

# High Quality Research and Evaluation Design in ITEST Projects

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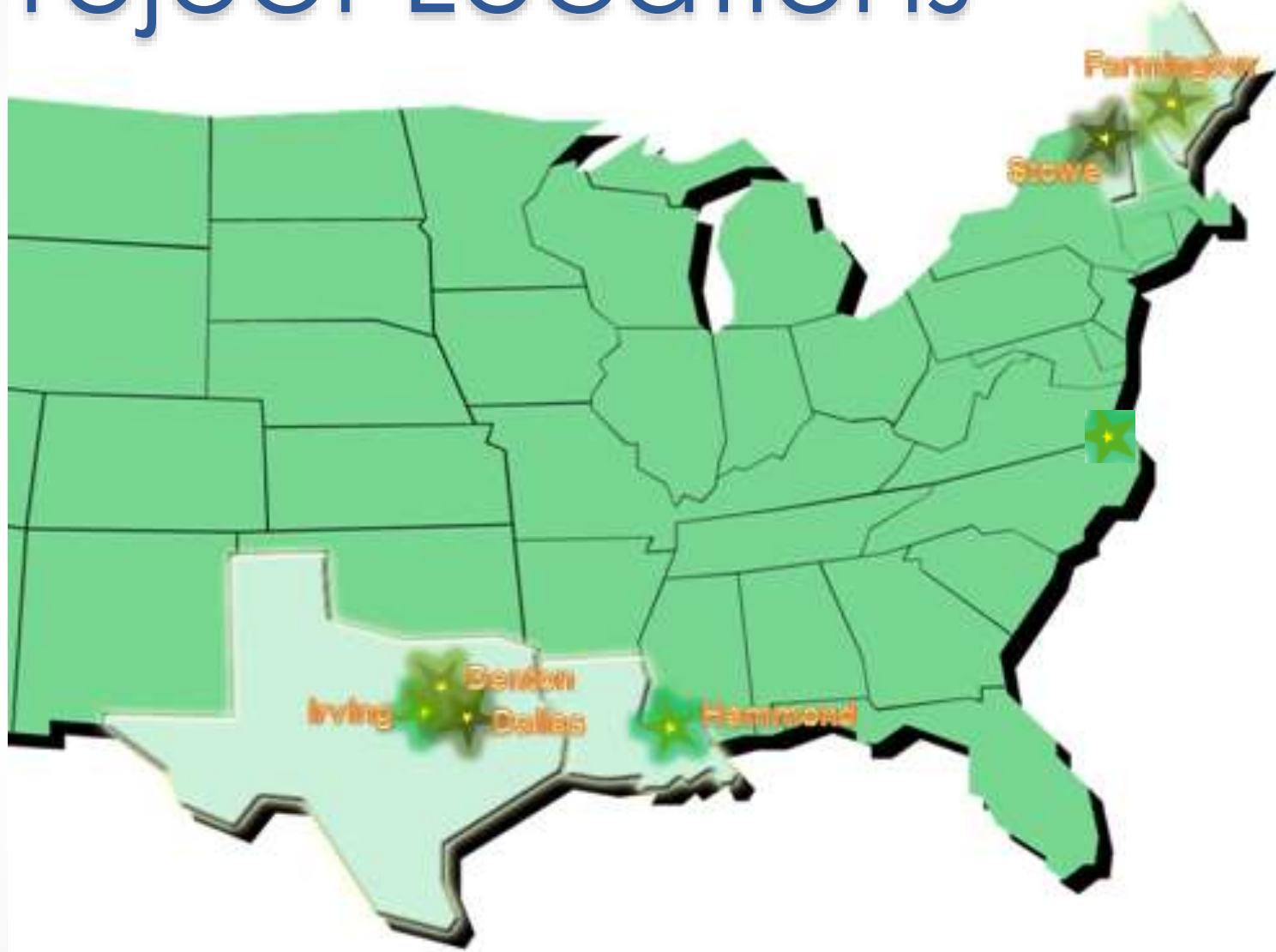
University of North Texas

# Overview: Going Green! Middle Schoolers Out to Save the World

- ✧ Funded 2008 – 2011; Extended through 2013
- ✧ New Funding 2013 to Scale Up to additional environments with increased focus on STEM Careers
  - Year One (Grades 6 – 8)
    - 7 veteran classroom teachers in 3 states for treatment
      - Texas
      - Vermont
      - Louisiana
    - 13 classrooms for comparison
      - Hawaii
      - Virginia
      - North Carolina
      - Louisiana
      - Texas
    - Year Two
      - Adding 11 classrooms from Maine, Florida, and possibly other states



