

INSPIRING our LEADERS of TOMORROW

EPICS In IEEE And TISP: Two Key Programs That Impact Your Local Community And Pre-University Educators

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IEEE
SECTIONS
CONGRESS
/// 2014

Outline

- ▶ Why is IEEE interested in community impact through pre-university education and outreach ?
- ▶ IEEE Educational Activities Objectives
- ▶ Program Overview: Engineering Projects in Community Service (EPICS) in IEEE
- ▶ Program Overview: The Teacher In Service Program (TISP)
- ▶ Q&A

Community Impact through Pre-University Education and Outreach

- ▶ Because it is in our stated and un-stated mission
- ▶ IEEE Constitution
 - The IEEE shall strive to enhance the quality of life for all people throughout the world through the constructive application of technology in its fields of competence.
- ▶ IEEE Policies, Section 7.8 IEEE Code of Ethics:
 - “to improve the understanding of technology; its appropriate application, and potential consequences;”
- ▶ IEEE ByLaws I-303.3
 - “implement programs specifically intended to serve and benefit IEEE members in educational pursuits, the engineering and scientific community, and the general public.”

Remember the Top 5 Recommendations from SC 2011 ?

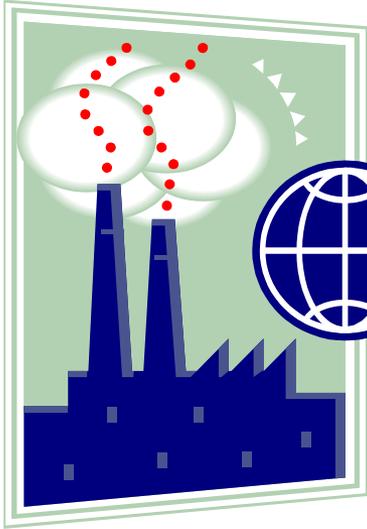
Recommendation # 1

- ▶ IEEE to develop a comprehensive long-term strategy to increase the number of next generation youth pursuing science and engineering careers.

Recommendation # 5

- ▶ To encourage interest in pre-university students in engineering careers, IEEE to publish a subscription periodical (paper or electronic) targeted to high school students that highlights engineering activities of interest to those students. The periodical should also have articles promoting the benefits of an engineering career and what the students can do in college to get involved with IEEE.

Societal Grand Challenges



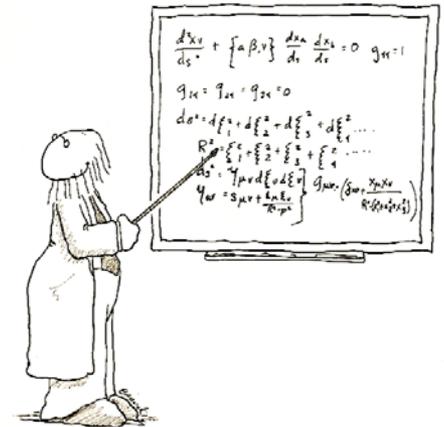
Energy
Environment
Climate Change
Sustainability

