stelar
STEM LEARNING AND RESEARCH CENTER

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Transforming Science Education for Success at Work at the Human-Technology Frontier

New Perspectives in Science Education
Florence, Italy

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NSF

EDC Learning transforms lives.

Agenda

- Who we are and what we do: Education Development Center (EDC) STEM Learning and Research Center (STELAR)
- National Science Foundation – Innovative Technology Experiences for Students and Teachers (ITEST)
- Work at the Human-Technology Frontier and Emerging Skills and Competencies
  - Psychology of Working Theory
  - Educational Implications
  - Equity, Ethical and Policy Implications

Our Affiliation with NSF

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Innovative Technology Experiences for Students and Teachers (ITEST)

- Address shortage of technology workers in the US
- Build skills to succeed in a technology driven world
- Broadening participation of underrepresented groups

STEM Learning and Research Center (STELAR)

- Technical support
- Disseminating results
- Broadening participation

http://stelar.edc.org/

ITEST Reach: Since 2003 NSF has invested $403 million in more than 366 ITEST projects with widespread impact

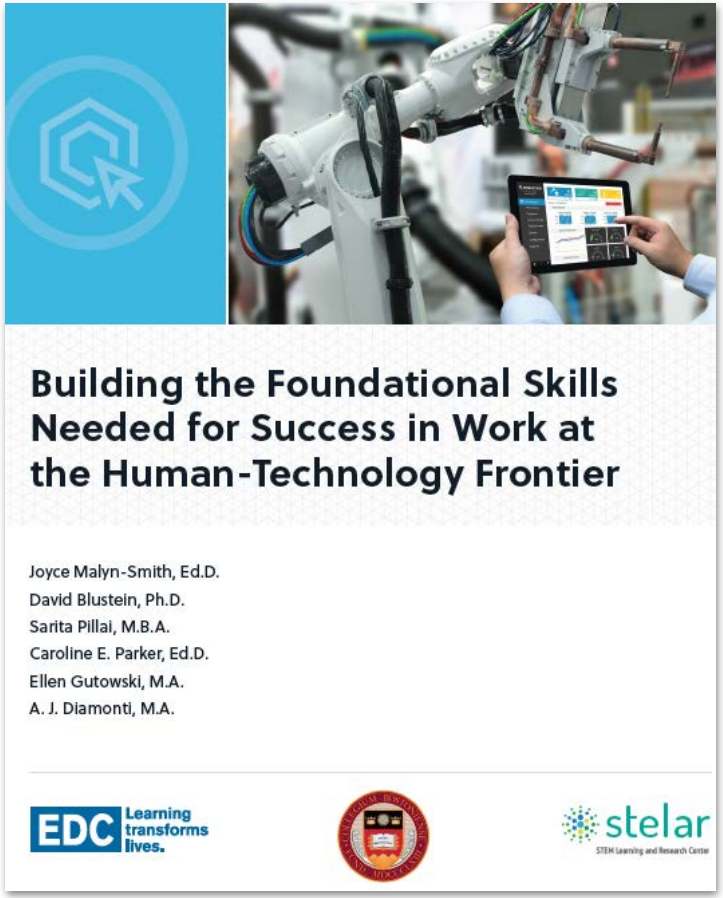
835,000
youth

10,620
parents & caregivers

52,000
educators

The Human-Technology Frontier

White Paper



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Psychology of Working Theory

Multiple human needs:

- Survival
- Social Connection
- Self-determination
- Distal outcomes
- Well-being
- Work fulfillment

Reference: Duffy, R.D., Blustein, D.L., Diemer, M.A., & Autin, K.L. (2016). The Psychology of Working Theory. Journal of Counseling Psychology, 63, 127-148.

Decent Work

- Physical and interpersonally safe working conditions
- Hours that allow for free time and adequate rest
- Organizational values that complement family and social values
- Adequate compensation
- Access to adequate health care

What would STEM programs using psychology of working as the conceptual framework look like?

- Focus on identifying barriers and developing ways to work around obstacles.
- Focus on enhancing empowerment and critical thinking.
- Explore internalization of social identities.
- Continue efforts at career exploration and skills development, with the intention of enhancing self-efficacy and interests.
- Develop psychological attributes that help people navigate difficult social barriers
  - Proactive personality
  - Social support
  - Adaptive cognitive and psychological skills

How Industry Leaders View Future Work

- Predominance of dynamic, interdisciplinary teams
- Focus on data
- Ubiquitous computational thinking
- Engineering design/design thinking
- Blurred boundaries between humans and machines
- Increased focus on continuous lifelong learning

Competencies for the New Type of Worker

- Is a good problem-solver
- Is self-directed, curious, resilient
- Possesses insight, diligence, persistence and cooperation
- Able to keep data safe, interpret and tell data stories
- Computational thinking – use, modify, create technologies
- Comfortable partnering with machines

