ABET

Accreditation's Role in Preparing Tomorrow's Technical Workforce

Instituto Militar del Engenharia
Rio de Janeiro, Brazil
20 June 2018

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Executive Director & CEO
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www.abet.org

Topics

- Value of global quality assurance
- Shaping the global engineer
- Our role in encouraging Innovation
- Thoughts on future on the future of technical education

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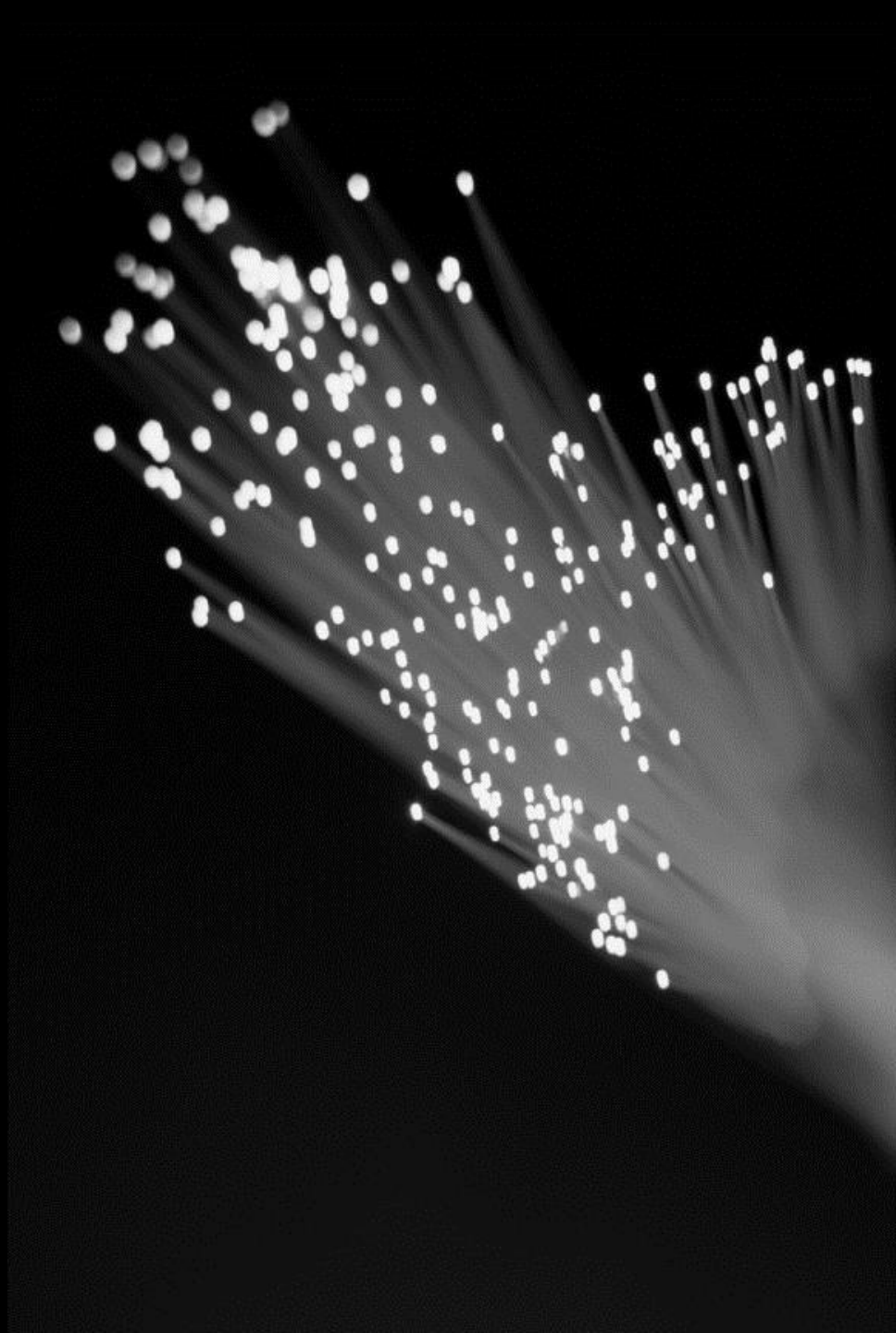
Value of Global Quality Assurance



Why Accreditation Matters

- Accreditation *demonstrates*
  - collegiate programs meet *threshold standards* to produce graduates that are ready to enter “the profession”
  - institutions are *committed* to improving the students’ *educational experience*
- Provides value
  - Students, institutions, faculty, global industry, general public

UN Sustainable Development Goals

www.un.org/sustainabledevelopment/

NAE Grand Challenges


Make solar energy economical


Provide energy from fusion


Develop carbon sequestration methods


Manage the nitrogen cycle


Provide access to clean water


Restore and improve urban infrastructure


Advance health informatics


Engineer better medicines


Reverse-engineer the brain


Prevent nuclear terror


Secure cyberspace


Enhance virtual reality


Advance personalized learning


Engineer the tools of scientific discovery

www.engineeringchallenges.org

India facing the 'worst water crisis in its history'

15 June 2018

Thousands of Indians die each year as they have no access to clean water

India facing the 'worst water crisis in its history‘

- 600 million people facing acute water shortage
- 21 cities are likely to run out of groundwater by 2020 despite increasing demand
- Threaten food security: 80% of water in agriculture
- 200,000 Indians die every year because they have no access to clean water
- Demand will be twice as available supply by 2030
- Water scarcity would also account for a 6% loss in India's gross domestic product (GDP)

BBC News 15 June 2018

Women queuing to fill water in plastic pots is a common sight in India

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Bangalore water woes: India's Silicon Valley dries up

Bangalore is known as India's Silicon Valley. But the metropolis, renowned for its IT parks and gleaming skyscrapers, is running out of water fast.

Sanjoy Majumder reports.