Food, Water



Healthcare

Education



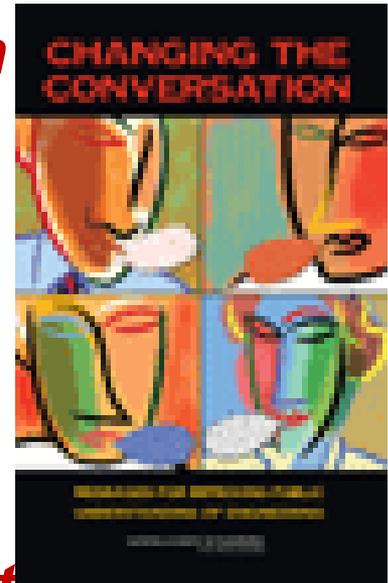
Transportation



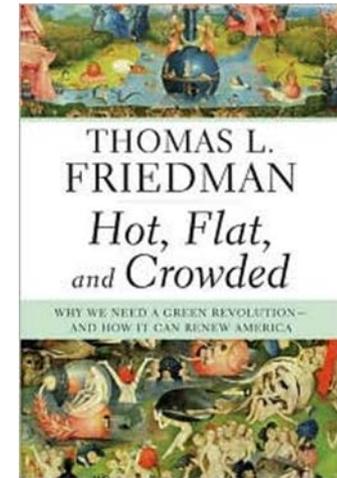
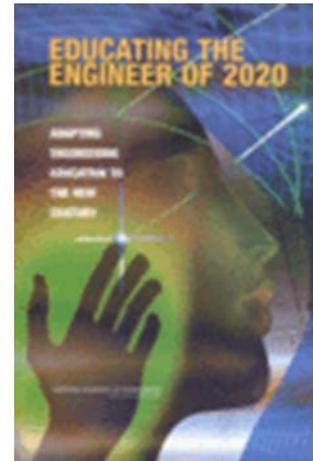
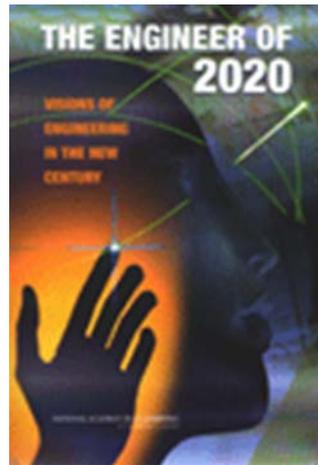
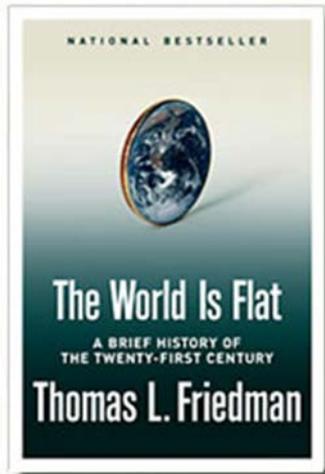
Changing the Conversation

*No profession unleashes the spirit of **innovation like engineering**. From **research to real-world applications**, engineers constantly discover how to **improve our lives** by creating bold new solutions that connect science to life in unexpected forward thinking ways. Few professions turn so many ideas into so many realities. Few have such a **direct and positive impact on people's everyday lives**. We are counting on engineers and their imaginations to help us meet the needs of the 21st century.*

"Changing the Conversation", National Academy of Engineering, 2008



Global Challenges



How do we make our programs outward focused entrepreneurial engines of innovation?

Pre-university engineering education and technological innovation

- The demands of the 21st century will require technological innovation
 - ▣ advanced technologies in developed countries
 - ▣ infrastructure solutions in developing countries
- The development of the next generation technical professional can be supported through a variety of experiences
 - integration of engineering principles in classroom instruction
 - practical application of technical solutions in the community

Pre-University Activities



- ▶ Aim: To increase the understanding of engineering, computing and technology (ECT) among the pre-university constituencies and to demonstrate the impact of technology on the community
- ▶ Objective: Increase the propensity of young people to select engineering as a career path by providing programs and products for the adult influencers in their lives
- ▶ Sample activities:
 - Engineering Projects In Community Service (EPICS) in IEEE
 - Teacher In-Service Program (TISP)
 - Information Portals: TryEngineering.org, TryNano.org, TryComputing.org, IEEE Spark
 - Informal Education – IEEE Exhibits for Science Centers

Community Impact – EPICS in IEEE

From powering villages with solar cells, to developing assistive devices for the physically challenged, to connecting rural schools with technology the EPICS in IEEE Program has enabled engineers and students to make a difference in the lives of people in their communities around the world.