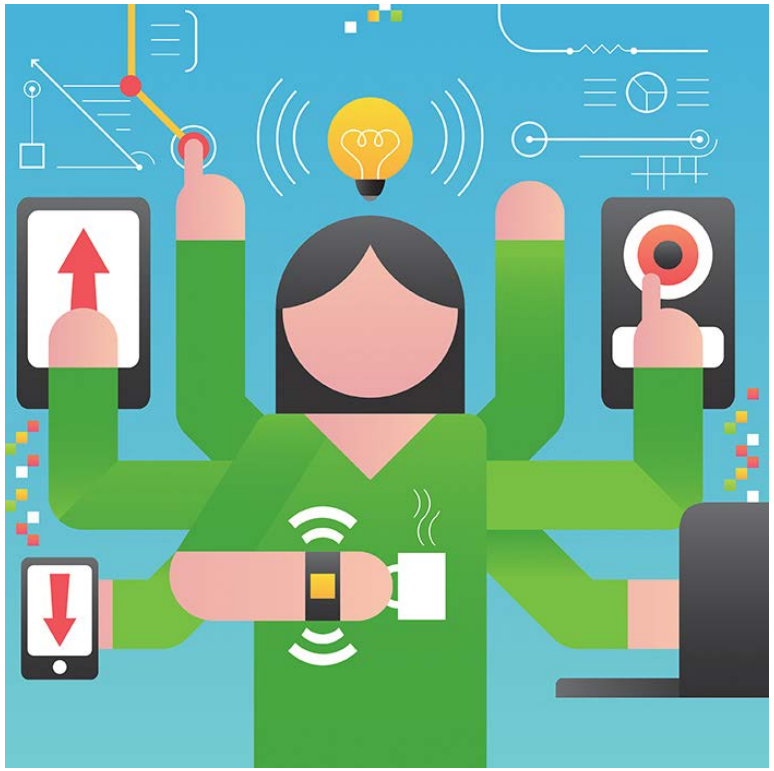


image credit: https://www2.deloitte.com

System-level and Education/Classroom Changes

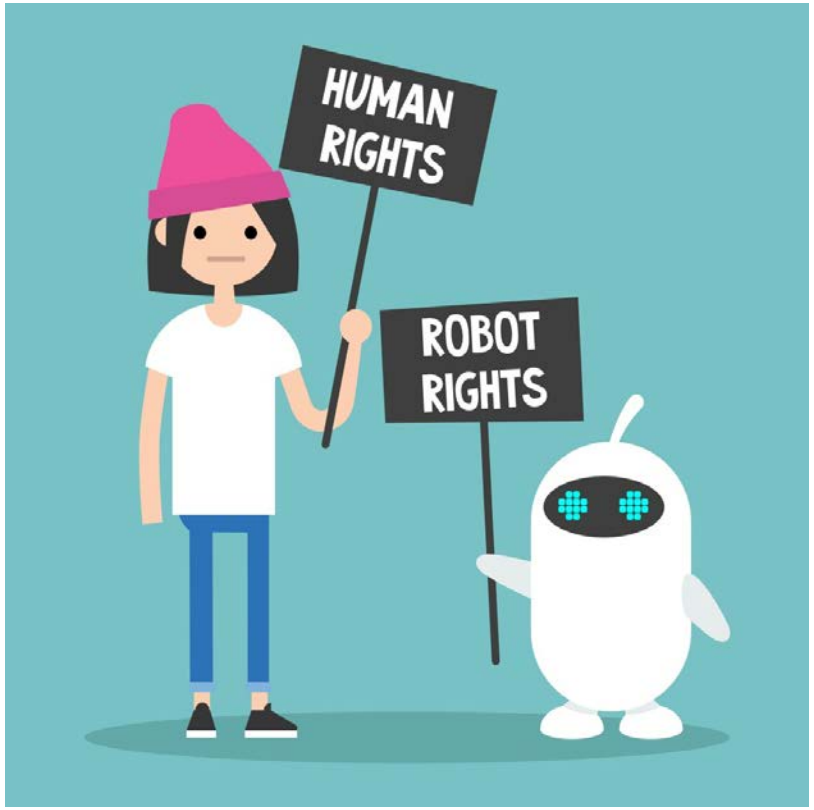
- Build vision, increase awareness and provide political support
- Set policies, fund programs and professional development
- Increase and intensify government/university/industry partnerships
- Encourage integration of new instructional strategies e.g. problem-based learning, virtual learning and cross-geographic team collaboration
- Develop assessments targeting new skill sets and dispositions
- Begin skill building and disposition development early with Foundational Career Competencies