Produced by Kunal Sehgal, filmed and edited by Varun Nayar

30 May 2017

Share

https://www.bbc.com/news/av/world-asia-india-40083140/bangalore-water-woes-india-s-silicon-valley-dries-up

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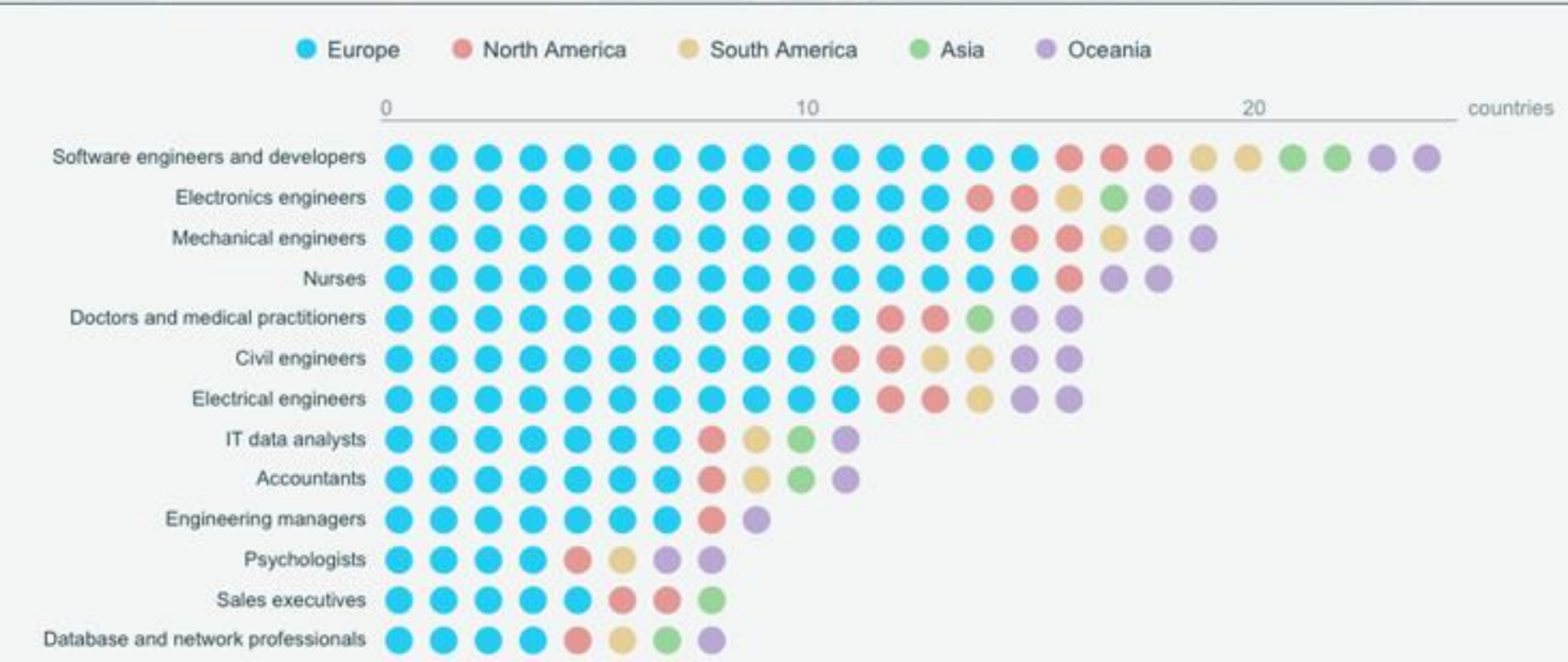
Global Engineer

Are we Preparing Students to Succeed in a Global Economy?

http://nationalvanguard.org/

THE WORLD'S MOST IN DEMAND PROFESSIONS

Across the developed countries of the world, skilled professionals are in high demand. Software engineers are needed in 24 countries, nurses are needed in 18, while 11 countries report a shortage of accountants. Explore the chart below to see which occupations are most in demand across the world and discover which skills are needed.



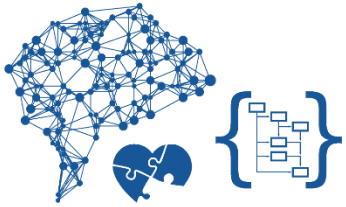
Top 10 skills

in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity



Source: Future of Jobs Report, World Economic Forum

Washington Accord
Global Graduate Attributes (KSA)

- Engineering Knowledge
- Problem Analysis
- Design/Development of Solutions
- Investigation & Experimentation
- Modern Tool Usage
- The Engineer and Society
- Environment and Sustainability
- Ethics
- Individual and Teamwork
- Communication
- Project Management and Finance
- Lifelong Learning

INTERNATIONAL ENGINEERING ALLIANCE

- **U.S.** – *ABET:* W/S/D
- **Australia** – *EA:* W/S/D
- **Canada** – *EC:* W; CCTT: S/D
- **Ireland** – *EI*: W/S/D
- **New Zealand** – *IPENZ:* W/S/D
- **UK** – *ECUK:* W/S/D
- **Hong Kong China** – *HKIE:* W/S
- **South Africa** – *ECSA:* W/S/D

Japan – *JABEE*: W

- **Singapore** – *IES*: W
- **Chinese Taipei** – *IEET:* W/S
- **South Korea** – *ABEEK:* W/S/D
- **Malaysia** – *BEM*: W
- **Turkey** – *MUDEK*: W
- **Russia** – *AEER*: W
- **India** – *NBA*: W
- **Sri Lanka** – *IESL*: W
- **China** – CAST: W
- **Pakistan** – PEC: W

