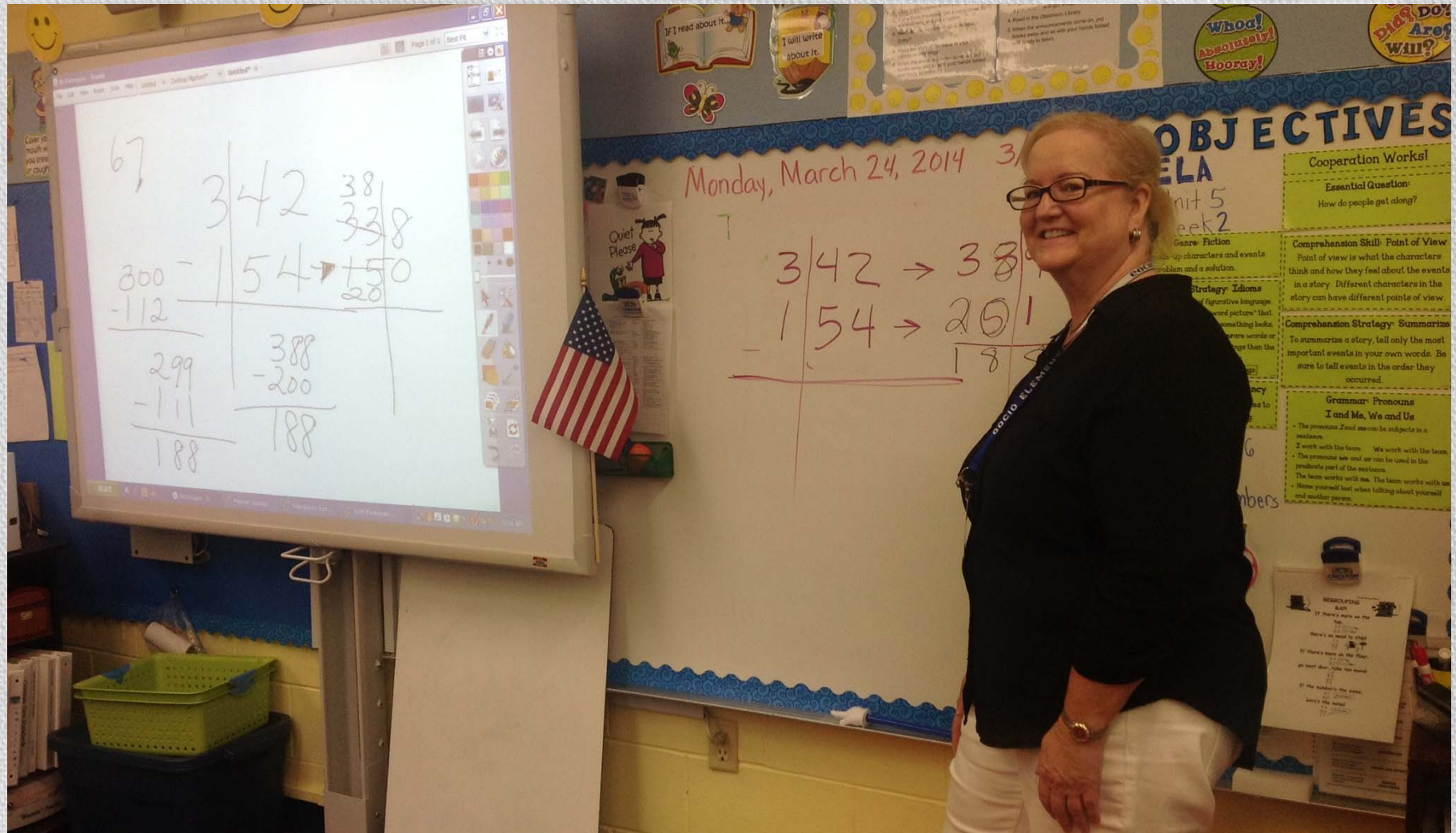


1 + 2 + 3 + 4 + . . . . . 97 + 98 + 99 + 100

50 pairs x 101 (the sum of each pair) = 5,050.

