The Need for Impact:

Modern Engineers and Experiential Learning

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July 9, 2026

AGENDA

- Education at a Crossroads
- Engineering's Evolution
- The Empathetic Engineer
- e4USA's Model of Success
- Making an Impact

Education at a Crossroads

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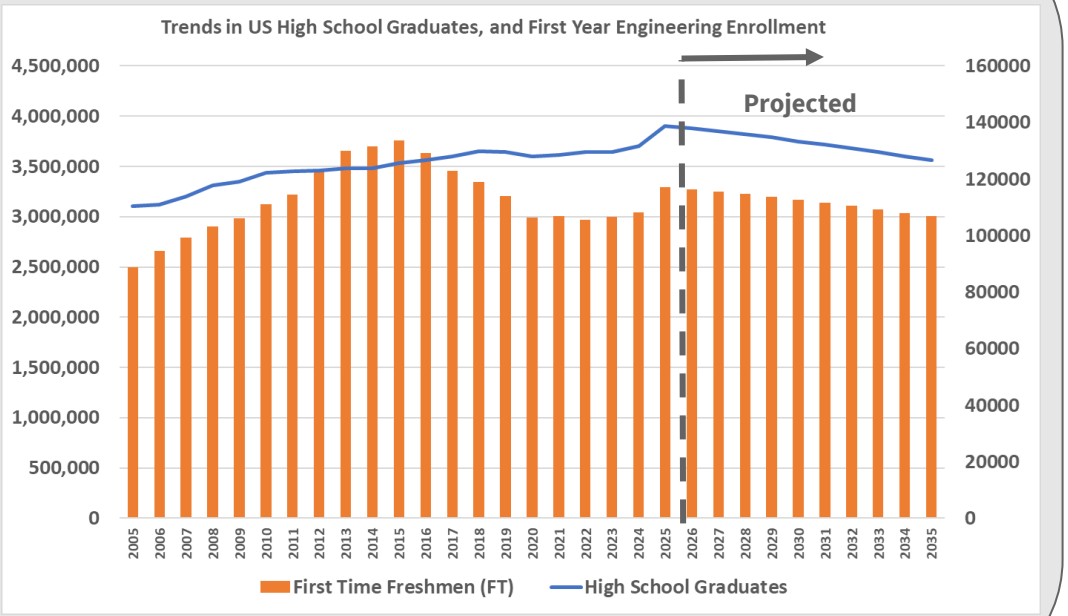
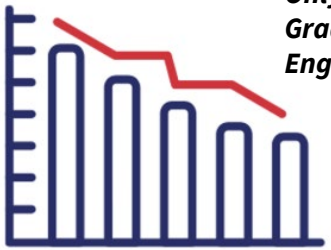
FEARLESSLY FORWARD