Washington (W), Sydney (S), Dublin (D) Accords

Innovation

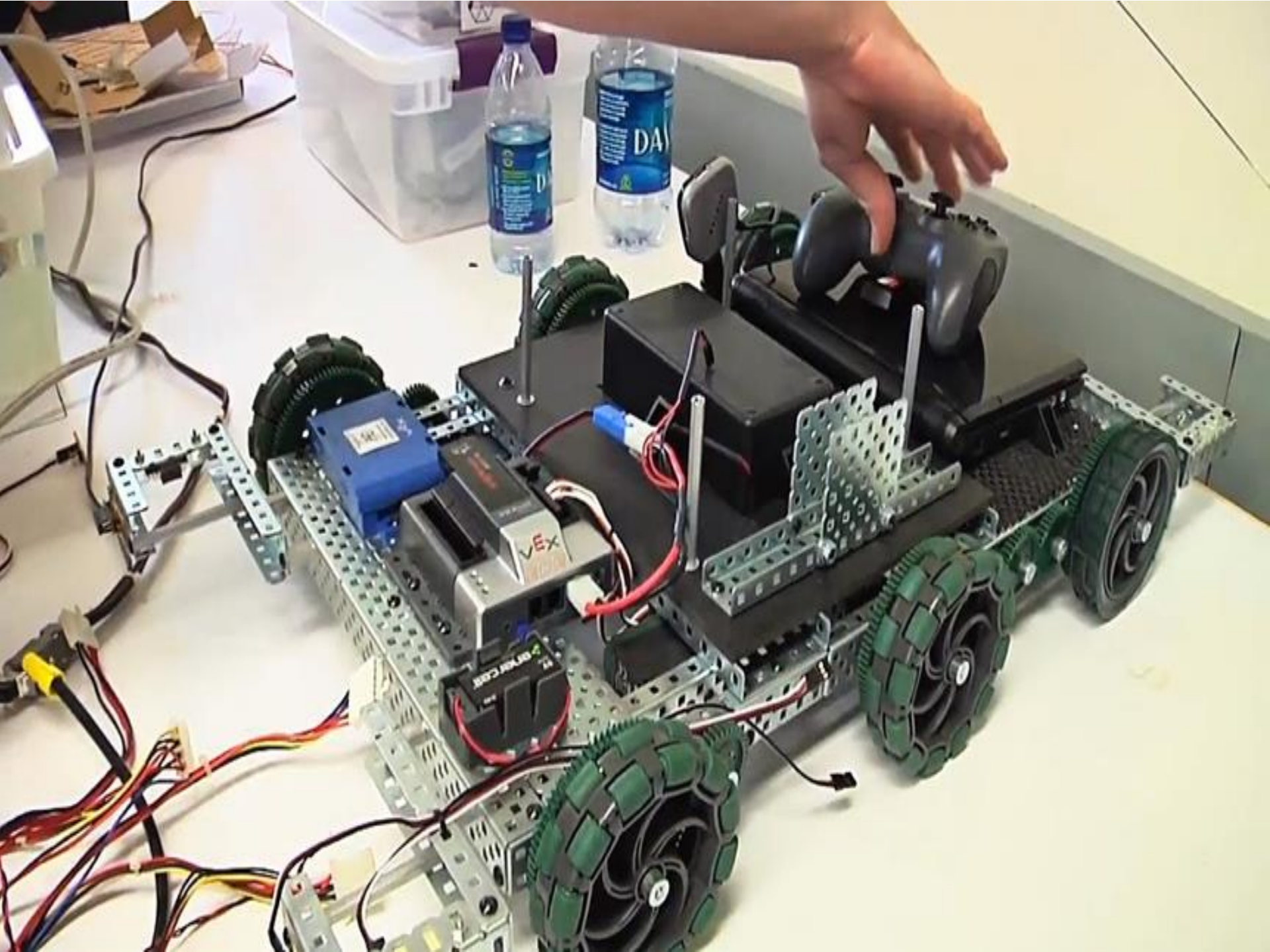
Our Role in Encouraging Innovation

- Our criteria & processes
  - encourage innovation
- Focused on “Outcomes”
  - what student learn and do
- Holistic approach
  - Entire Student’s educational experience

Themes

- Blurring of disciplinary boundaries
- Holistic approach to problem solving
- Informed by business
- Customizable curriculum
- Dynamic hands-on learning

Blurring of disciplinary boundaries


VEX

BS, MS, PhD in Robotics Engineering

Worchester Polytech University (WPI)

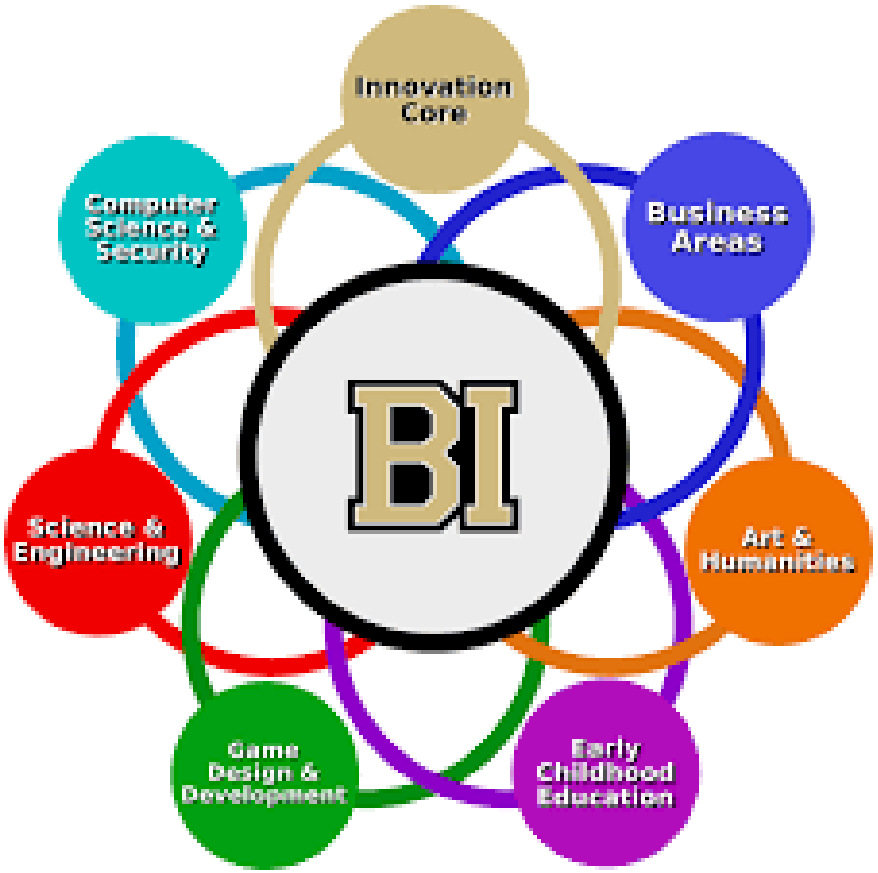
- Involves Electrical, Computer, Mechanical Engineering, Computer Science
- Complementary coursework in social implications and entrepreneurship
  - Provide the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