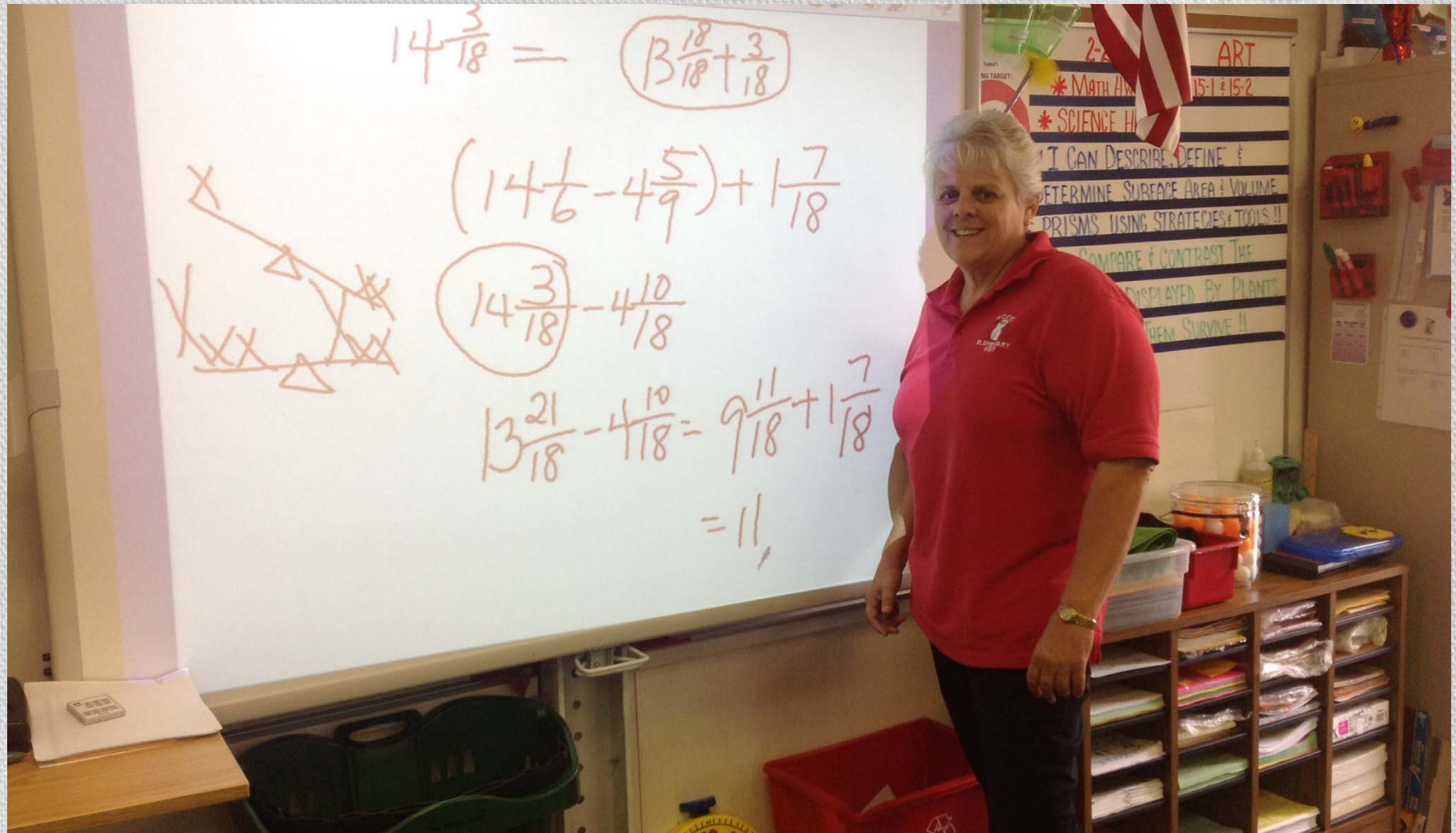


# Sample subtraction strategy (样本减法策略)



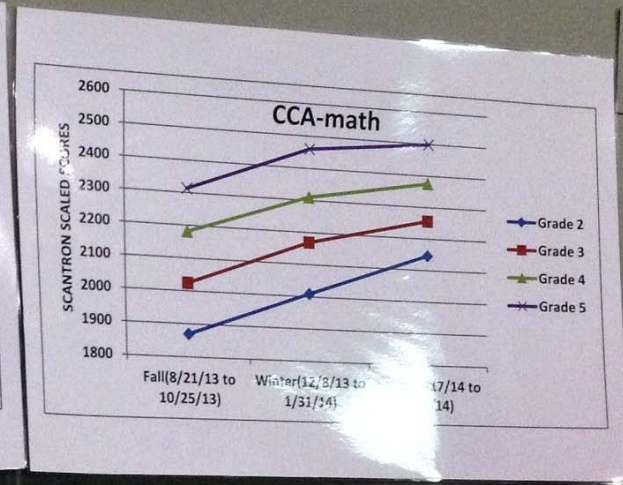
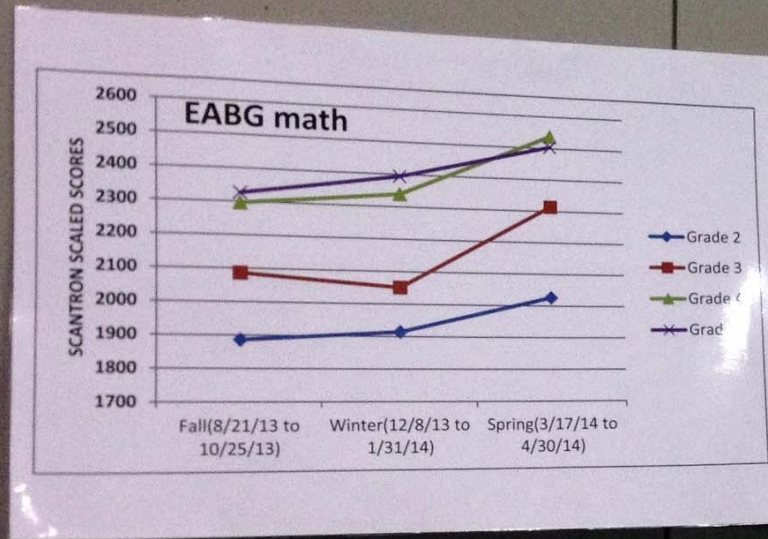