# Project Locations



# Key Activities

- Study electricity and stand-by power
- Inventory home plug-in appliances
- Measure plug-in appliances at home with the power monitoring devices
- Share data with other project participants
- Use data for 'what if' projections





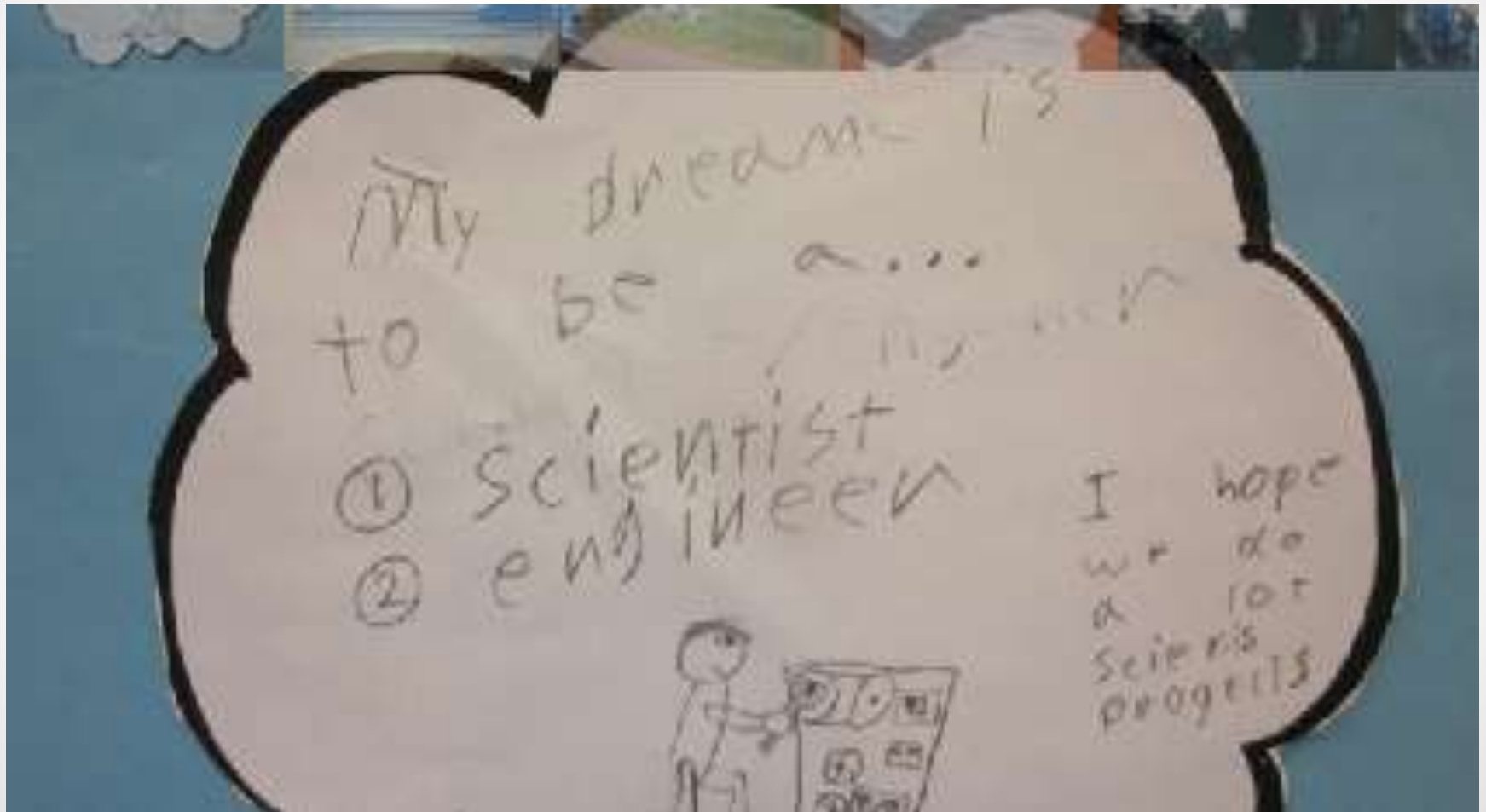
# Middle Schoolers Out to Save the World (MSOSW)