https://www.wpi.edu/academics/departments/robotics-engineering

Blurring of disciplinary boundaries

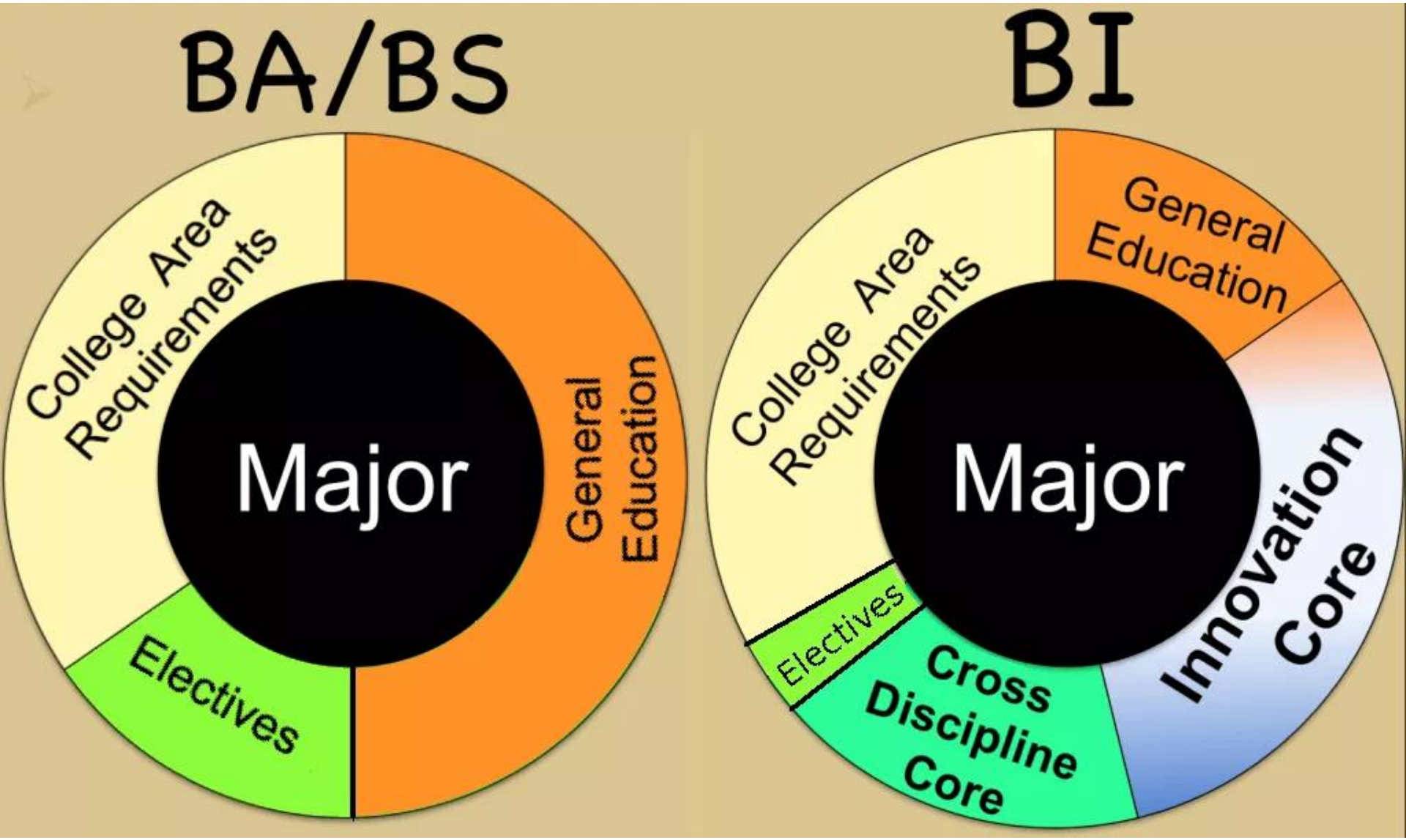
Bachelor of Innovation™

UNIVERSITY OF COLORADO **COLORADO SPRINGS**



http://innovation.uccs.edu

Blurring of disciplinary boundaries



The Bachelor of Innovation™ in Electrical Engineering

- Provides students with both the technical and business background to work on innovative electrical engineering-related projects, including the ability to:
  - recognize the broader issues in electrical engineering technology-related problems;
  - understand the technological, business, legal and societal constraints affecting this technology
  - have the ability to communicate the key issues, needs, potential options, and final solution to a challenge.

UCCS Bachelor of Innovation

- Innovation Core
  - ENTP 1000 Introduction to Entrepreneurship 3
  - INOV 1010 The Innovation Process 3
  - BLAW 2010 Business and Intellectual Property Law 3
  - INOV 2010 Innovation Team: Analyze and Report 3
  - INOV 2100 Technical Writing, Proposals, and Presentations 3
  - INOV 3010 Innovation Team: Research and Execute 3
  - INOV 4010 Innovation Team: Design and Lead 3
  - ENTP 4500 Entrepreneurship and Strategy
- Cross Discipline Core
  - Business
  - Globalization
- Math, Science, Electrical; Engineering Core + Electives

Olin College
of Engineering

- Founded in 1997
- Electrical, Computer, Mechanical, and General Engineering
- No separate academic department
- Faculty all on 5 year contracts, no tenure possible
- Classes emphasize context and interdisciplinary connections
- Continuous curriculum reviews