The Enrollment Crisis

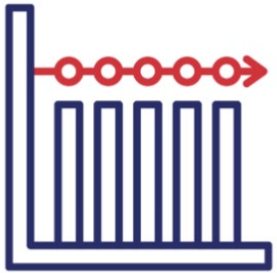


Data Courtesy of ASEE and NCES

Only 3%-3.8% of HS Graduates Enroll in Engineering

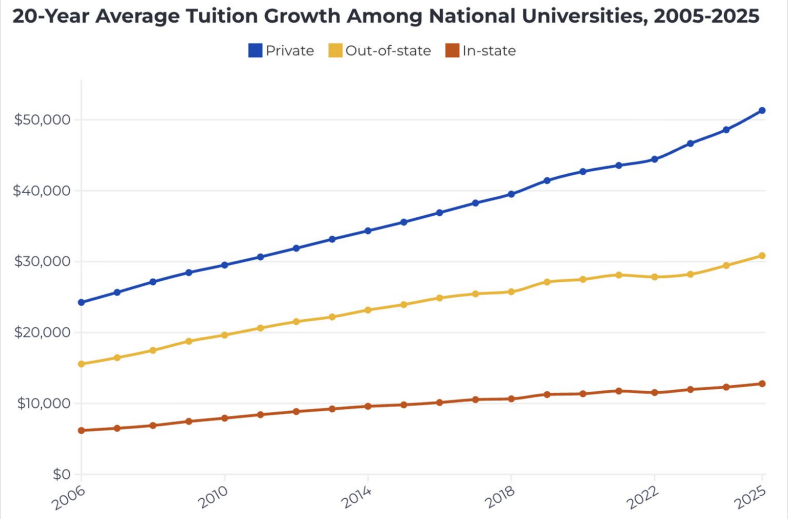


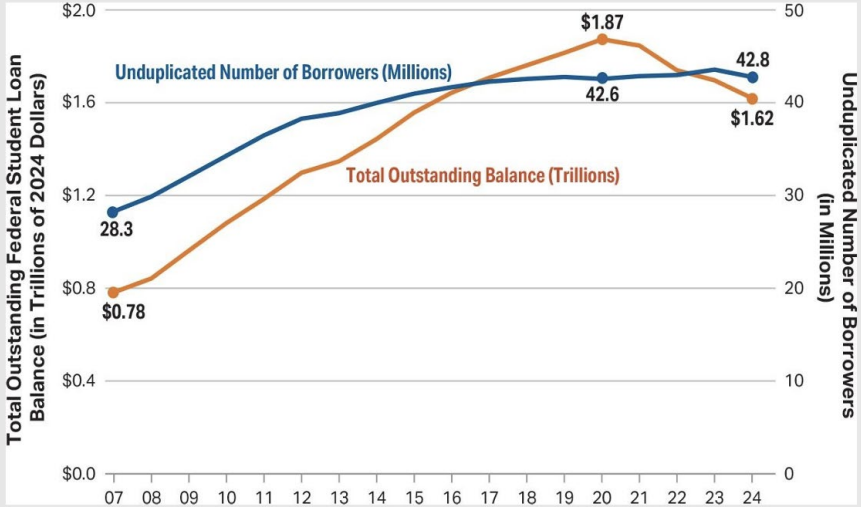
Declining High School Graduates