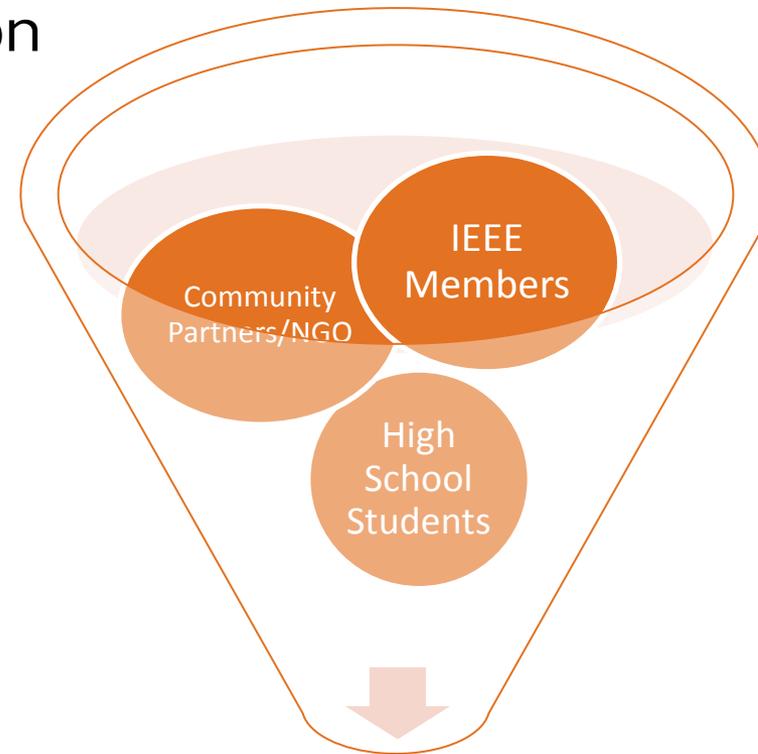
EPICS in IEEE – A Social Innovation and Educational Program



- ▶ Program that organizes university and high-school students to work on engineering-related projects with local area community organizations.
- ▶ Goals
 - (1) To solicit proposals to fund community focused projects from student branch members, YP groups, WIE SBAG; (2) to develop and deliver training on human centered design and professional skills
- ▶ Objective
 - Raise students' awareness of engineering-related careers and encourage university students to practice professional skills

IEEE New Initiative – IEEE Implementation of High School Engineering Projects in Community Service (EPICS) -2010-2013

- ▶ IEEE - first professional association
 - leverage the technical expertise of its membership
 - global scale
 - three way partnerships
- ▶ Focus on development of devices and systems in IEEE fields of interest for the benefit of the target audiences of the non-profit community partners.



EPICS in IEEE Projects

EPICS in IEEE Characteristics



Program Justification



The Need

- ▶ Community service organizations lack technical expertise
- ▶ Understanding of community service for technical professionals
- ▶ Advancing technology for the benefit of humanity

The Benefits

- ▶ Improve human condition by innovative use of technology
- ▶ Strengthen competencies through education
- ▶ Workforce Development
- ▶ Public image
- ▶ Engage IEEE members through volunteerism

EPICS in IEEE Goals

- ▶ Impact communities around the world with objectives of:
 - Increasing high school students' interest in pursuing engineering-related career path
 - Leveraging demonstrated ability of EPICS in IEEE to reach female and under-represented groups
- ▶ Engage IEEE volunteers
 - Student members
 - Young Professional groups
 - Other Affinity Groups
- ▶ Leverage global reach of IEEE to undertake community service projects all over the world.



EPICS in IEEE Around the World

# of Projects	
Argentina	3
Belgium	1
China	2
India	16
Kenya	2
Malaysia	2
Mexico	1
Namibia	1
Nigeria	1
Portugal	1
South Africa	5
Tunisia	1
Uganda	2
United States	7
Uruguay	2
Zambia	3
Zimbabwe	1
Total	51



EPICS Project Categories

- ▶ **EPICS in IEEE** projects fall under four defined “categories.”
- ▶ These categories help students connect engineering skills to community issues that focus on needs in the areas of :
 - Access & Abilities
 - Education & Outreach
 - Environment
 - Human Services