# Sample fraction strategy





# Sample Implementation Results





# Project MIND Conference



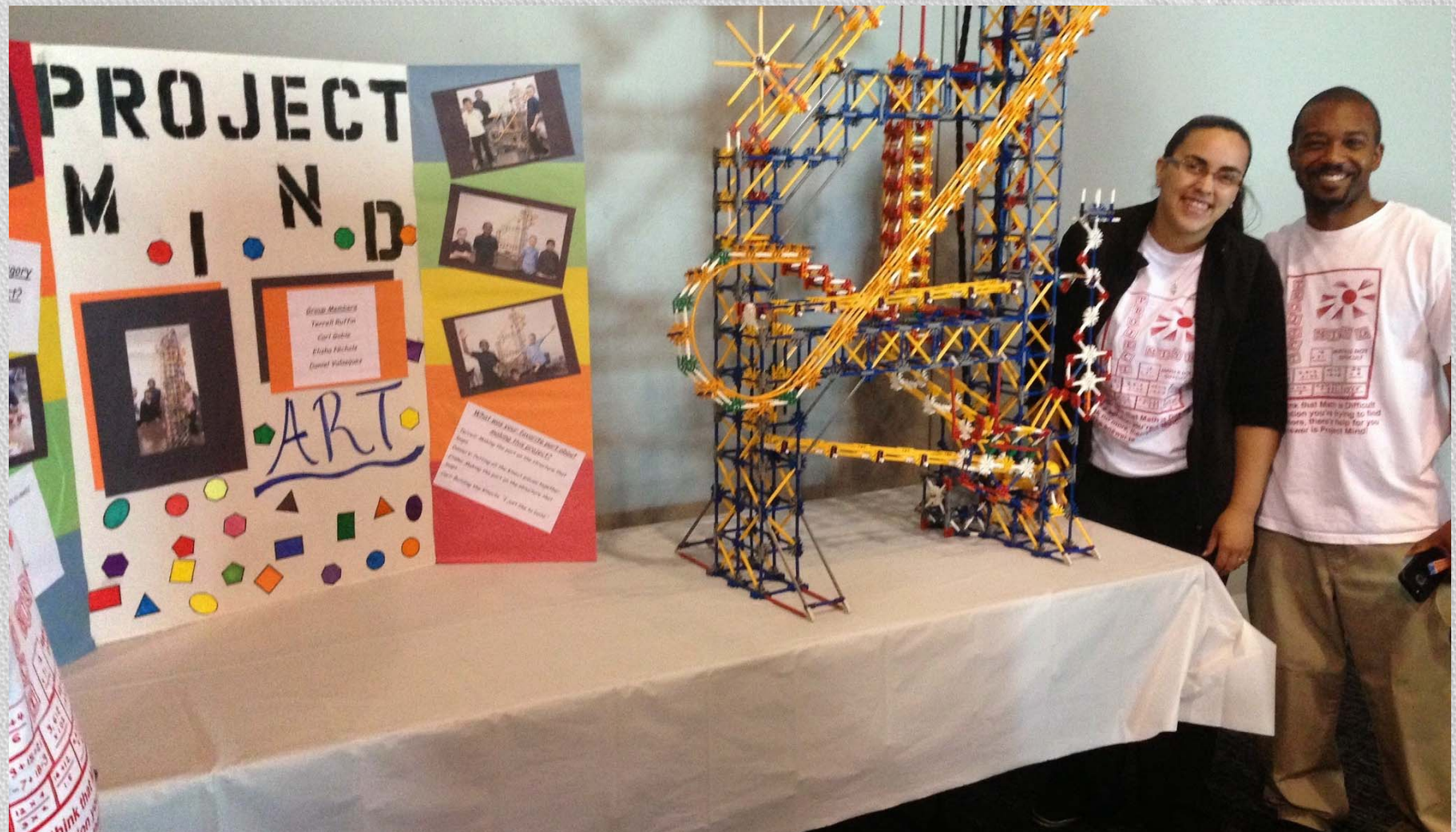


# Math Stories



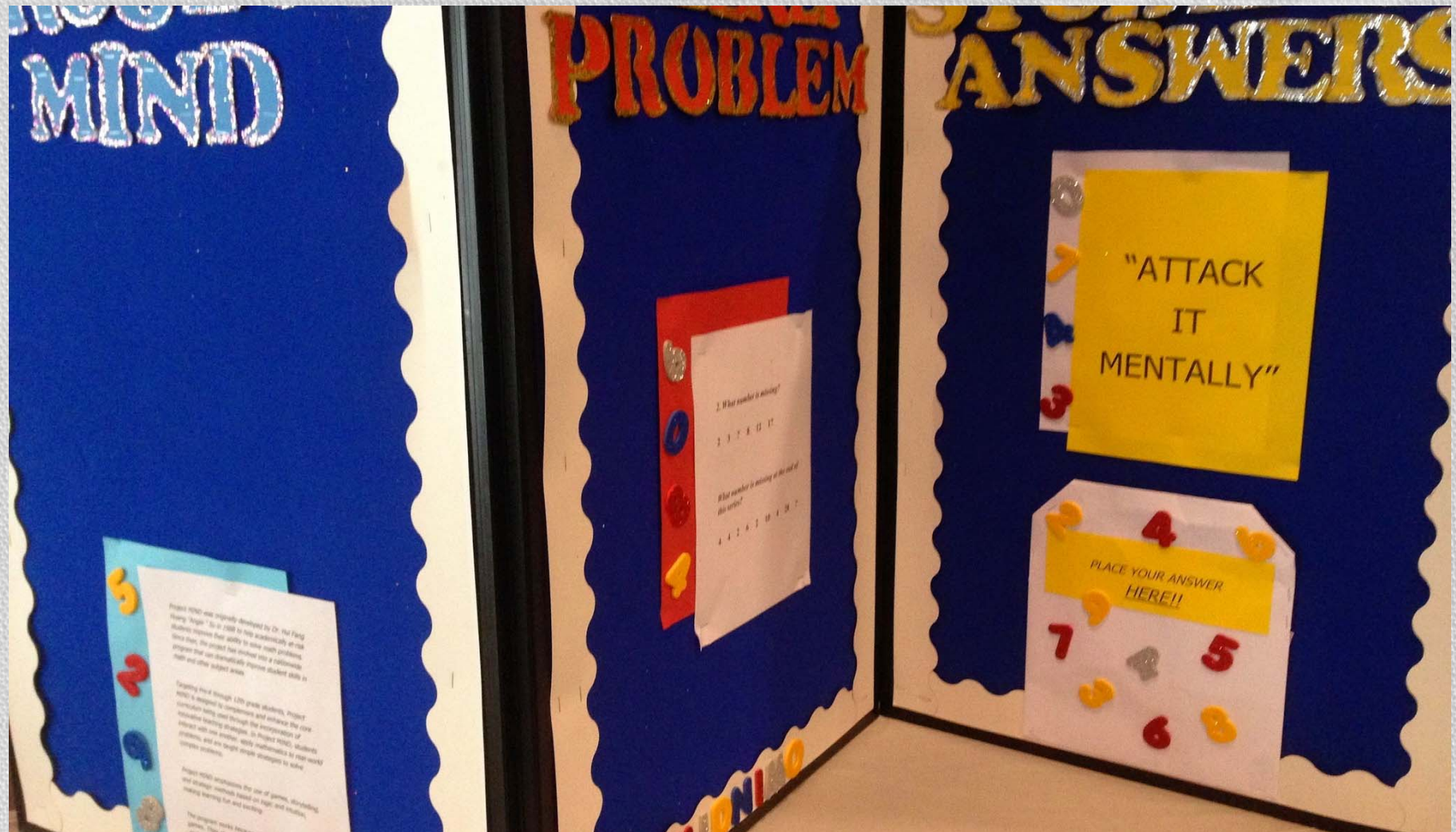


# Math Arts, Ohio





# Weekly Mathematics Problems





# Math Songs





# Middle School Mental Math Competition





# Puzzles and Brainteasers



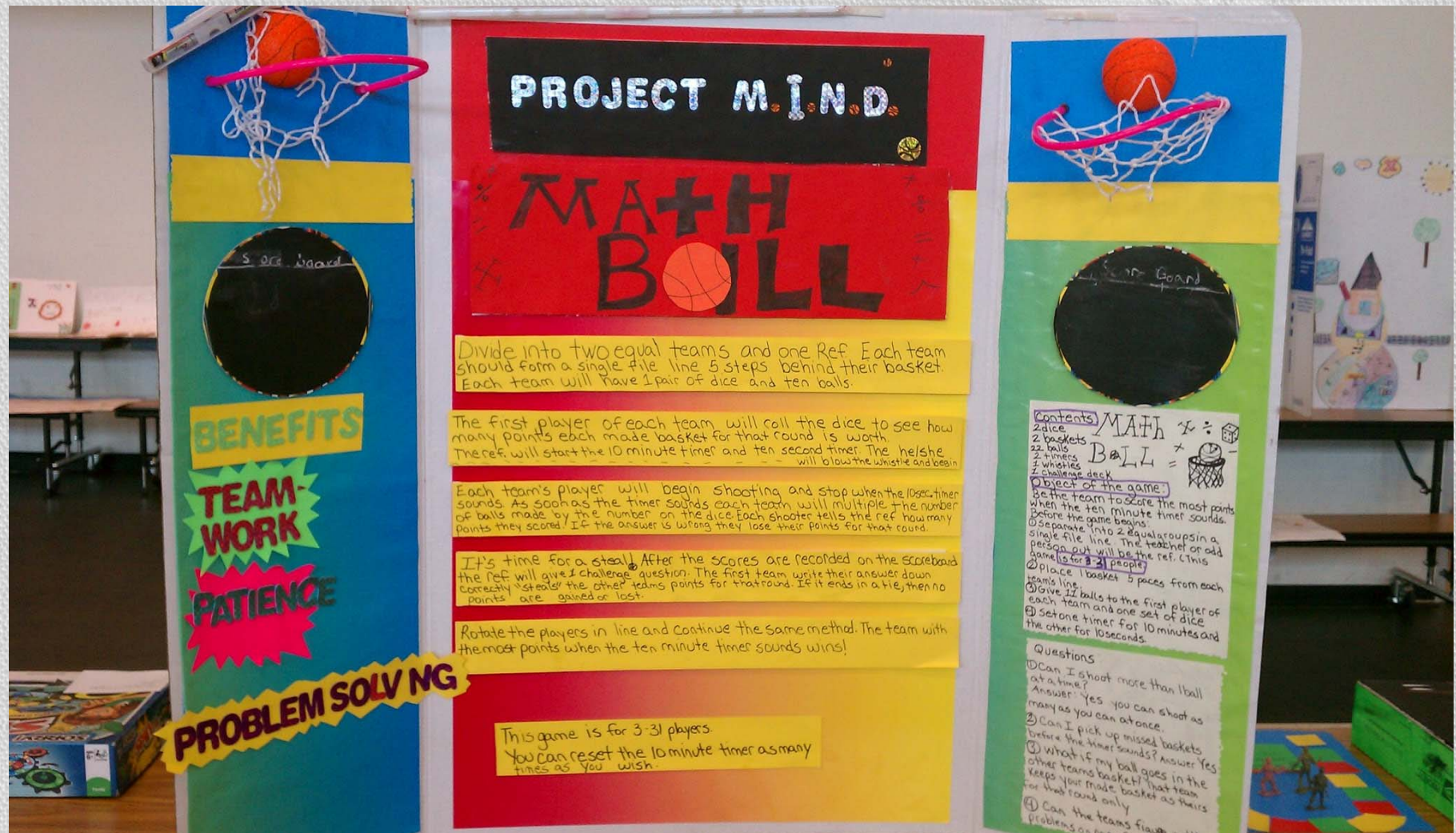


# Math Arts





# Math Games





# End-of-the-Year Project MIND Competition





# Gifted Middle Grade Students





# Math and Science Connections





# Geometry Connections





# Project W.I.N. (Women in Need)



## Improving QOL In Community

### Project Growth & Sustainability

In addition to improving the quality of life for the Tri-County area residents, the goal of the NSU Quality of Life (QOL) Council is to promote scholarly research which will achieve sustainability and ultimately have a statewide, national, and global impact. In the past 13 years, over 50 community based research studies have been funded and we're proud to say that many of these projects have gained sustainability through community and national funding sources. We encourage you to take a moment to "catch up" with our previous award winners and see how their projects have grown since QOL..

Women in Need, P.I. Dr. Hui Huang "Angie" Su

**Principal Investigator:** Hui Fang Huang "Angie" Su, Ed.D.

**Team Members:** Kathy Thomas, Ed.D., Stan Hannah, Ph.D., Madeleine Hellman, Ed.D.

Project WIN's primary purpose was to help the women who reside at the Broward Outreach Center (a homeless shelter in Pompano Beach, Florida) improve overall functioning, while focusing on the skills needed to reenter the workforce. This was achieved through the implementation of a training program designed to enhance memory recall capabilities and compensate for memory loss, through the use of mathematics. In addition to the educational aspects of the program, the development of social networks among the participants, the building of self-esteem, and the opportunity for self-improvement were cited by most of the participants as being among the most important results of the program.

Project WIN has been awarded Governor Jeb Bush's prestigious Points of Light Award. The project also was featured in Boca