Stagnating Engineering Enrollment

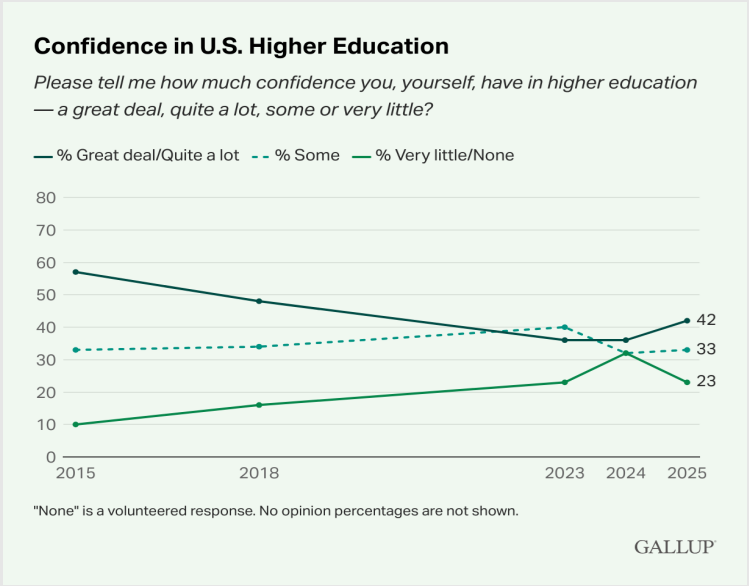
Rising Tuition and Debt

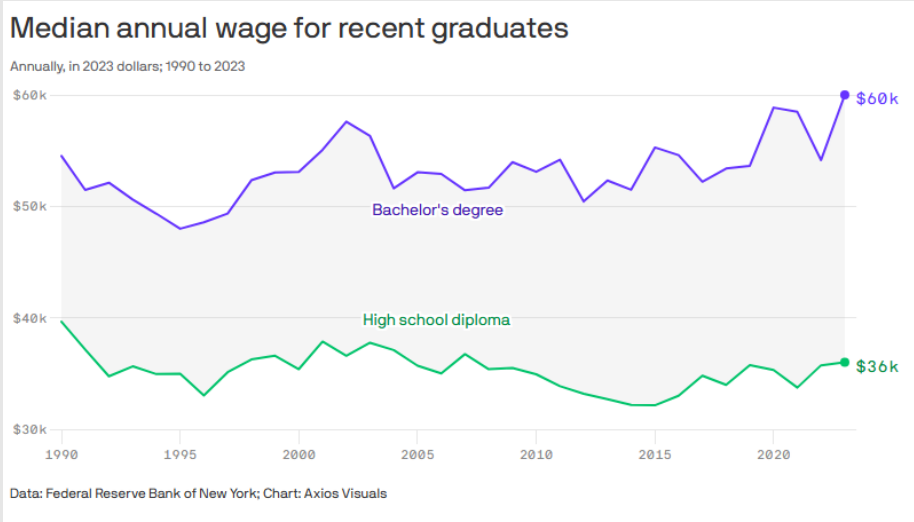


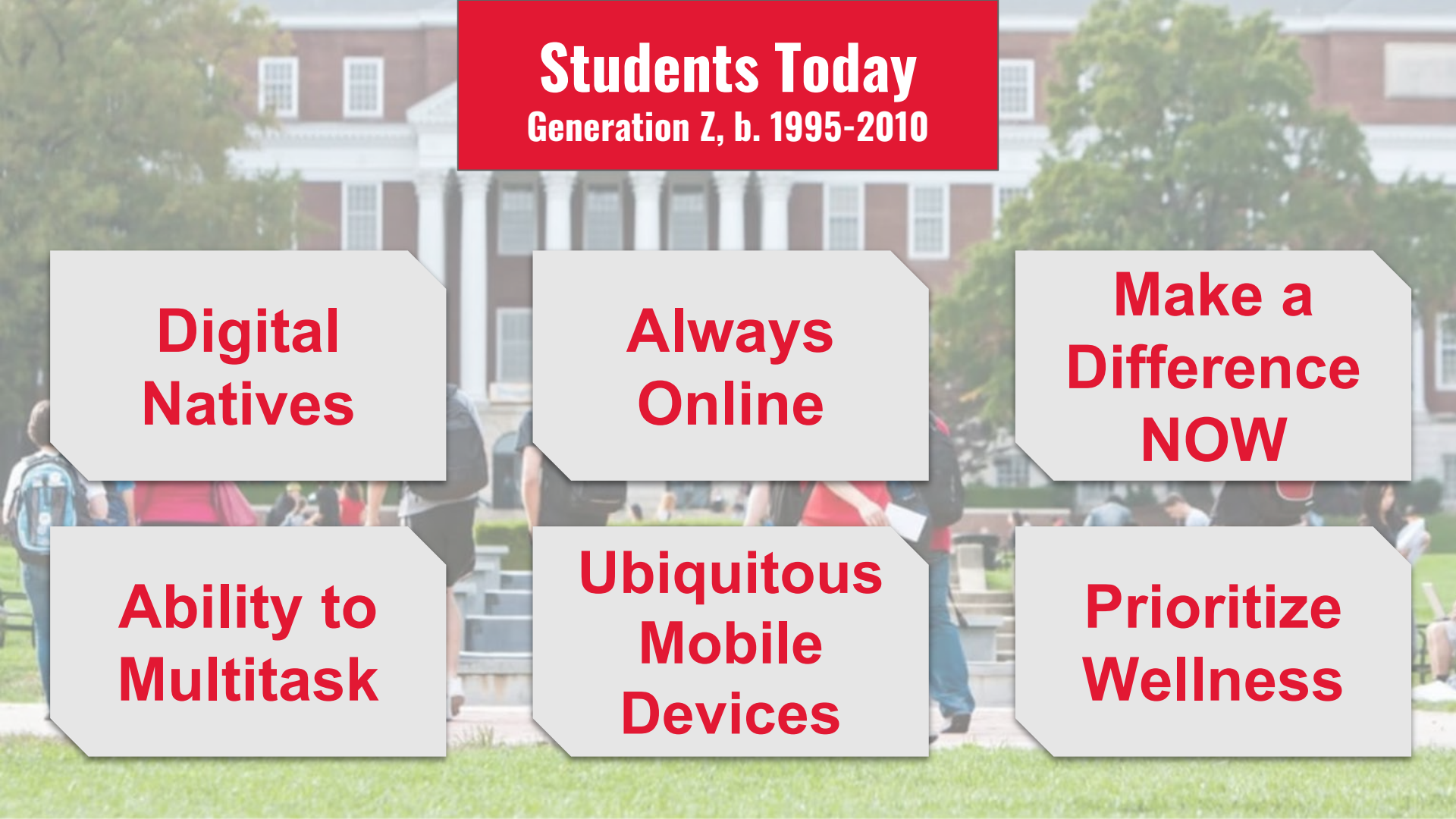


But Net Cost of Attendance is Going Down
(Universities Offering More Grant Aid)

