

# Stepping Up To STEMS



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# The Problem

## **Many Students in U.S. pursuing science and engineering degrees are from other countries**

(Rising Above the Gathering Storm Two Years Later, [www.nap.edu/catalog/12537.html](http://www.nap.edu/catalog/12537.html) )

- The number of U.S. Engineering Ph.D.s are declining while foreign student numbers increase
  - Trend also seen in scientific disciplines **and** with students pursuing graduate degrees
    - Other countries are increasing their investments in higher education
    - Schools had been testing students in math and reading but not science

## **U.S. Student Ranking Out of 31 Countries**

(Organization for Economic Cooperation and Development)

- 15<sup>th</sup> in reading
- 19<sup>th</sup> in math
- 14<sup>th</sup> in science

## **Performance at Proficient Level in Science**

(The STEM Crisis, National Math and Science Initiative)

- 29% of 4<sup>th</sup> grade students
- 33% of 8<sup>th</sup> grade students
- 18% of 12<sup>th</sup> grade students

## **Teachers who did not major in the subject in college or are not certified to teach it**

- Taught 1/3<sup>rd</sup> of high school students enrolled in mathematics
- Taught 2/3<sup>rd</sup>s of high school students enrolled in physical sciences

# The Step Process of Science

- Technology advancements are based on progressive steps in science and engineering that build upon previous experience
  - Learn steps in making discoveries through observation and scientific inquiry
  - Develop investigative skills through laboratory experiences
  - Develop communication and organizational skills
  - Work with trained mentors to run thematic programs and encourage scientific thinking and team work
- Success in STEM education is tied to continuously building science and technology skills early on and throughout a student's educational career
  - Participation in short exposure STEM activity programs (aha or awareness moments)
  - Participation in sustained STEM programs (continuous exposure and loss of fear factor)
  - Participation in the investigation of authentic science projects with scientists as mentors
- A teacher must also have mastered a number of progressive steps through their education and personal authentic science experiences
  - Research requires hands-on experience
  - Keep up technological advancements and new discoveries

# Parent, Family and Community Involvement



- **Parents are key to the success of a student's STEM career**
  - Develop an understanding of the significance of STEM
    - Participation in short term STEM programs with their child
  - Learn communication via computer skills and online knowledge
    - Scholarship and University applications are on line
    - Many schools now post student work and progress on line
- **Family involvement contributes to early exposure to STEM**
  - Allows parents greater freedom to participate
  - Develops interest/awareness in a subject previously not known before
  - Provides loss of fear of new subjects and they all have fun!
- **Community Involvement**
  - Allows for exposure to applied science and engineering
  - Develops buy-in from companies and a giving back attitude
  - Allows for the development of the communities own workforce
  - Allows for cultural understanding



# Model Programs

- **UT Brownsville's STEMS Program (UTB STEM)**
  - Exposes students to field science through outdoor experiences
  - Developed a STEM pipeline (middle school through university)
  - Takes students out of their comfort zone
- **NASA Space Science Day (NSSD)**
  - Trains upper level High School - University students to be mentors to young students
  - Trains teachers to use NSSD hands-on activities year-long to sustain learning
  - Exposes middle school students to NASA's mission in a fun and participatory venue
  - Exposes community to NASA's mission
- **Texas Valley Communities Foundation ENCORE Program**
  - Develops partnerships with industry, educational facilities and community
  - Exposes middle school students to college life and the latest STEM technology
  - Creates a partnership with both parents and students
- **NASA y Tu**
  - Developed downloadable 30-second educational video segment in Spanish for web and aired on Univision
  - Highlights interviews with NASA Hispanic astronauts, engineers and scientists,
  - Contains background information, educational resources for educators and students
  - Contains NASA activities and opportunities for student participation
- **NASA's Career Exploration Program(CEP), Intern and Cooperative Education Programs**
  - Sustained mentorship of minority/underrepresented high school and university students





## Conclusions

- There is a critical need for STEM qualified workers who are US citizens that requires innovative solutions
- Training, mentorships and hands-on experiences are a must
- Training and exposure to STEM programs should be a fun learning experience to demystify science – and build an ‘I can do it’ attitude
- Global participation requires a well trained multilingual – multicultural workforce
- Funding for sustainable programs vs. short term programs