# Examples of Populations served: MIND for the Homeless





# Nanjing Kindergarten





# MIND Training for the Special Education Teachers in Taiwan





## **Mathematic Intervention for Children with Autism in Taiwan (CCK Foundation)**

- During the study period, a total of thirteen children with autism completed the mathematic intervention with mean age of 7.50 years (76.92% female) were identified in the study group.
- Seventeen children with similar autistic function were identified in the control group with mean age of 7.33 years and 88.20% female.
- The results in Table 1 show that no significant differences in age ( $P=0.44$ ) and gender ( $P=0.41$ ) for two groups



**Table 1. Demographic Characteristics of Study Subjects (Children)**

	Study Group		Control Group		P-value
	n	%	n	%	
<b>Gender</b>					0.41
<b>Male</b>	10	76.92	15	88.20	
<b>Female</b>	3	23.08	2	11.80	
<b>Age(years)</b>	Mean	SD	Mean	SD	0.44
	7.50	.73	7.33	.91	



# Mathematic Intervention for Children with Autism in Taiwan (December, 2017)

Nonparametric Friedman tests were used to compare the pre- to post intervention change between the study and control subjects, that indicated significant differences between study and control group in both mathematic problem solving ability ( $P=0.04$ ) (Table 2) and Bracken receptive total composite score ( $P=0.002$ ) (Table 3).



## Table 2 – Friedman Test Results for Mathematics Problem Solving Ability Score

**Table 2. Friedman Test Results for Mathematic Problem Solving Ability Score**

	Study Group			Control Group			P-value
	Mean	SD	Median	Mean	SD	Median	
<b>Pre-Math Intervention</b>	27.92	16.32	29.00	32.35	10.65	31.00	<b>.04*</b>
<b>Post-Math Intervention</b>	35.77	14.30	34.00	35.42	8.89	34.00	
<b>*Significant at <math>P \leq 0.05</math></b>							



## Table 3 – Friedman Test Results for Bracken Receptive Total Composite Score (RTC)

**Table 3. Friedman Test Results for Bracken Receptive Total Composite Score (RTC)**

	Study Group			Control Group			P-value
	Mean	SD	Median	Mean	SD	Median	
<b>Bracken_RTC</b>							<b>.002*</b>
<b>Pre-Math Intervention</b>	129.23	22.21	145.00	128.29	24.73	135.00	
<b>Post- Math Intervention</b>	140.38	18.08	146.00	134.59	26.95	148.00	
<b>*Significant at <math>P \leq 0.05</math></b>							



# Mathematic Intervention for Children with Autism in Taiwan

Further, we compared the relevant Bracken subset assessments for the two groups. Although study group demonstrated improvement in all the Bracken subsets after intervention, there were only two Bracken subsets: self/social awareness ( $P=0.000$ ) and time/sequence ( $P=0.015$ ) showed significant differences between study and control groups (Table 4).