Target Audience: 6<sup>th</sup> – 8<sup>th</sup> graders  
Monitoring Standby Power  
Students in Texas, Louisiana, North Carolina  
Maine, Vermont, and Hawaii



Funded by the National Science Foundation  
Innovative Technology Experiences for  
Students and Teachers (ITEST)

# ITEST Goal: Interest in STEM Careers



# Project Goals

- Awareness of and Reduction of CO<sup>2</sup> impact
- Increase student interest of STEM career options
- Out of School activity coordinated in School

# Evaluation Design

- Research Layered on Top of Evaluation
  - Strive for Common Instruments
  - Plan for Cross-Project Sharing
- Treatment vs. Comparison Groups
  - Comparisons → Treatment following year
  - Teacher stipends to collect data (after both pre & post complete)
  - Female vs. Male Contrast Groups
- Formative vs. Summative Evaluation
- Internal vs External Evaluators
  - Internal Evaluation Strong
  - External double-checks and has complementary strengths
  - Quantitative and Qualitative External Evaluators



# Evaluation Design: What to Measure

- Process
  - Number of schools, teachers, students
  - Training Institutes, Curriculum Enhancements,, Advisory Group Sessions
  - Site Visits, Demos, Walk-Throughs
  - Program Officer Visits and Summit Attendances
- Product
  - Content Gain
  - Attitude Gain
  - Career Interest Gain
  - Presentations, Publications

# Evaluation Design Considerations

- Treatment and Comparison
- Rural, Urban, Suburban
- Public, Private
- Grades 6,7,8
- Gender
- Number of years in project
- Propensity Matching

# Evaluators

- Internal versus External
  - Research Scientist
  - Co-PI
- Qualitative versus Quantitative
  - Qualitative
    - NVivo
    - Interviews
  - Quantitative
    - ANOVA/MANOVA
    - HLM
    - PSM
    - MDS

# Instrumentation for STEM Projects

- STEM Semantic Survey
  - Semantic Differential
  - 7-point scale pairs (interesting – boring) 5 areas:
    - Science
    - Math
    - Engineering
    - Technology
    - STEM Career
- Career Interest Inventory
  - 13 item Likert (SD to SA), 3 subscales
- Math items from TIMSS
- Attitudes toward School
- Creative Tendencies
- For Year Two Adding Environmental Science Inventory

# STEM Semantic Survey

## To me, SCIENCE is:

1.	fascinating	①	②	③	④	⑤	⑥	⑦	mundane
2.	appealing	①	②	③	④	⑤	⑥	⑦	unappealing
3.	exciting	①	②	③	④	⑤	⑥	⑦	unexciting
4.	means nothing	①	②	③	④	⑤	⑥	⑦	means a lot
5.	boring	①	②	③	④	⑤	⑥	⑦	interesting

## To me, MATH is:

1.	boring	①	②	③	④	⑤	⑥	⑦	interesting
2.	appealing	①	②	③	④	⑤	⑥	⑦	unappealing
3.	fascinating	①	②	③	④	⑤	⑥	⑦	mundane
4.	exciting	①	②	③	④	⑤	⑥	⑦	unexciting
5.	means nothing	①	②	③	④	⑤	⑥	⑦	means a lot

## To me, ENGINEERING is:

1.	appealing	①	②	③	④	⑤	⑥	⑦	unappealing
2.	fascinating	①	②	③	④	⑤	⑥	⑦	mundane
3.	means nothing	①	②	③	④	⑤	⑥	⑦	means a lot
4.	exciting	①	②	③	④	⑤	⑥	⑦	unexciting
5.	boring	①	②	③	④	⑤	⑥	⑦	interesting

## To me, TECHNOLOGY is:

1.	appealing	①	②	③	④	⑤	⑥	⑦	unappealing
2.	means nothing	①	②	③	④	⑤	⑥	⑦	means a lot
3.	boring	①	②	③	④	⑤	⑥	⑦	interesting
4.	exciting	①	②	③	④	⑤	⑥	⑦	unexciting
5.	fascinating	①	②	③	④	⑤	⑥	⑦	mundane

## To me, a CAREER in science, technology, engineering, or mathematics (is):

1.	means nothing	①	②	③	④	⑤	⑥	⑦	means a lot
2.	boring	①	②	③	④	⑤	⑥	⑦	interesting
3.	exciting	①	②	③	④	⑤	⑥	⑦	unexciting
4.	fascinating	①	②	③	④	⑤	⑥	⑦	mundane
5.	appealing	①	②	③	④	⑤	⑥	⑦	unappealing

# Instrumentation

## Career Interest Questionnaire

### Part 1

**Instructions:** Select one level of agreement for each statement to indicate how you feel. Your answers will remain confidential.