Declining Public Trust vs. Value

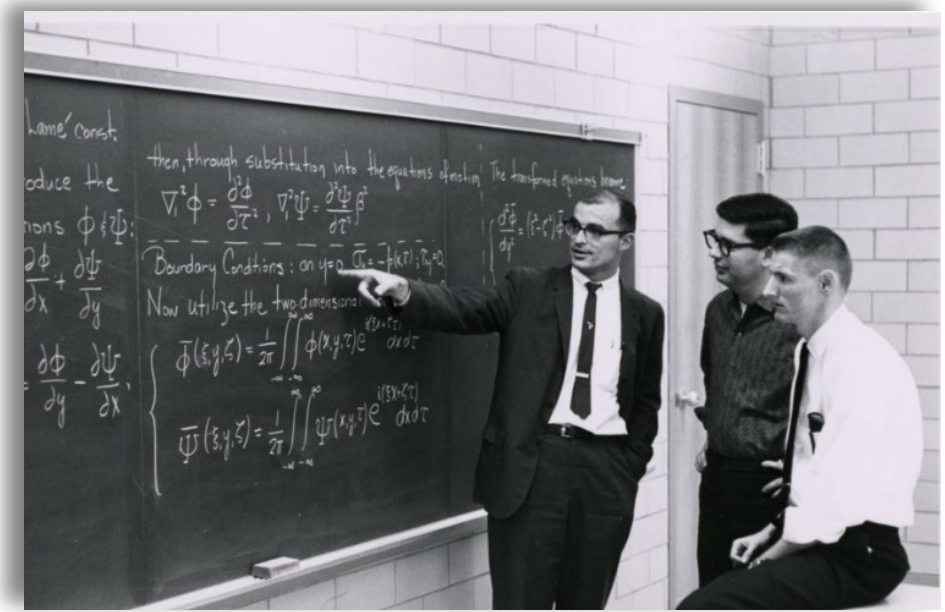





Students Today
Generation Z, b. 1995-2010
Digital Natives
Always Online
Make a Difference NOW
Ability to Multitask
Ubiquitous Mobile Devices
Prioritize Wellness

Changing Learning Environments

EDUCATION THEN …

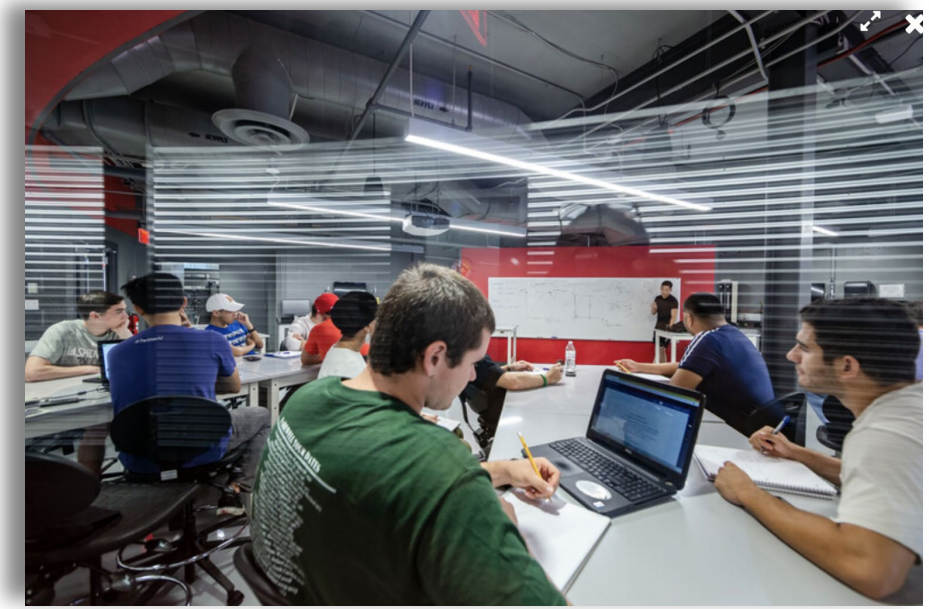


- In-Person lectures with blackboard/whiteboard
- Paper homework and exams
- No Internet, email, text or mobile devices

Changing Learning Environments

… AND EDUCATION NOW

- In-Person and Online Lectures with Video, Clickers and Tablets
- Online homework and exams
- New Digital Tools (AI)



Engineering's Evolution

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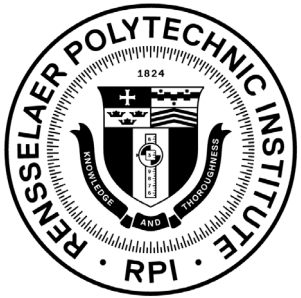
FEARLESSLY FORWARD

First U.S. Engineering Schools

1802: **U.S. Military Academy**
(West Point, N.Y.)

1819: **Norwich University**
(Northfield, Vt.)



1824: **Rensselaer Polytechnic Institute**
(Troy, N.Y.)

Major Changes in U.S. Engineering Education

19th Century

- Practice Education: Shop Skills, Technical Training, Manufacturing
- Establishment of Land-Grant Institutions
- Professional Societies: ASCE, ASME, ASEE

Justin Morrill, U.S. Senator and sponsor of Morrill Land-Grant Acts

Sylvanus Thayer, Superintendent of West Point and engineering education pioneer

Robert Henry Thurston, first ASME President and founder of first mechanical engineering lab for funded research in U.S. higher education

20th Century

- Theory/Science Education: Fundamental Mathematics and Mechanics, Science Laboratories
- Engineering Design Education: Project-Based Learning, Hands-On/Applied Work, Ethics, Professional Development, Industry Collaboration
- Professional Societies: AIChE, IEEE, AIAA
- ABET est. 1932, provides quality standards