# Table 4 – Friedman Test Results for Bracken Subset Assessment

Table 4. Friedman Test Results for Bracken Subset Assessment

	Study Group			Control Group			P-value
	Mean	SD	Median	Mean	SD	Median	
<b>Bracken_Direction/Position</b>							.525
Pre-Math Intervention	14.62	4.31	16.00	15.18	5.09	18.00	
Post-Math Intervention	15.92	3.80	16.00	15.41	5.00	18.00	
<b>Bracken_Self/Social Awareness</b>							.000*
Pre-Math Intervention	4.38	1.71	5.00	4.53	1.94	5.00	
Post-Math Intervention	5.38	1.12	6.00	4.76	1.75	5.00	
<b>Bracken_Texture/Material</b>							.067
Pre-Math Intervention	6.77	3.19	7.00	7.18	3.50	8.00	
Post-Math Intervention	9.15	2.94	10.00	8.18	4.32	10.00	
<b>Bracken_Quantity</b>							.054
Pre-Math Intervention	17.23	4.19	18.00	16.65	4.37	18.00	
Post-Math Intervention	19.31	3.47	20.00	17.41	5.30	19.00	
<b>Bracken_Time/Sequence</b>							.015*
Pre-Math Intervention	12.08	4.23	14.00	11.06	3.99	12.00	
Post-Math Intervention	14.23	3.22	15.00	12.88	4.24	13.00	
<b>*Significant at <math>P \leq 0.05</math></b>							



# RESULTS

The collected data were tabulated and analyzed with two types of statistical methods including descriptive and inferential statistics.

Nonparametric statistics were performed due to non-normal distribution of data from a relatively small sample size in this pilot study.

All statistical analyses were performed with the IBM SPSS Statistics Version 25 for Windows.

The significant level was set at 0.05 P-value.



# Sri Lanka Field Testing of *Divide-Add and Halve-Add (DAHA) Method*





## Field Test Results with 131 student Participants

we conducted a research study of 4<sup>th</sup> grade students of two schools (one is a girls' school and the other is a mixed one) in Sri Lanka. We refer to these schools as School A and School B. The two schools are located in the same city and there were no significant differences in their learning environments.

In both schools, a teacher took one class and explained the DAHA method for 15 to 20 minutes at the start of the lesson, engaged in problem solving activities, and then conducted a 15 minutes test on this new method, consisting of 10 sums of multiplication (up to 12) of two numbers while keeping the other class as control group. The control group also tested on the same but asked them to solve the problems using the standard method. In both groups, students' performances are evaluated (in a scale of 0-100) and a summary of the results are shown in the Table 1.



# Student Achievement Data

## Student Achievement Data:

Table 1: Test Performance Summary

School A			School B	
Method Used	Standard	DAHA	Standard	DAHA
Number of Students	38	31	31	31
Mean Score	96	86	88	58
Median Score	100	100	100	60

Table 1 shows that the average scores of the students who followed the standard method to solve problems are very high; 96 and 88 for schools A and B, respectively. Also, the students of School A performed very well in the DAHA method with an average score of 86. Further, school A median scores show that at least 50% of the students in school A scored the full marks (100) in both methods. For better comparison of students' performance, field data are further analyzed and are illustrated in Figure1.



# Test Performance

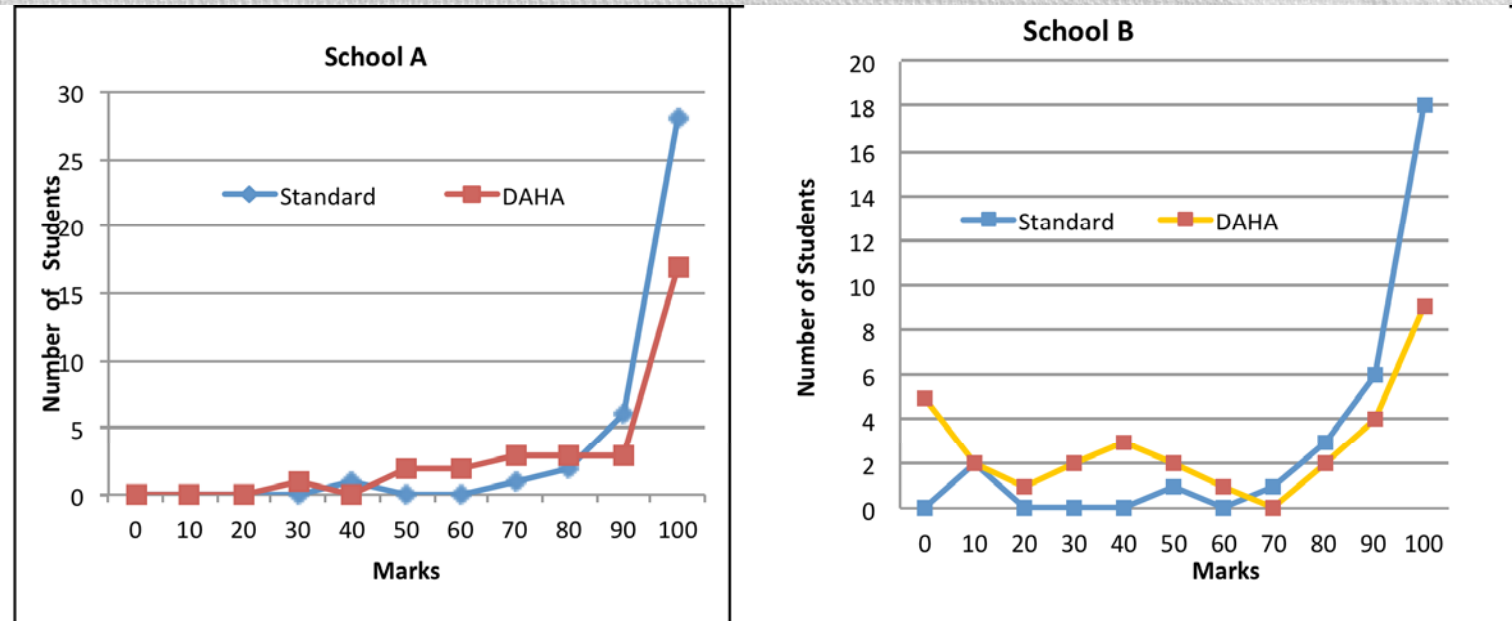


Figure 1 shows that the performance of the group who followed the DAHA method to solve problems in school B is comparatively lower than the same group in school A. This may be due to the comparatively less in class time availability for the DAHA implementation in school B, as noted by their class teacher. Overall, the performance of 4<sup>th</sup> graders are quite good as they worked out sums without memorizing times-tables and learnt the novel multiplication strategy within two class periods.



# Summary Comments

Our field test experience with elementary teachers and students emphasized the importance of introducing DAHA at early stage of learning to provide children learn math facts with number sense and work with numbers flexibly rather than blindly memorizing them. It created opportunities for children to think, engage and talk about math problems in a more natural and enjoyable way. Many of the elementary teachers who witnessed the field test implementation showed their interest of teaching the DAHA method at elementary level. This is a good sign as mathematics change is hard and teachers tend to teach the way that they were taught.