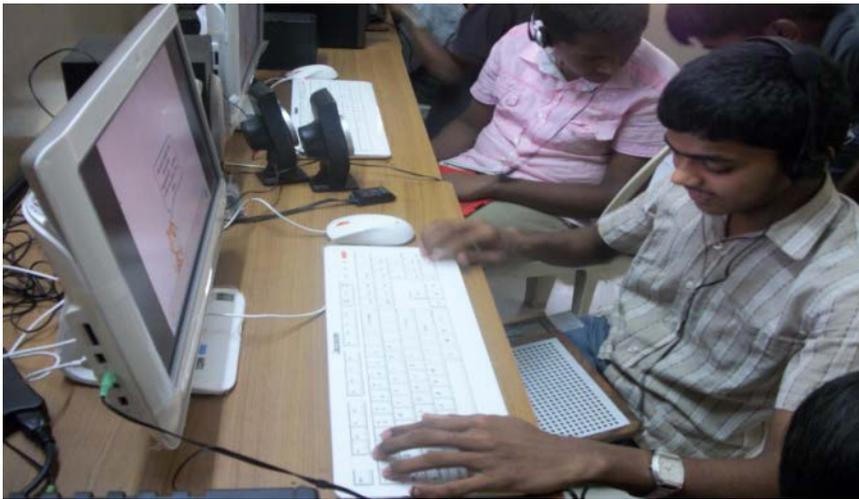


EPICS in IEEE – Measures of Success

- ▶ 19 out of 51 EPICS in IEEE projects are considered completed.
- ▶ 204+ volunteers, 427 University Students and 796 pre-university students have been involved to date
- ▶ An estimated 120,000 people will benefit from the funded projects. This includes populations that are potentially affected by the solution or actual numbers of visitors/residents/school children etc.

Access & Abilities

“**Access and Abilities**” projects with EPICS in IEEE work towards adaptive services, clinics for those in need (such as children with disabilities), programs for adults, and assistive technologies.



Access & Abilities: Example

- ▶ **“Humanitarian Computing: Educational Solutions for the Visually Impaired”** (National Institute of Technology –Karnataka, India)
 - Problem Statement: Many assistive technologies such as screen readers for visually impaired are very expensive in India. There are few free educational software products for the visually impaired.
 - Project: 21 University students from the NIT-K produced seven different education tools that were aimed at making learning fun for the visually impaired.

Education & Outreach

- ▶ Projects that fall under “**Education and Outreach**,” showcase efforts between members, students and the NGO to fulfill the potential futures of young students who may pursue careers in engineering, math, science or technology.



Education & Outreach: Example

- ▶ **“Design Development and Construction of Modular Educational Kits for Teaching Electronics”** (*National University of Cordoba, Argentina Section, Argentina*)
 - Problem Statement: Lack of educational materials to teach the basics of electronics in high schools.
 - Project: University students will design and develop kits that will include a user manual (to help the instructor), a cabinet with the necessary tools for experiments, components and materials, and platelets

Environment

- ▶ EPICS in IEEE “**Environment**” projects focus on the environmental issues that impact everyday life and communities in every region.
 - Young students learn about the importance of environmental issues and how engineering can be a part of the solution.



Environment: Example

- ▶ **“Poverty Reduction and Environmental Conservation Through Solar Powered Solutions”** (*Kyambogo University, Uganda*)
 - Problem Statement: Low income communities lacked access to power grid.
 - Project: University students set out to design, build and install environmentally friendly solar powered phone chargers and charging controllers for low income communities. Agha Khan High School students experienced the hands-on process of developing the product and building a prototype model.

Human Services

- ▶ With EPICS in IEEE projects that address “**Human Services**,” students find connections between engineering and any limitless number of community, or humanitarian, needs. This includes homelessness prevention, affordable housing, family and children agencies, neighborhood revitalization, and local government.



Human Services: Example

- ▶ **Synchronous Traffic Control System** (*IES College of Engineering, Kerala Section, India*)
 - Problem Statement: Emergency vehicles encounter difficulty travelling quickly and safely through busy intersections
 - Project: Engineering students from IES worked with high school students to design and implement a wireless transceiver and transmitter that can change traffic lights. It was installed and tested at a busy intersection in Thrissur.



How can we sign up and get involved today?