Olin College
of Engineering

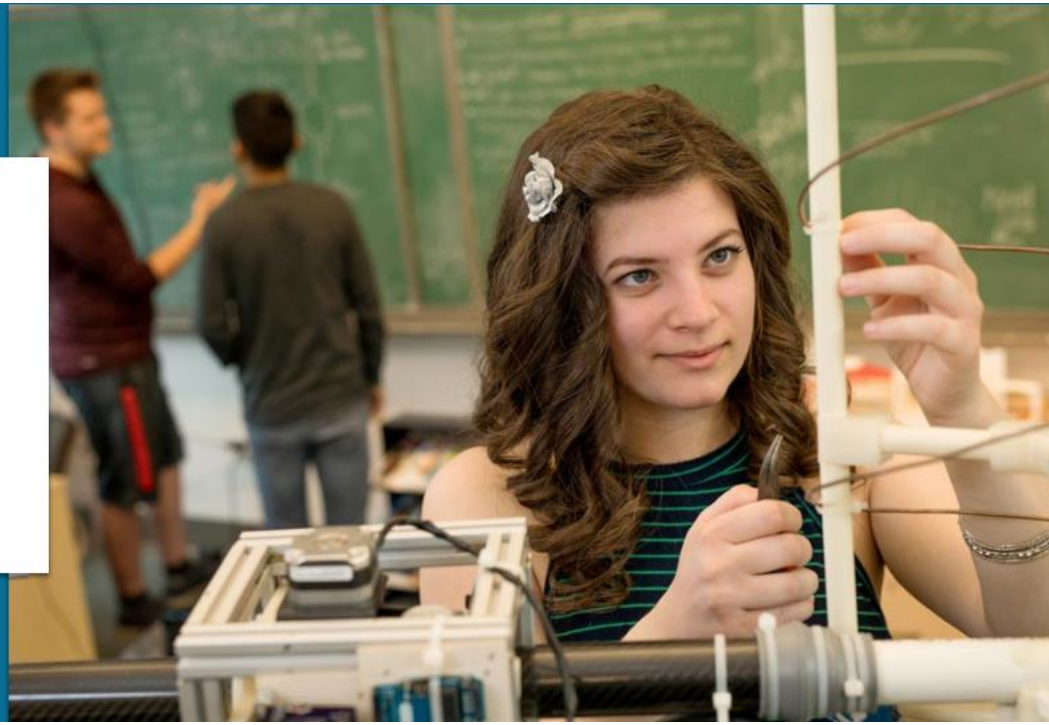
- Project-based learning
  - Curriculum built around hands-on engineering and design projects
  - This project-based teaching begins in a student's first year and culminates in two senior "capstone" projects.
  - In the engineering capstone, student teams are hired by corporations, non-profit organizations, or entrepreneurial ventures for real-world engineering projects.

CAPITOL TECHNOLOGY UNIVERSITY

1927

Team-Oriented, Multidisciplinary Projects

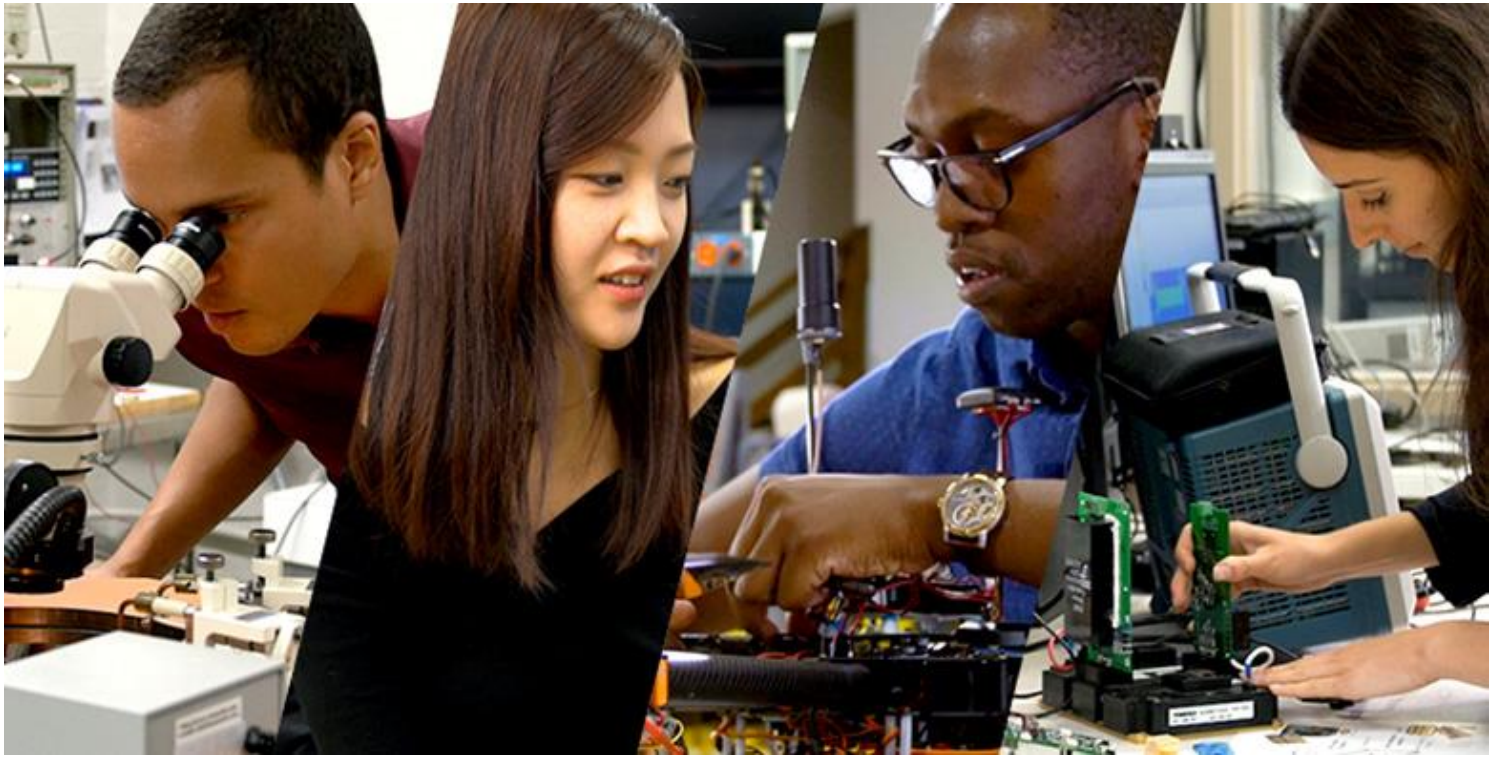
Professionals from all backgrounds collaborate in the real-world, so we've structured our labs to operate the same way. Students majoring in electrical engineering, cyber and information security, astronautical engineering and others all form teams to collaborate, trouble-shoot and explore what's possible in our labs.