# The End Results





# Where are they now?

- **Julius Su**, Ph.D. Chemistry, Caltech(Director of CSA@Caltech, Founder & CEO of SKIES)  
<http://www.wag.caltech.edu/home/jsu/Personal/cv.pdf>
- **Jonathan Su**, Ph.D. Biomedical Engineering, Duke University(Assistant Professor of Mechanical Engineering, Elon University (#1 in Regional Universities South)  
<https://www.usnews.com/best-colleges/rankings/regional-universities-south>
- **Judith Su**, Ph.D. Biochemistry and Molecular Biophysics, Caltech (Assistant Professor of Optical Sciences and Assistant Professor of Biomedical Engineering, University of Arizona)  
<http://www.optics.arizona.edu/research/faculty/profile/tsu-te-judith-su>
- **Jessica Su**, Ph.D. Computer Science, Stanford University (Research Scientist at Facebook)



# References

- Su, H. F., Ricci, F., Mnatsakanian, M. (2016). Critical Thinking as a Mathematical Problem-Solving Strategy: Making the Case: Classroom Scenario. *Transformations: A Publication of the Florida Association of Mathematics Teacher Educators (FAMTE)*. Reprinted from *Dimensions in Mathematics Journal*. Pages 46- 53. Volume 1, Issue 1. Winter 2016.
- Su, H. F., Ricci, F., Mnatsakanian, M. (2016). Mathematical Teaching Strategies: Pathways to Critical Thinking and Metacognition. *International Journal of Research in Education and Science (IJRES)*. Volume 2, Issue 1, Winter 2016, pp. 190-200. ISSN: 2148-9955.
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- Su, H.F. Lai, L., Riviera, J. (2012). *Effective mathematics strategies for pre-school children with autism*. Australian Primary Mathematics Classroom Journal (APMC), Vol. 17. No. 2. Pp. 25 -30. The journal is published by The Australian Association of Mathematics Teachers Inc.
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- Su, H.F., Mnatsakanian, M. (2011). *The effective use of online diagnostic tools to help identify appropriate learning modules as a form of professional development for mathematics teachers*. ICTCM 2011 Conference Proceedings. Pearson Higher Education.
- Su, H. F., Marinas, Furner, J. (2011). *Number sense made simple using number patterns*. The International Journal for Technology in Mathematics Education (IJTME). Vol. 18, No. 1. pp. 39 – 50. March, 2011.
- Su, H.F. Lai, L., Riviera, J. (2010). *Using an exploratory approach to help children with autism learn mathematics*. Creative Education Journal. Vol. 1, No. 3, December 2010, pp. 149-153.



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- Su, H. F., Marinas, Furner, J. (2010). *Investigating numeric relationships via an interactive tool: covering number sense concepts for the Middle Grades*. Creative Education Journal. Vol. 1 No. 2, September, 2010. pp.121-127.
- Su, H.F., Sico, J., Vicaro, E., Su, T.C., Zeleke, M. (2010). *A Simple approach to Algebra and Higher Order Thinking Skills*. An Amazon.com publication. August 4, 2010. ISBN-10: 1453735410.
- ***For publications on Project MIND materials, please visit [amazon.com](http://amazon.com) and search books by Hui Fang Huang Angie Su***





STEM PROJECTS WITH SCHOOL  
DISTRICTS AND HIGHER  
EDUCATION  
INSTITUTIONS BOTH IN THE US  
AND IN ASIA THROUGH GRANTS  
PARTNERSHIP




**The low number of students going into STEM fields has sparked several calls for change over the years in mathematics education and mathematics.**



## In the US –

- STEM Project at Conniston Middle School in Palm Beach County, Florida for Middle School Female Minority Students.
- Purpose is to bring STEM awareness to the students



A stylized, light-colored plant illustration is positioned on the left side of the slide. It features a central vertical stem with several elongated, pointed leaves branching out. At the top of the stem is a cluster of small, round buds or flowers. The illustration is rendered in a minimalist, graphic style.

# DEVELOPING AN AFTER- SCHOOL PROGRAM TO INCREASE STEM INTEREST, AWARENESS AND KNOWLEDGE OF YOUNG HISPANIC FEMALES IN A TITLE I MIDDLE SCHOOL

Steven Terrell, College of Engineering and  
Computing, Nova Southeastern University

Deirdre Krause, College of Nursing, Nova  
Southeastern University

Bruce Campbell, Palm Beach State College



# Background

- The number of STEM-related jobs is projected to grow by over 10% by 2025.
- Children are “natural scientists, engineers and problem-solvers” (Murphy, 2001) but by the 8<sup>th</sup> grade over 50% of students have lost interest in pursuing an education or career in the STEM field.
- Females and minorities are vastly underrepresented in STEM educational programs and careers.
- Gender inequity is of special concern due to societal “programming” (i.e., males and females are interested in different topics).
- Early exposure to informal STEM experiences can positively affect both learning and participation