- ▶ Sections can work with student members to submit proposals for funding, indicating
 - Non-profit community organization partner
 - High School students partners
 - Project duration and detailed budget
 - Project title and emphasis
 - Project description, objectives, and methodolc
- ▶ Section members can serve as mentors on approved projects
- ▶ Publicize the impact of the projects on the local communities in local news channels (i.e. newsletters/newspapers, social media etc.)



www.ieee.org/go/epics-high

IEEE's Teacher In-Service Program

"Engineering in the Classroom"



Teacher In Service Program (TISP)



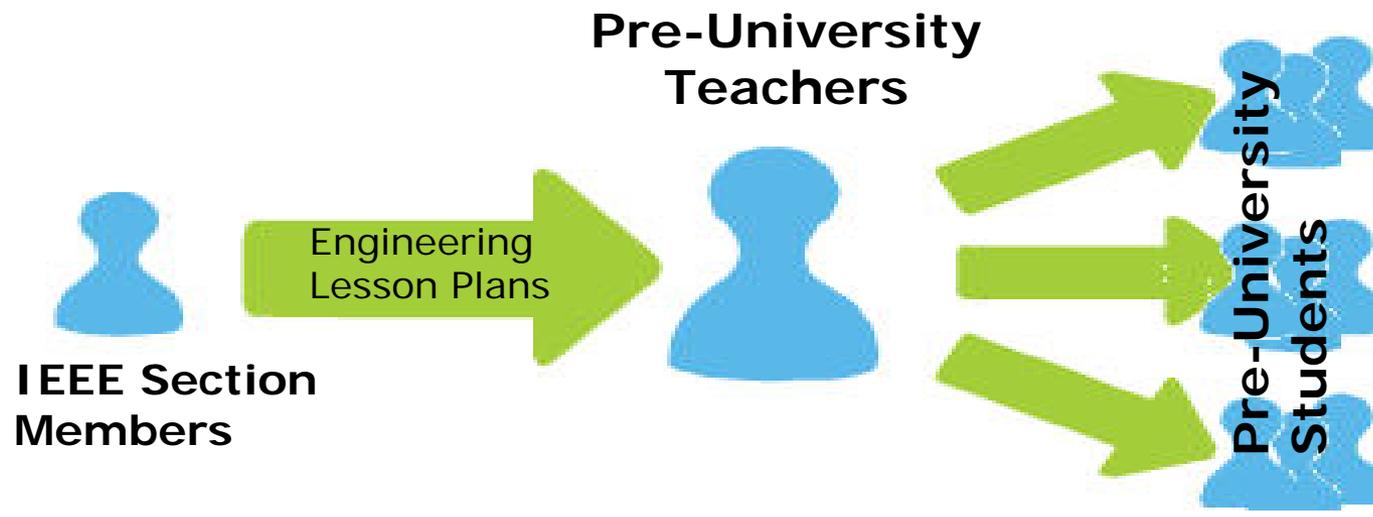
- ▶ Features Section volunteers presenting subject matter to local pre-university educators in an in-service or professional development setting.
 - The in-service session would demonstrate the application of engineering concepts to support the teaching and learning of science, mathematics and technology disciplines.
- ▶ The goal is to empower TISP champions with tools and strategies to ultimately enhance the level of technological literacy of teachers and students

Teacher In Service Program (TISP)

- ▶ A train the trainer program that trains IEEE volunteers to work with pre-university teachers
 - Based on approved lesson plans
 - Emphasis on **volunteer-teacher interaction** as opposed to volunteer-student interaction



TryEngineering.org



TISP Lesson Plans

- ▶ Approved lesson plans found on TryEngineering.org
 - Prepared by IEEE volunteers
 - Tested in classrooms
 - Aligned with Education Standards
 - Most include a design challenge
 - Emphasize teamwork
 - Designed to highlight engineering design principles
 - Affordable common materials



Example: Working with Wind Lesson Plan

▶ Learning Objectives

- Learn about wind energy conversion
- Design a wind turbine
- Construct the wind turbine
- Test the wind turbine
- Evaluate Performance

▶ Learner Outcomes

- wind energy
- interaction of technology and societal issues
- engineering design
- teamwork



Alignment to Curriculum Framework

Lesson plans are aligned to one or more of the following sets of standards:

- ▶ U.S. Science Education Standards
- ▶ U.S. Next Generation Science Standards
- ▶ International Technology Education Association's Standards for Technological Literacy
- ▶ U.S. National Council of Teachers of Mathematics' Principles and Standards for School Mathematics
- ▶ U.S. Common Core State Standards for Mathematics
- ▶ Computer Science Teachers Association K-12 Computer Science Standards