Dynamic Hands-On Learning

Lab component to *every* engineering course

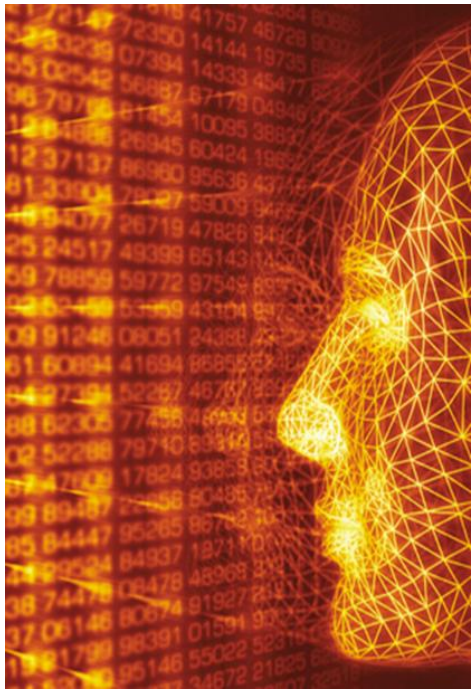
- "Learn by doing"



Thoughts on Future Challenges

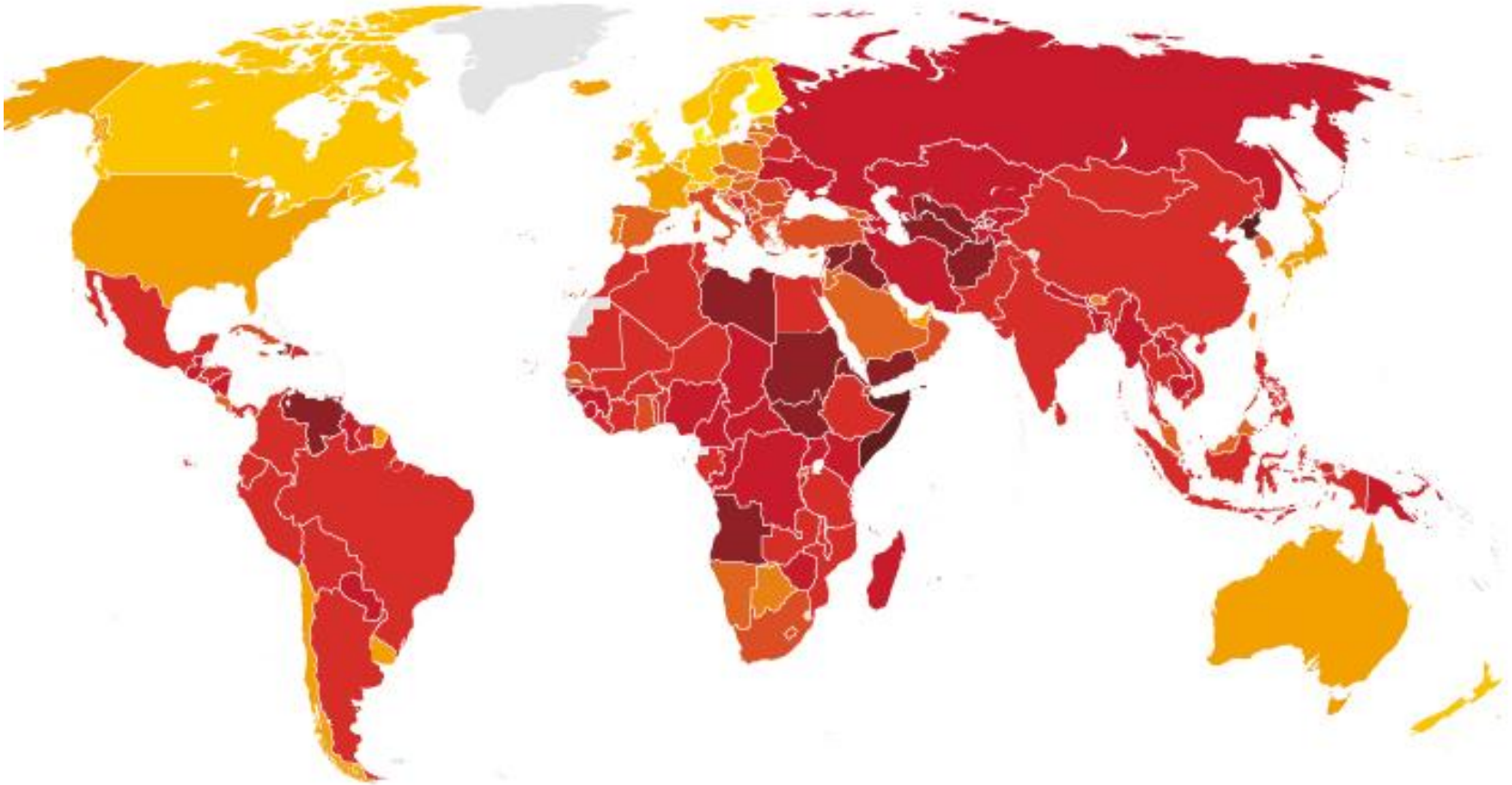
Global Technical Professionals

- Challenges: complex, grand, global, unpredictable
- Multidisciplinary “systems” approach
- Global, sustainable solutions
- Mobility: work anywhere, with anyone
- Language, history, cultural sensitivity
- Greater interaction with general public
- Washington Graduate Attributes