STEM Career Competencies Grades K-8

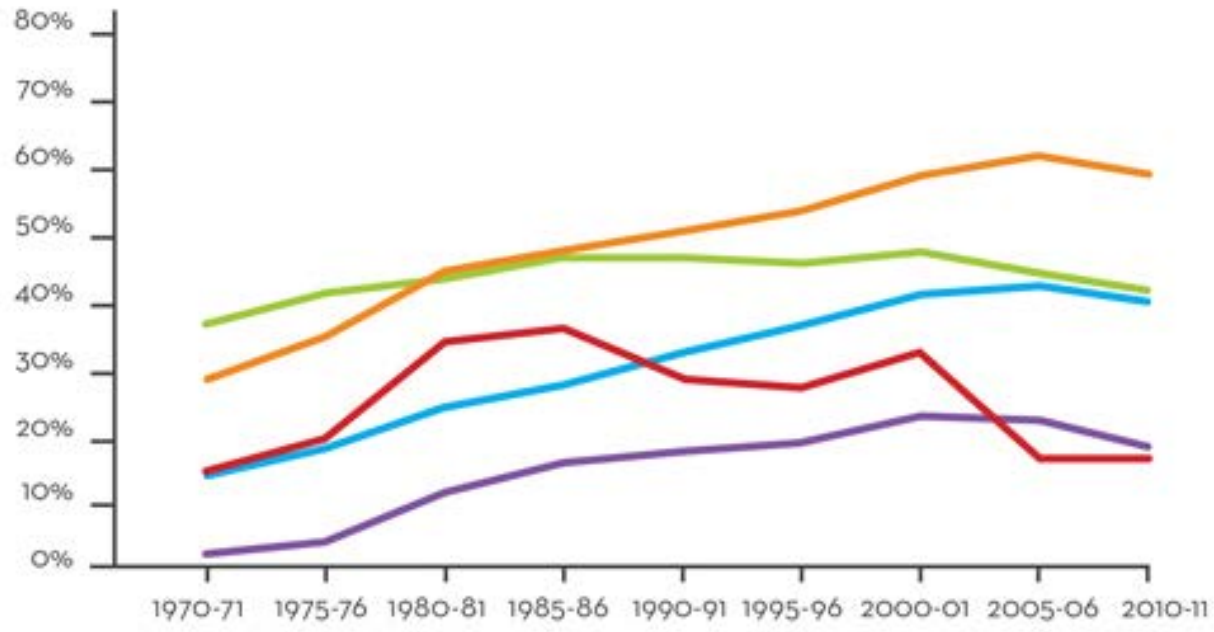
- Data literacy
- Design thinking
- Digital literacy
- Cybersecurity and digital citizenship
- Computational thinking
- STEM career development

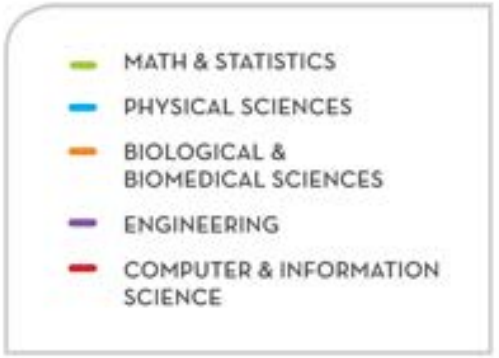
Equity, Access and Ethical Implications

- Growing inequity in STEM among underrepresented groups hastened by AI and other technologies
- Shift in skills to enter labor market
- Diversity drives innovation
- Public policy implications



FEMALE PERCENTAGE OF SELECT STEM UNDERGRADUATE DEGREE RECIPIENTS: A LONGITUDINAL LOOK





Who is the Workforce of the Future?