SD = Strongly Disagree, D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree

		SD	D	U	A	SA
1	I would like to have a career in science.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	My family is interested in the science courses I take.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	I would enjoy a career in science.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	My family has encouraged me to study science.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Part 2

		SD	D	U	A	SA
5	I will make it into a good college and major in an area needed for a career in science.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	I will graduate with a college degree in a major area needed for a career in science.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	I will have a successful professional career and make substantial scientific contributions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	I will get a job in a science-related area.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	Some day when I tell others about my career, they will respect me for doing scientific work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

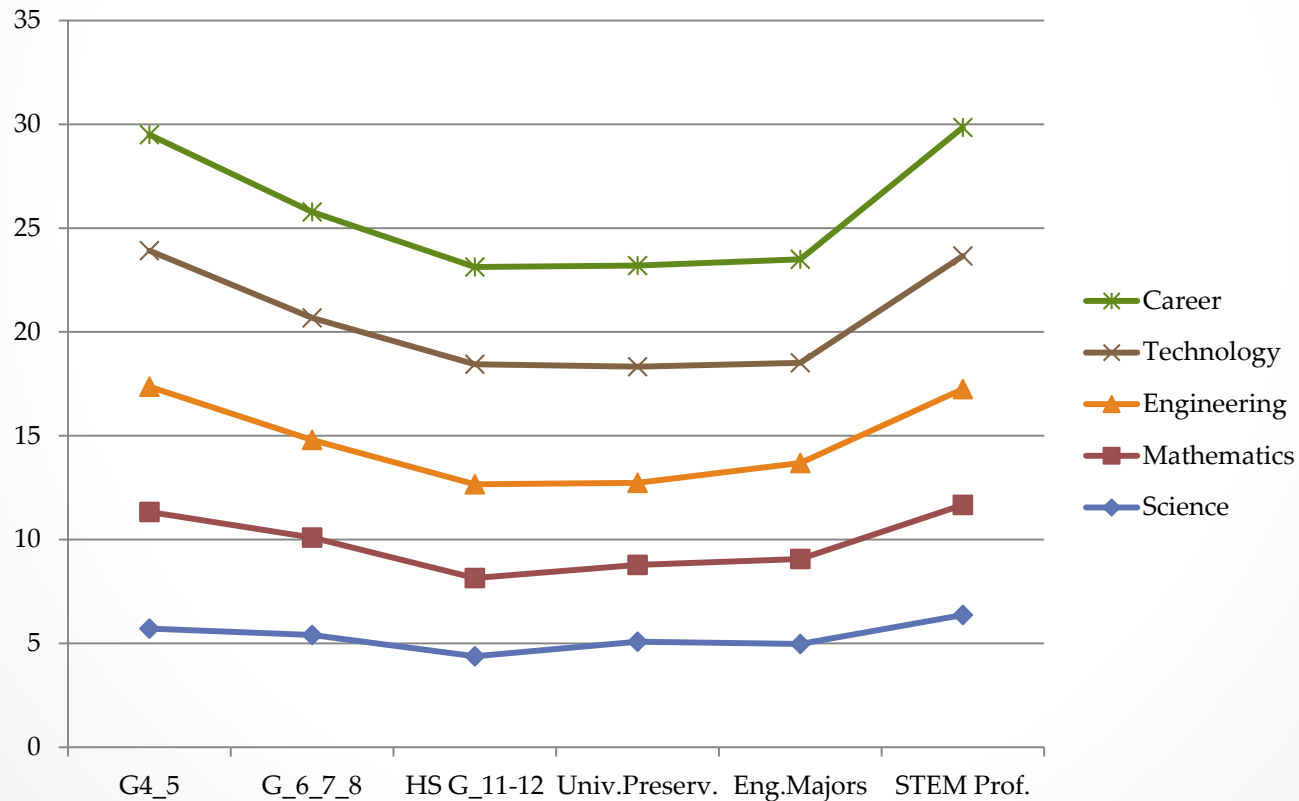
### Part 3

		SD	D	U	A	SA
10	A career in science would enable me to work with others in meaningful ways.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11	Scientists make a meaningful difference in the world.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	Having a career in science would be challenging.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