http://manofthehouse.com/money/career-advice/business-ethics-in-the-workplace

Corruption Index

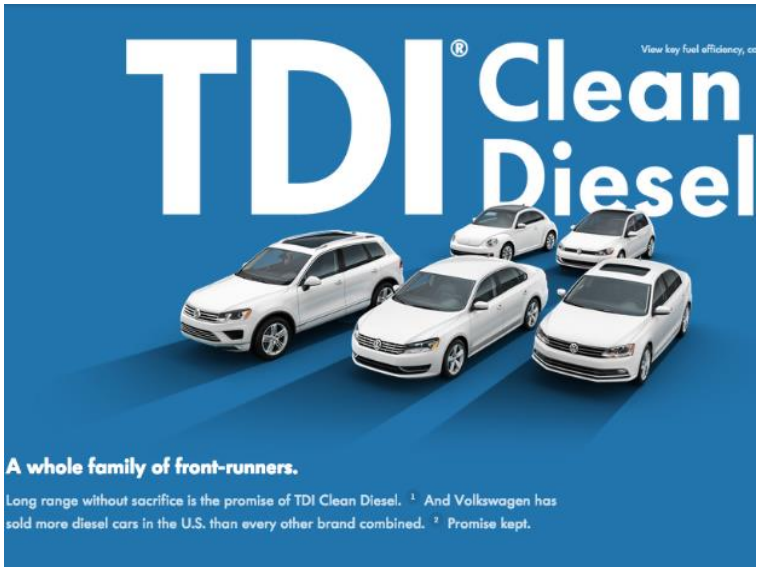


#cpi2015

www.transparency.org/cpi

What's the impact of unethical behavior?

- Reduces/destroys confidence, reputation
- Negative effect on quality
- Economic impact
- Diversion of resources
- Safety and welfare of the general public


TDI® Clean Diesel
A whole family of front-runners.
Long range without sacrifice is the promise of TDI Clean Diesel. [1] And Volkswagen has sold more diesel cars in the U.S. than every other brand combined. [2] Promise kept.


GM


EVELOPING NOW
PROTESTS OVER TOXIC WATER IN FLINT, MICHIGAN
DEMONSTRATORS DEMANDING GOVERNOR RESIGN

ABET Symposium, 2016

Joe Palca
NPR

Mark Edwards
Virginia Tech

Arvind Thiruvengadam
West Virginia Univ

Steve Cramer
Univ Wisconsin

https://vimeo.com/168369949

ABET

How to effect change?

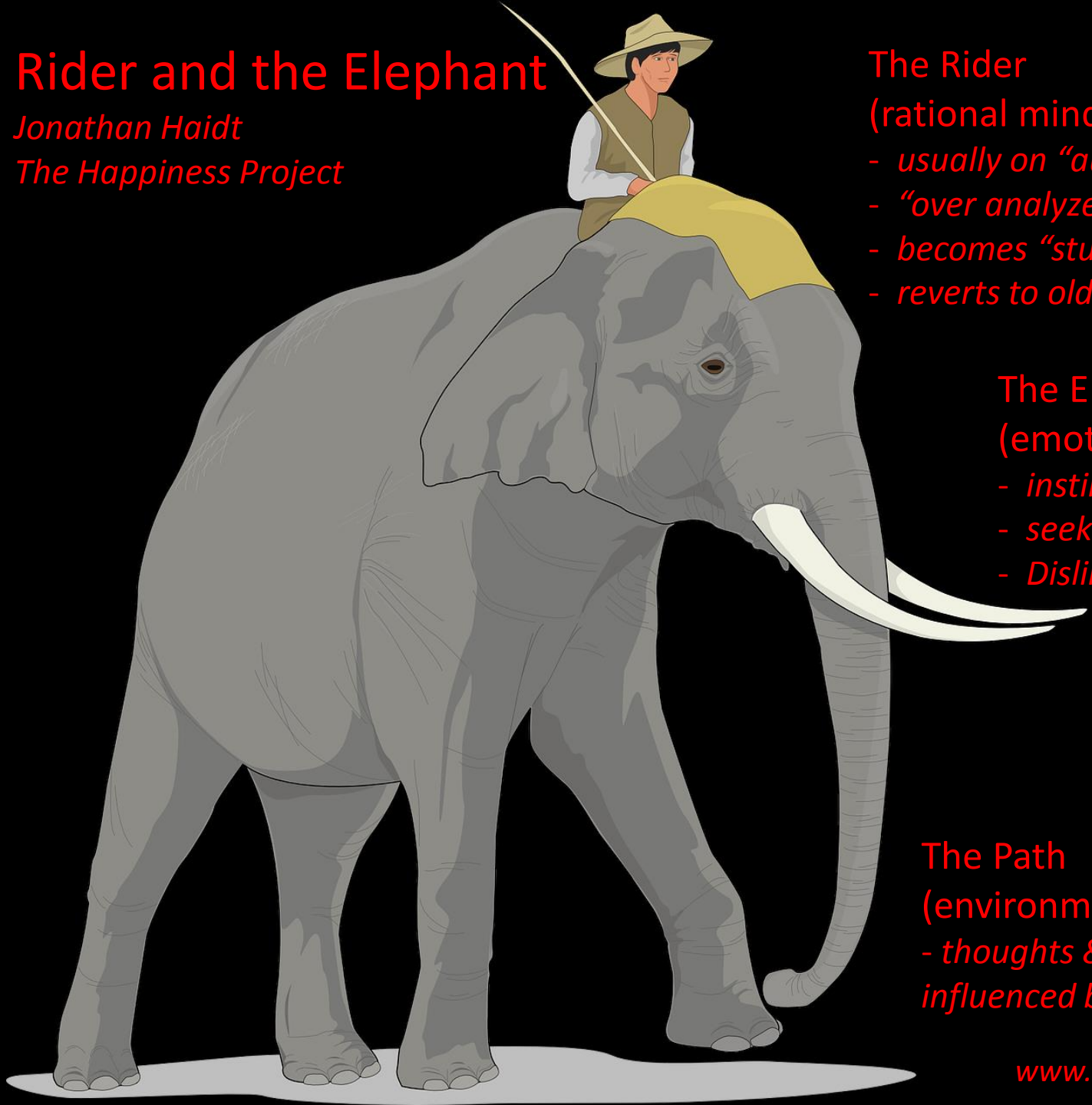
Why do Students Cheat?*

- Performance concerns
- Academic load
- Peer behavior: “others do it”
- Pressure from family
- GPA: qualification for …
- “Unfair” professors
- Time pressure
- Grades for grad school
- Lack of effort
- Low self esteem