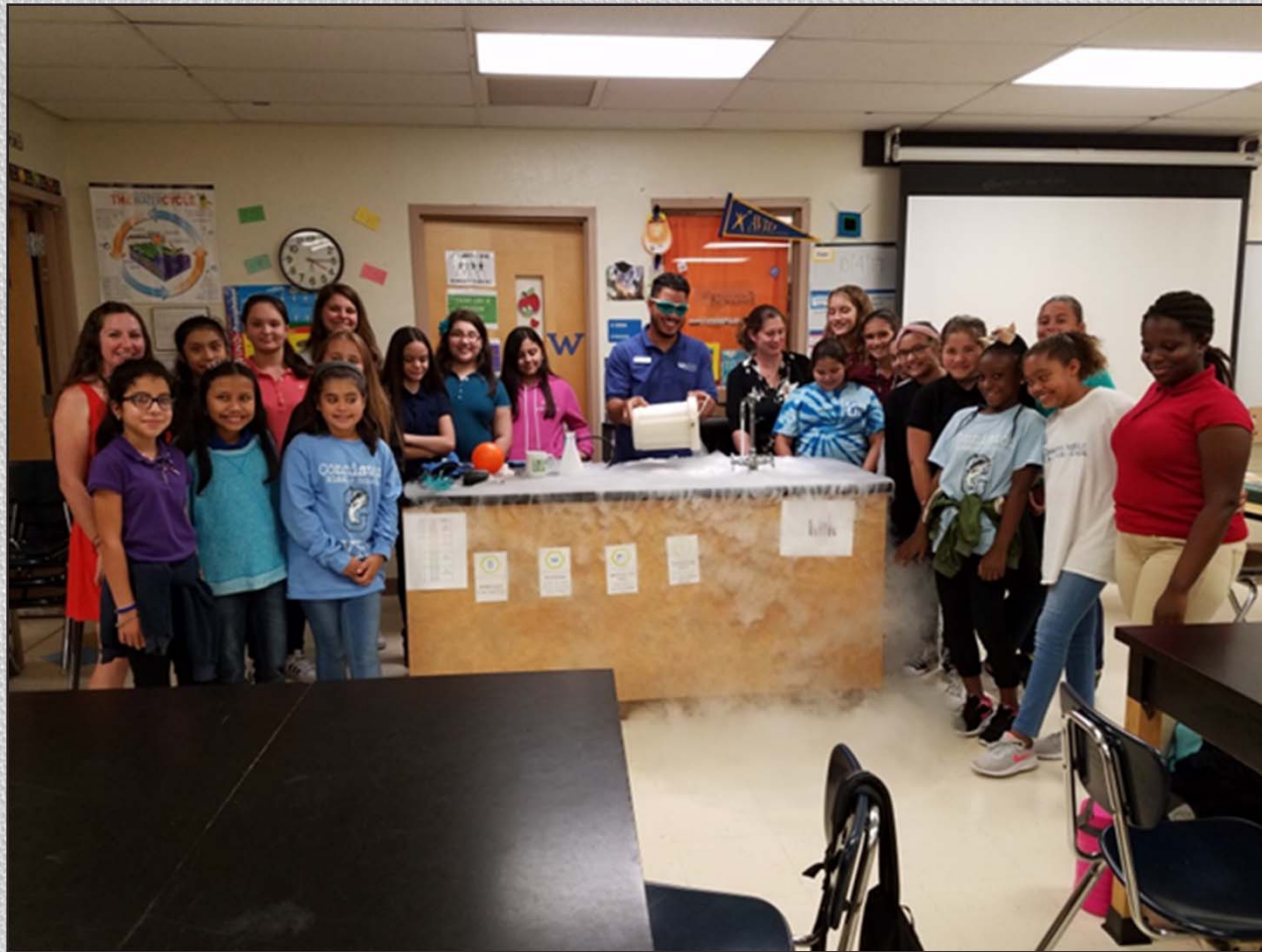


# Current Project

- The objective of this project is to measure the effect of bimonthly after-school workshops on STEM awareness and interest by 6<sup>th</sup> grade females in an urban, lower socio-economic Title 1 school in West Palm Beach, Florida.
- Conniston Middle School is a Title 1 institution with a population of approximately 1,000 students; 50% Hispanic, 30% non-Hispanic white and 20% African-American.
- The current project involves 22 Hispanic 6<sup>th</sup> grade females who have gained hands-on experience in workshops offered by the South Florida Science Center and other local business and industries.
- These hands-on sessions included topics such as physics, robotics, electronic circuitry and chemistry.
- Funded by Nova Southeastern University Quality of Life Grant

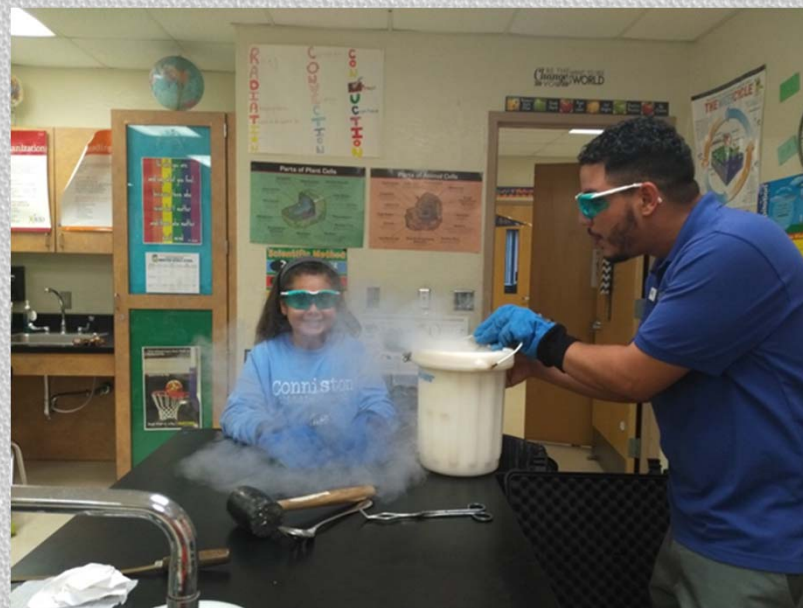


# Our Team!





# Science - Chemistry



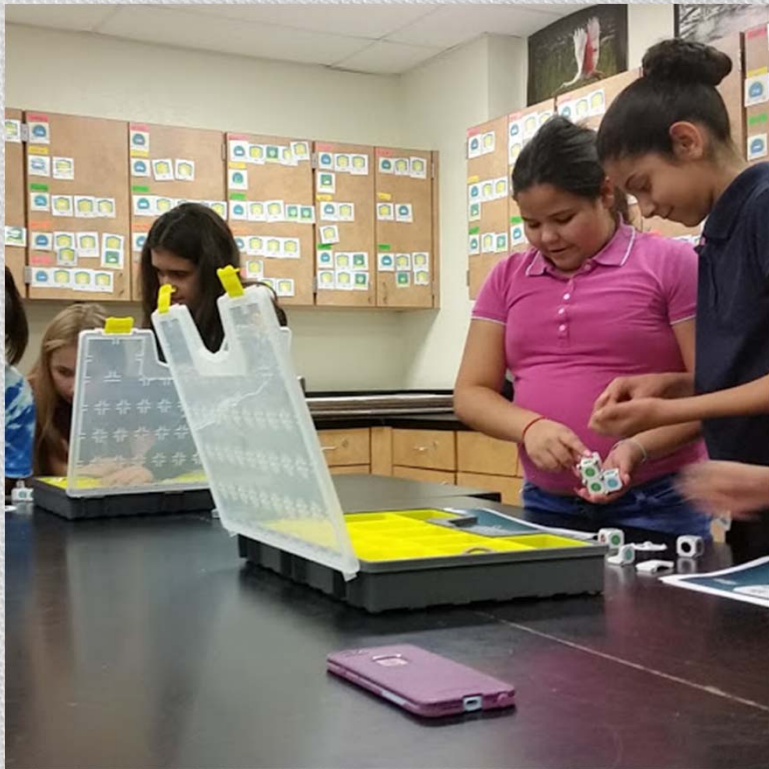


# Engineering - Electricity





# Technology - Robotics





# Robotics Results





# Physics - Rocketry



Newton's third law states that for every action (force) in nature there is an equal and opposite reaction.



# Current School Year Results

- Students attitudes and interest towards STEM were measured at the start of the year, after the first semester and at the end of the school year using the Student Attitudes Towards STEM (S – STEM) middle grades survey.
- There was no significant growth on the overall STEM attitudes and interest score.
- There was a significant gain on the Science sub-scale score.