Theodore von Karman, aerospace pioneer and founder of JPL

Stephen Timoshenko, father of modern engineering mechanics

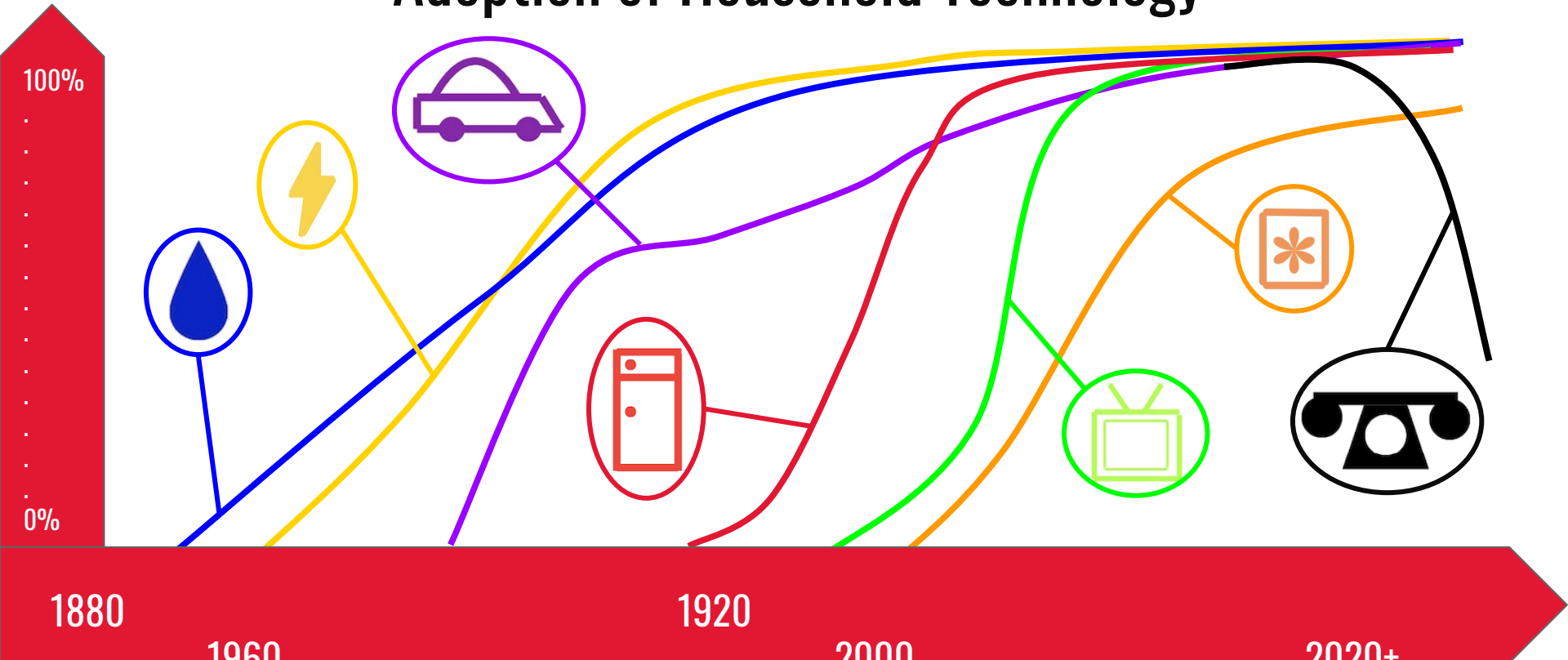
21st Century

- Modern Engineering Education: Research, Complex Systems, Pedagogy, First-Year Experience, Capstone Design, Experiential/Service Learning, Online Models, Virtual Labs, Increased Speed of Innovation
- Influence/Impact of AI/ML
- Transition from kinetic, human and machine conflicts (Civil War, WWI, WWII, Cold War) to potential for Cyberwar