# New Measures on the Horizon

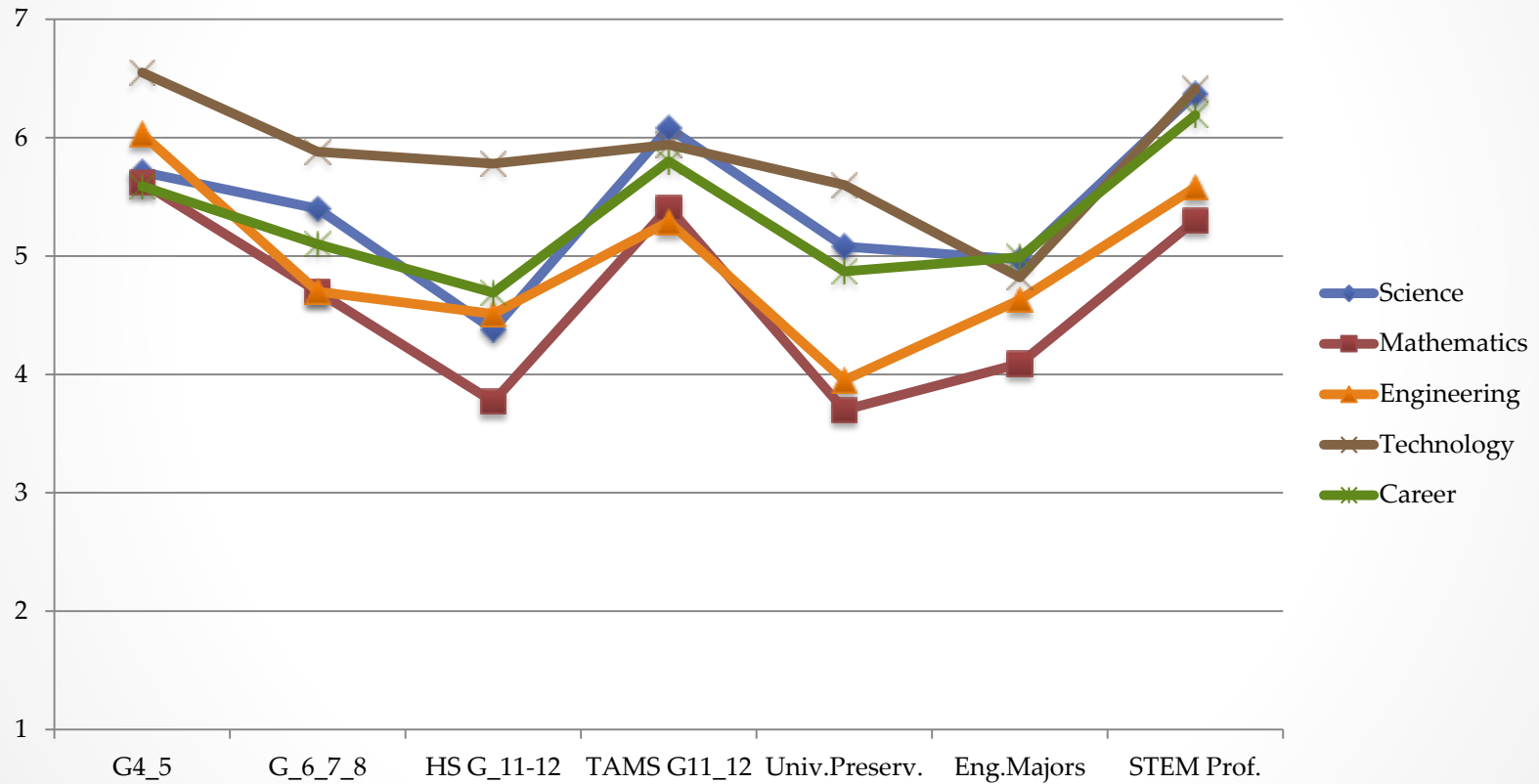
- Attitudes Toward the Environment
  - Likert Scale
- Card Sort: Scientist/Not a Scientist
  - Non-verbal (picture based) measure of construct change
- Career Interest Intent: I plan to have a career in ...
  - Science
  - Technology
  - Engineering
  - Mathematics
  - Other

# Goal: Move Middle School STEM Dispositions => STEM Professionals (Including NSF PIs)





# Addition of TAMS – Now a “W” Shape



TAMS: Texas Academy of Mathematics and Science

# Longitudinal

- BUGS (9 years later)
- Good Shepherd follow up in 8<sup>th</sup> grade (2 years later)

# Contact Information

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