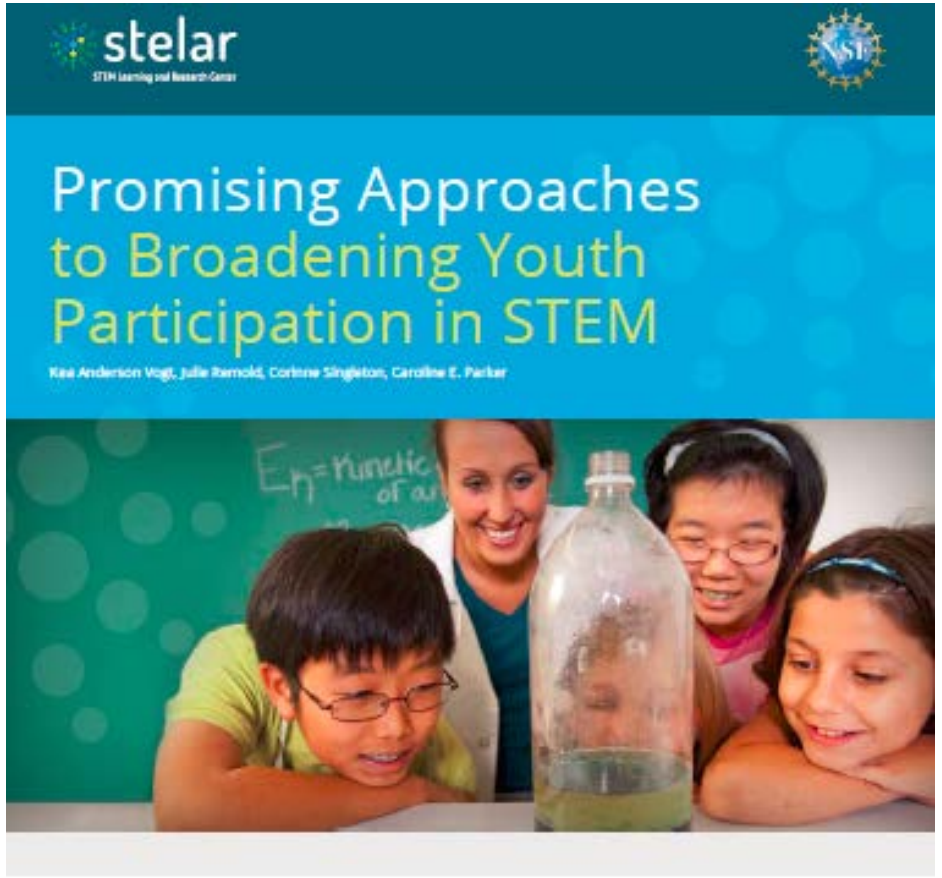
Populations traditionally underrepresented in STEM are the very groups who will be the workforce of the future

Barriers to STEM Faced by US Learners

- Access to grade level rigorous content courses
- Bias in discipline
- Pressure on teachers to teach to the test
- De facto segregation
- Deficit mindset
- School safety
- Out-of-school challenges including racism, economic instability, immigration uncertainty

Pushing the conversation

How can we create spaces where culturally and linguistically diverse learners transform future possible workplaces?

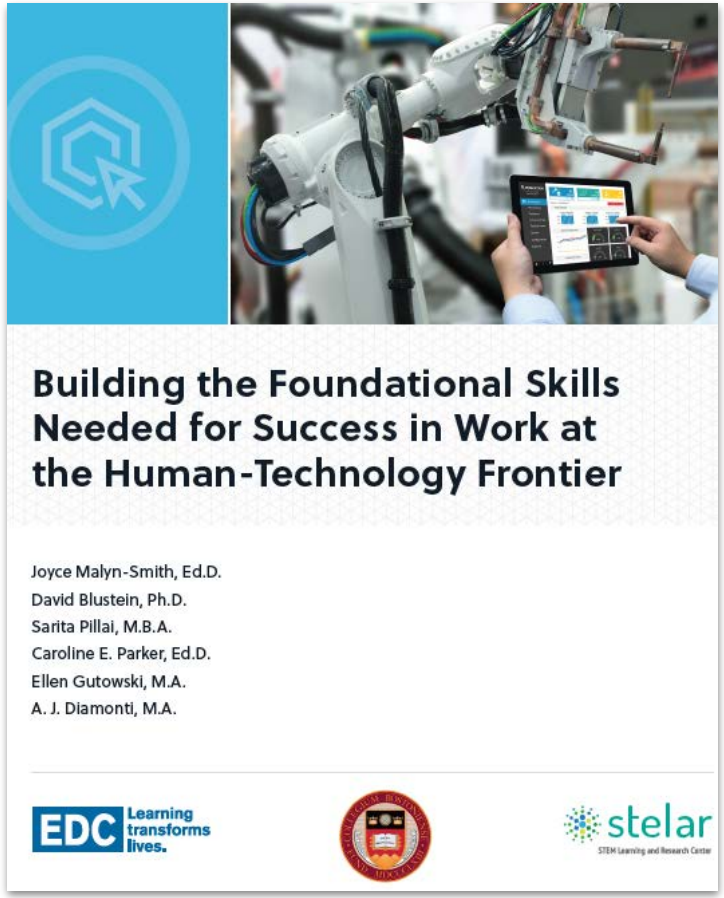


Policy Implications

- Invest early in STEM learning incorporating STEM competencies
- Act now to shape the human-technology frontier for inclusion
- Continually address the ethical, safety, and security implications of the human-technology frontier
- Engage research and practice leaders within government agencies and institutions to engineer innovation and conduct research in STEM workforce education
- Share findings broadly to leverage change in both education and the future workplace

Q & A

White Paper



go.edc.org/HTF-Whitepaper

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