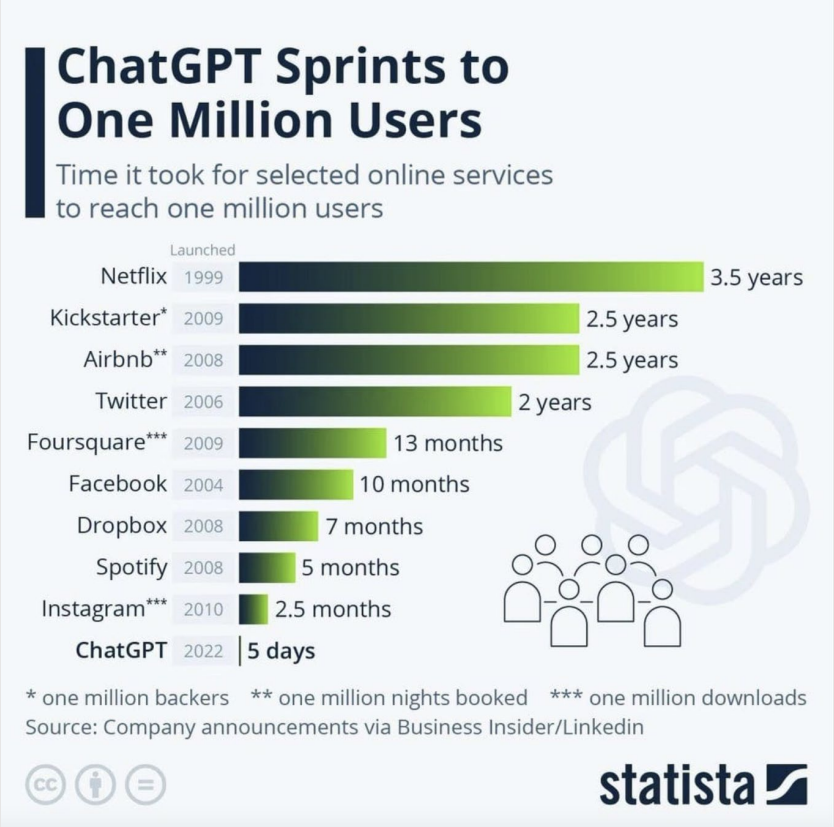
Leah Jamieson, IEEE President and co-founder of Engineering Projects in Community Service (EPICS)

Engineering Impact on U.S. Quality of Life

Adoption of Household Technology



Innovation and Adoption at Increasing Speed



Common Traits Of Engineering Students

"Problem Definers" and "Problem Solvers"

Handle Evolving Risks, Cultures, Ethics & Technologies

Leaders in Management, Innovation, Entrepreneurship & Public Policy

Application Skills Combined with Theoretical Strengths

The Empathetic Engineer

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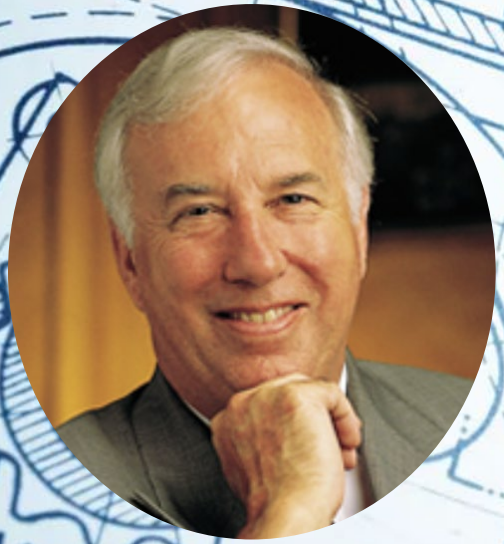


“Engineers create solutions for people and society.”