# Future Plans

- Funding for a second year has been received from an NSU Presidential Quality of Life Grant. Additional funding is being sought from external grants and other funding sources.
- Current relationships will be maintained but will also include faculty from other colleges within NSU.
- Focus will be on inclusion of other demographics, increased frequency of meetings and an expansion of topics.
- Previously developed tools allowing for the use of mobile technology in the classroom will be introduced.



## Current Project Partners: National Science Foundation Project

The project, entitled "Broadening Participation Research: Fostering Retention in STEM Disciplines at Minority Serving Institutions. Is a partnership between Tuskegee University, University of the South West, University of New Mexico, Florida International University, and Nova South eastern University.



# The goal of the Tuskegee Project – Three years





# Technology Partnership

(<http://www.ilearnacademe.org/wp-content/uploads/2016/03/CSA.mp4>) (<http://www.ilearnacademe.org/wp-content/uploads/2016/03/CalTech.mp4>)





# STEM Partnership

CSA@Caltech serves as a conduit for a research and development pipeline where university researchers and teachers and students work together to create innovative teaching and learning experiences.



## The Community Science Academy at Caltech

- The ultimate goal of CSA@Caltech—to promote STEM (science, technology, engineering, and mathematics) in secondary education and to help create the next generation of scientists.
- Building on this success, CSA@Caltech plans to add a third year of study next summer and continue their development of new educational technologies. "Our goal is to make high-quality science accessible to all," says CSA@Caltech codirector Julius Su (BS '98, BS '99, PhD '07).

(<http://www.caltech.edu/news/science-community-47421>)



## Baudhuin Preschool Research Study with Children with Autism

Combining results for this study, Taiwan, and Sri Lanka, we are currently field testing Project MIND at the East China Normal University with the special education population in Shanghai and hope to apply for a joint grant to further carry out our research in China. We are also working on partnership ideas with Chongqing Normal University in Chongqing



# Targeting two College of Education in China

East China Normal University, Shanghai



Chongqing Normal University. Chongqing





# School of Mathematical Sciences, Chongqing Normal University





## Other International Countries

- Saint Vincent
- Jamaica





# St. Vincent & The Grenadines





# Education the center-piece of SVG's development

- The government of SVG places great emphasis on education and training of its citizens to meet with new technological demands (e.g., STEM and STEAM programs, and Coding programs).
- The goal is to provide every citizen with quality education from early childhood to the adult years.
- The major aim is to have at least one university graduate, on average per household by the year 2025.



# Education System

Most educational institutions are publicly funded:

- 116 privately operated pre-schools and nine public institutions
- 68 primary schools of which 11 are government assisted,
- 26 secondary schools of which 7 are government assisted.
- Primary school lasts for 7 years.
- Attendance at secondary school hovers around 60% for both sexes.
- Number of primary teachers with degrees in 2017: 39m: 207 F



## **Access: Four distinct levels**

- Pre-primary which caters for children between the ages 3 and 5 years
- Primary for students 5 to 11+ years
- Secondary level for students 11+ to 16 years (CSEC (Caribbean Secondary Education Certificate) Examinations
- Post-secondary/ tertiary level for students who matriculate to that level



# STEM INITIATIVE: 'One Laptop per Child Initiative'

Goal: to provide every citizen with quality education from early childhood to the adult years

[http://www.education.gov.vc/education/index.php?option=com\\_content&view=article&id=125&Itemid=107](http://www.education.gov.vc/education/index.php?option=com_content&view=article&id=125&Itemid=107)

- 2011 - at the primary level - distribution of 15,000 laptop computers to primary students and their teachers.
- 2014 - distribution of 12,500 Laptops to all secondary students and their teachers
- 2018 – re-examination of the project (challenges and benefits)
- Players - Prime Minister of SVG, Microsoft, the Taiwanese computer giant Acer, the former Venezuelan President Hugo Chavez and his successor Nicholas Maduro



# Equity

- The policy of Adult and Continuing Education is based on principles of equal access for all people to both formal and non-formal education of comparable quality.
- The Ministry of Education is charged with the responsibility of setting educational policy, regulations and standards and with monitoring the sector to ensure that standards are observed.
- Number of Primary Teachers With Degrees 2013-2014:  
19m: 143 F (n- 162)



# Legislations, Regulations, and Policies

- Legislations, regulations and policies passed to strengthen the management and administration of the education system.
- 1992 - the 1937 Ordinance was repealed with the passage of the Education Act 1992 (first major education act to be passed in fifty five years).
- 2005 - the Saint Vincent and the Grenadines Community College Act 2005.
- 2006 - the Further and Higher Education (Accreditation) Act; the Education Act
- The Education Act is yet to become active; the Education Act of 1992 is still the Act that governs the Education System.
- The Education Regulations 2014 and the Early Childhood Education Services Regulations 2014 have been drafted and will become legal document once the Education Act 2006 is proclaimed.



- The St. Vincent and the Grenadines Community College (SVGCC) provides post-secondary/tertiary level certifications.
- The Community College has four divisions that include: The Division of Arts, Science and Humanities, Division of Technical and Vocational Education, Division of Nursing Education and Division of Teacher Education.
- The College is governed by the St. Vincent and the Grenadines Community College Act and is managed by a board.



# NSF Programs to support Scientists

- Senior scientists, engineers, managers or directors at a scientific institution / industrial facility
- Science educators, science communicators, science administrators, Intellectual Property managers, Technology managers, Science and Technology policy makers, etc.
- Postgraduate students who are not permanent employees of Universities and/or Institutions but registered for research degrees and conducting full time research
- Full time Research Scientists on contract

ILD/OSTP/D/BR

• **These are in line with the Science, Technology and Innovation Strategy**

## The Scheme is available as;

1. **NSF Training Fellowships** - For senior scientists & technologists and allied personnel having postgraduate qualifications to obtain specialized training at internationally recognized institutions for a period up to a maximum of twelve months.
2. **NSF Travelling Fellowships** - For senior scientists, technologists and allied personnel having postgraduate qualifications to visit specialised institutions and research facilities for short term training or to develop collaborative programmes for a period up to a maximum of one month.

amongst scientific, research and innovation community so that they could provide a stronger contribution to the national development



## NSF Requirements

- Proof of proficiency in English/ working language of the programme (oral and written)
- Evidence of acceptance by the foreign training institution and reasons for selecting same
- Applicants who are applying for programmes exceeding one month under the OSTP will be called for an interview with NSF Board of Management as and when necessary
- All recipients of OSTP awards will have to sign a legally binding document with NSF obligating to



**NSF**  
**Overseas Special Training Programme**  
**(OSTP)**



# Questions and Answers

Thank you for attending my presentations

For further inquiries, please email

[shuifang@nova.edu](mailto:shuifang@nova.edu)