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)

• 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)

• 15th in reading
• 19th in math
• 14th in science

Performance at Proficient Level in Science
(The STEM Crisis, National Math and Science Initiative)

• 29% of 4th grade students
• 33% of 8th grade students
• 18% of 12th grade students

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

• Taught 1/3rd of high school students enrolled in mathematics
• Taught 2/3rds 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