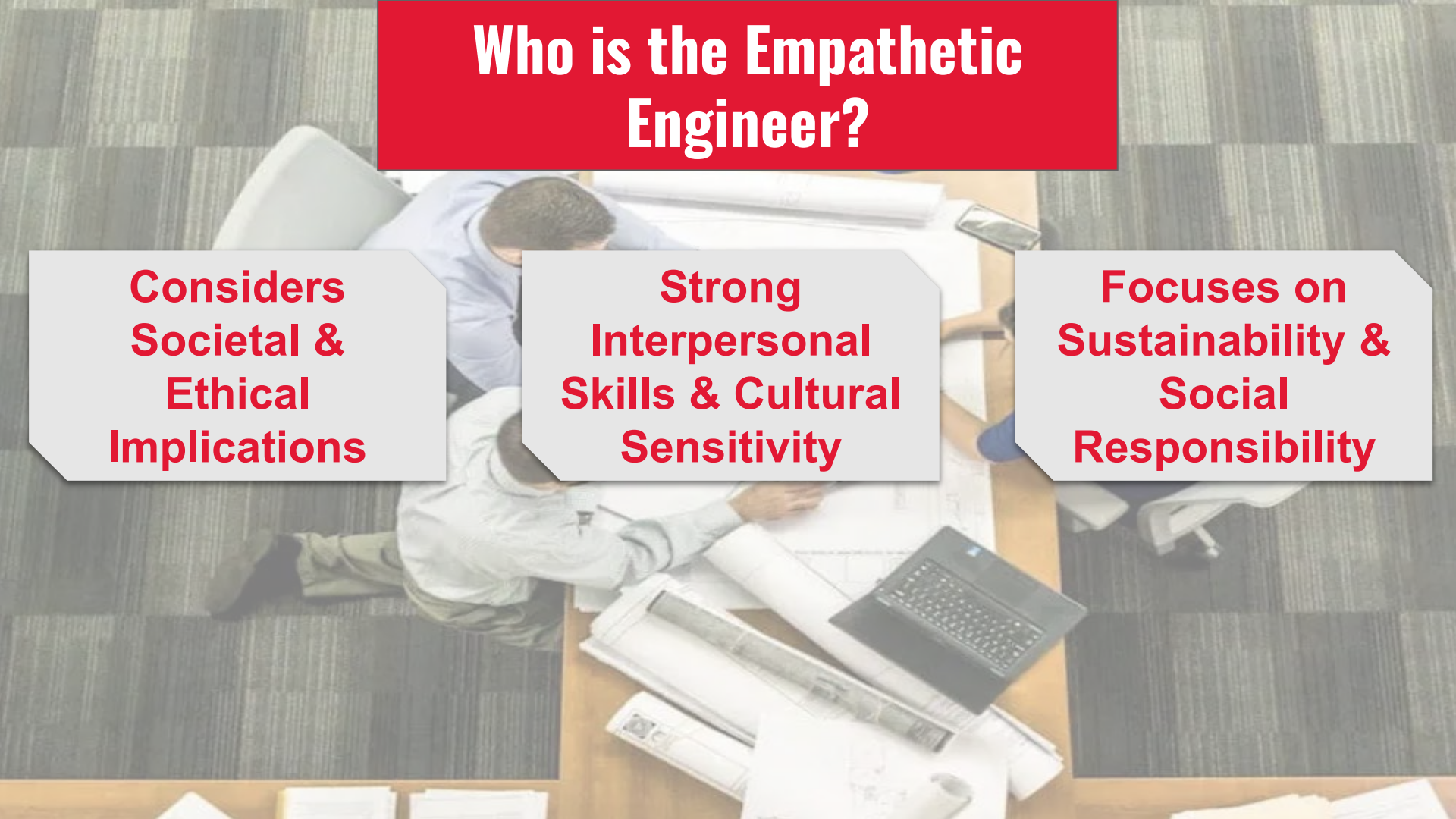
C. Dan Mote, Jr., former President of the University of Maryland and the National Academy of Engineering

As engineers, we must …

- Respond to emerging challenges
- Consider the needs of people and the planet
- Create solutions that *deliver* value and are *shaped* by values

… *to be* Empathetic Engineers.

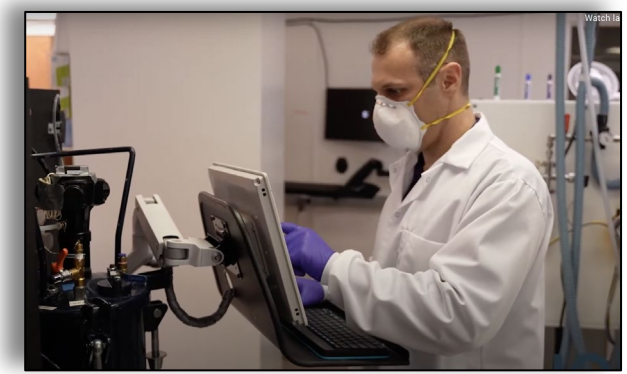
Who is the Empathetic Engineer?



- Considers Societal & Ethical Implications
- Strong Interpersonal Skills & Cultural Sensitivity
- Focuses on Sustainability & Social Responsibility

Take on Societal Needs …

Drones Helping First Responders



Safer and Better Batteries Developed By Startups

Robots Boosting Aquaculture

… With Real World Solutions

e4USA's Model of Success

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FEARLESSLY FORWARD

engineering for us all

A Pipeline of Empathetic Engineers

- First-of-its-kind, national initiative started in 2002 and supported by NSF since 2018 to introduce engineering design principles to a new generation of students.
- Multiple course offerings provide flexible entry points for different learners and teaching styles.
- Professional development online and in person empowers any teacher to help students design a better future.

Experiential Learning

- Tackle real-world, local challenges while building skills
- Multi-year, vertically integrated and hands-on
- Contextual and Integrative Experiences that Introduce Systems Thinking

Engineering FOR US ALL (e4usa)

Experiential Design Process

Solving Real Problems. Improving Real Lives.

1 IDENTIFY & EMPATHIZE

Build relationships. Listen deeply. Understand the community's needs, strengths, and context.

Goal: A shared understanding of the real problem.

2 DEFINE

Synthesize what we learned and define the real problem in human-centered terms.

Goal: A clear, actionable problem statement.

3 IDEATE

Brainstorm many ideas. Encourage wild thinking and build on each other.

Goal: A wide range of creative possibilities.

4 PROTOTYPE

Build, sketch, model, or role-play our best ideas. Make it real enough to learn from.

Goal: Tangible prototypes to test and learn.