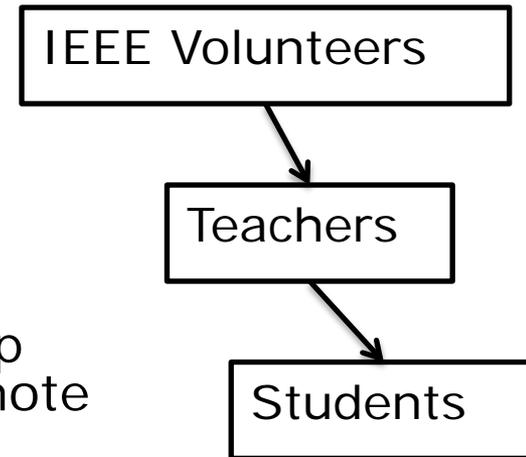
Overall TISP Goals



- ▶ Empower IEEE “champions” to develop collaborations with local pre-university education community to promote applied learning
- ▶ Enhance the level of technological literacy of pre-university educators
- ▶ Increase the general level of technological literacy of pre-university students
- ▶ Increase the level of understanding of the needs of educators among the engineering community
- ▶ Identify ways that engineers can assist schools and school systems

Training Workshop and Presentations

- ▶ Working with Sections, EA organizes a day and a half **Training Workshop** for volunteers for at least 50 – 60 attendees
 - EA will negotiate and contract the venue, manage the logistics, facilitate planning and execution of the workshop
 - Section organizing committee of 5 to 6 volunteers will provide feedback on workshop agenda, identify invited educators, and promote event
- ▶ During the workshop, volunteers will begin organizing into teams to develop an action plan
- ▶ After the workshop, volunteers working with teachers and school administrators will conduct **in-service presentations** and spread the program in their school districts



2013 Training Workshops – 119 Participants

- ▣ R7 Vancouver, British Columbia, Canada
 - Attendance: 40
- ▣ R4 Detroit, Michigan
 - Attendance: 26
- ▣ R10 Sydney, New South Wales, Australia
 - Attendance: 53

Training Workshops: 2005-Present



31 Workshops - 2578 Participants (2125 volunteers)

Region 1-6 - USA (490)

Boston, Massachusetts
Baltimore, Maryland
Pittsburgh, Pennsylvania
Atlanta, Georgia (2)
Indianapolis, Indiana
Dallas, Texas
Manhattan Beach, California
San Francisco, California
Detroit, Michigan

Region 7 - Canada (214)

Montreal, Quebec
Mississauga, Ontario
Vancouver, British Columbia

Region 8 – Europe, Middle East, Africa (532)

Cape Town, South Africa
Lusaka, Zambia
Porto, Portugal
Stirling, Scotland
Al Khobar, Saudi Arabia
Madrid, Spain

Region 9 – Latin America (938)

Rio de Janeiro, Brazil
Piura, Peru
Cordoba, Argentina
Guayaquil, Ecuador
Port of Spain, Trinidad
Montevideo, Uruguay
Tegucigalpa, Honduras

Region 10 – Asia & Pacific (404)

Kuala Lumpur, Malaysia
Shenzhen, China
Hyderabad, India
Queensland, Australia
New South Wales, Australia

**122 Sections
have participated
in TISP training**

www.ieee.org/education_careers/education/preuniversity/tispt/tispworkshops.html



2014 Training Workshops: Estimated 250-300 Attendees

▣ Planned

- R8: United Arab Emirates: Sections: Bahrain, Lebanon, Palestine, Pakistan, Egypt, Tunisia, Jordan, UAE
- R8: Kenya: Uganda, Tanzania
- R9: Mexico – Student Branches



Teacher In-Service Program Presentations

- ▶ Over **231** TISP presentations have been reported by IEEE volunteers



- ▶ TISP presentations have reached **over 5700** pre-university educators
 - This reach represents more than **624,000 students each year** in **19** countries each year

How to get involved



- ▶ Host and/or attend a train the trainer workshop
- ▶ Organize TISP sessions for the local school systems in your section
- ▶ Communicate with EAB for guidance, information exchange, and funding
- ▶ Organize a task force within the local IEEE Section to make TISP a permanent program of the Section
- ▶ Arrange for budgeting through the Region, and IEEE Boards (MGAB, EAB)



QUESTIONS