*Point Loma Nazarene University

Rider and the Elephant

Jonathan Haidt
The Happiness Project



The Rider
(rational mind)

- *usually on "auto pilot"*
- *"over analyze" tough problems…*
- *becomes "stuck" … exhausted*
- *reverts to old habits*

The Elephant
(emotional mind)

- *instinctive, pain/pleasure,*
- *seeks instant gratification*
- *Dislikes ambiguity*

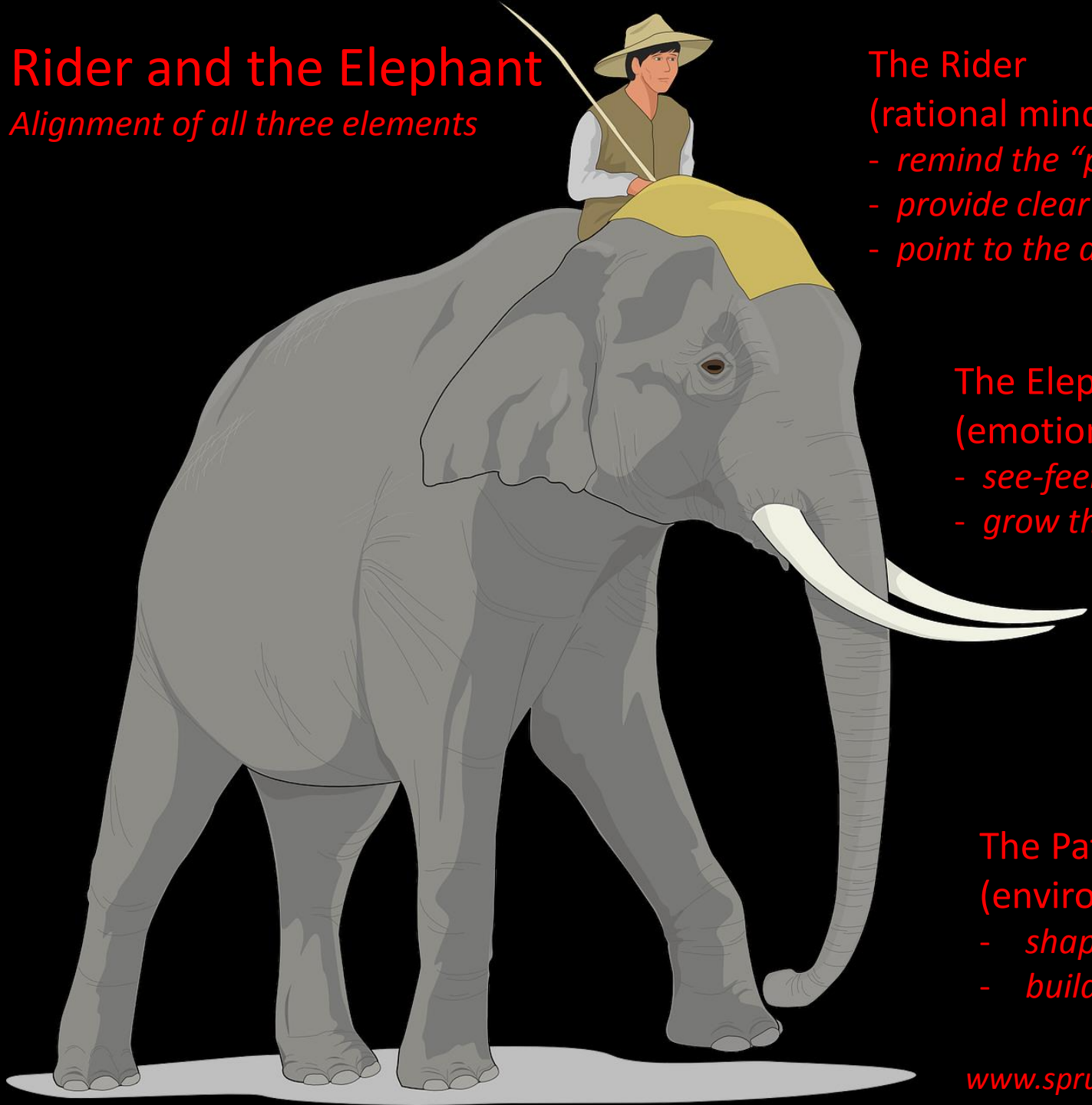
The Path
(environment)

- thoughts & actions deeply influenced by our environment

www.sprucedupspacesllc.com

Rider and the Elephant

Alignment of all three elements



The Rider
(rational mind)
- *remind the "positive"*
- *provide clear guidance*
- *point to the destination*

The Elephant
(emotional mind)
- *see-feel-change*
- *grow the person*

The Path
(environment)
- *shape the path*
- *build habits*

www.sprucedupspacesllc.com

Honesty

Accountability

Integrity

Sincerity

Core Values

Authenticity

Empathy

Ethical Behavior

Transparency

Values-led educational experience

- Promoting academic honesty
  - Preventive approach more effective than punitive
  - Instilling code of ethics/honor code
- Faculty training
- Consistent messaging
  - Student handbooks & institutional website
  - Incorporating into syllabi, sign pledge, etc
  - Incorporate into curriculum
- Case studies
  - Clear examples of constitutes unethical behavior

Trends in Engineering Education

… concerned with the increasing **breadth of engineering** as it applies to addressing the **world's grand challenges** in environment, energy, health care, information, poverty alleviation and other areas. That breadth is apparent across **many dimensions** - time zones, cultures, length-scales, disciplines within engineering and even those not traditionally considered to be part of engineering. "Increasingly, these challenges will be solved by eng**ineers working collaboratively with others**," Waitz says

- Ian Waitz, MIT News 2011

ABET Symposium, 2017

"We have an obligation to communities to help improve the human condition. This generation of engineering students are socially connected and helping them understand how engineering can help solve societal problems will bring more of them into the field of engineering. It's our responsibility to improve the human condition by the work that we do and the people we train"

Darryl Pines, PhD
Dean and Professor of Aerospace Engineering James Clark School of Engineering
University of Maryland

International Collaboration

IFEES
International Federation of
Engineering Education
Societies

ABET

BE CONFIDENT℠