5

Share prototypes with users and our community partner. Gather feedback.

Goal: Evidence about what works and what doesn't.

6 REFINE

Use feedback to improve our solution. Make it better, simpler, stronger.

Goal: A solution that meets real needs.

7 IMPLEMENT & SHARE

Put our solution into action with our community partner. Share what we learned and celebrate impact!

Goal: Lasting impact and inspiration for others.

ITERATE!
Learn, Improve, & Re-Design

STUDENTS + COMMUNITY PARTNER

Working together to co-create solutions that matter.

GUIDING PRINCIPLES

- **Human-Centered** — We start with people and their needs.
- **Equity & Inclusion** — We value every voice and perspective.
- **Sustainability** — We design for a better tomorrow.
- **Innovation** — We embrace creativity and persistence.
- **Community Impact** — We create solutions that make a difference.

e4usa
engineering FOR US ALL

REAL PROBLEMS
Authentic challenges from real community partners.

REAL LEARNING
Students build skills in engineering, teamwork, and systems thinking.

REAL IMPACT
Solutions that strengthen communities and change lives.

Design it. Build it. Change it. TOGETHER.

What is e4usa?

WHERE WE ARE TODAY

90

Staff, contractors and volunteers dedicated to expanding engineering education

15,000+

Students engaged in our courses

110+

High school partners bringing engineering design into their classrooms

125+

University partners supporting student pathways to college credit and placement

Partners and Supporters

TEACHENGINEERING

National Science Foundation

MathWorks

YES Youth Engineering Solutions

NCSS National Consortium of STEM Schools AFFILIATE MEMBER 2026

icgs International Coalition of Girls' Schools Advancing Girls' Education Globally

onshape

tsin Tennessee STEM Innovation Network

A. JAMES & ALICE B. CLARK FOUNDATION

AL & JANE NAHMAD AJNFF FAMILY FOUNDATION

JACK KENT COOKE FOUNDATION

Making an Impact

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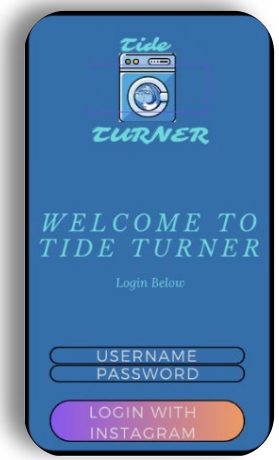
UMD: Plastic Pollution Reduction Project



- The Task: Decrease plastic pollution from washing synthetic clothing
- Used cartridge pool filter to build prototype with natural agave fibers, easy installation and replacement
- Created “Tide Turner” app concept to build awareness

South Mountain CC: Hand Prosthetic Project

- The Task: Design a hand prosthetic using only lab materials that can pick up a pencil
- Available as Humanities elective, done in consultation with professional prosthetist
- Creates functional designs at fraction of regular cost

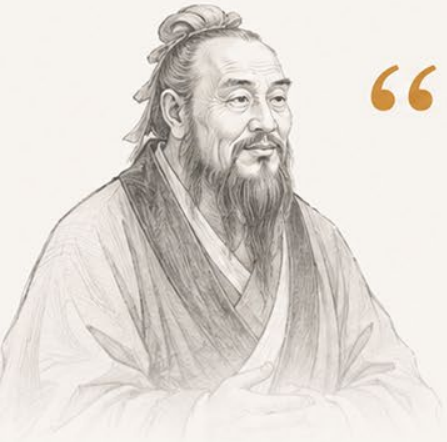
High School: Adaptive Lacrosse Stick Project

- The Task: Design Lacrosse Stick for 10-year-old Stella
- Must Be Pink, Bendable and Wheelchair Mounted
- Involved 19 College Park Academy students with parts donated from UMD Lacrosse

Confucius Had it Right!

“If your plan is for one year, plant rice. If your plan is for ten years, plant trees. If your plan is for 100 years, educate children.”

.. and create Empathetic Engineers



EXPERIENTIAL LEARNING

"When I **hear**, I forget.
When I **see**, I remember.
When I **do**, I understand."

— CONFUCIUS — 孔子

KNOWLEDGE BECOMES UNDERSTANDING THROUGH ACTION

HEAR
Information is told to us.

SEE
Visual context and examples.

DO
Experience transforms knowledge into deep understanding.

THE POWER OF LEARNING BY DOING

ENGAGE DEEPLY
Be curious.
Ask questions.

COLLABORATE
Share ideas.
Learn together.

THINK CRITICALLY
Solve problems.
Innovate.

APPLY KNOWLEDGE
Use in real life.
Make a difference.

GROW CONTINUOUSLY
Reflect. Improve.
Lead.


FEARLESSLY
FORWARD