



# Fostering Reskilling, Upskilling, and Lifelong Learning

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# The Challenge



- The landscape of jobs and work is changing at unprecedented speed, driven by
  - **Technological advances:** artificial intelligence, robotics, global connectivity, flexible manufacturing, ...
  - **New models of work, careers, education:** gig economy, remote workforce, life-long learning, ...
  - **External forces:** globalization, pandemics, geopolitics, ...
- Historical opportunities, but many challenges
  - Mismatch of US education system and needs of employers
  - Threats to privacy and algorithmic bias
  - Tension between economic efficiency and robustness to “black swan” events



# NSF FW-HTF Program

- Joint program of the NSF directorates for
  - Engineering
  - Social, Behavioral, & Economic Sciences
  - Education & Human Resources
  - Computer & Information Sciences & Engineering
- One of NSF's "Big Ideas"
  - Now in its 3<sup>rd</sup> year
  - \$30 million a year in awards

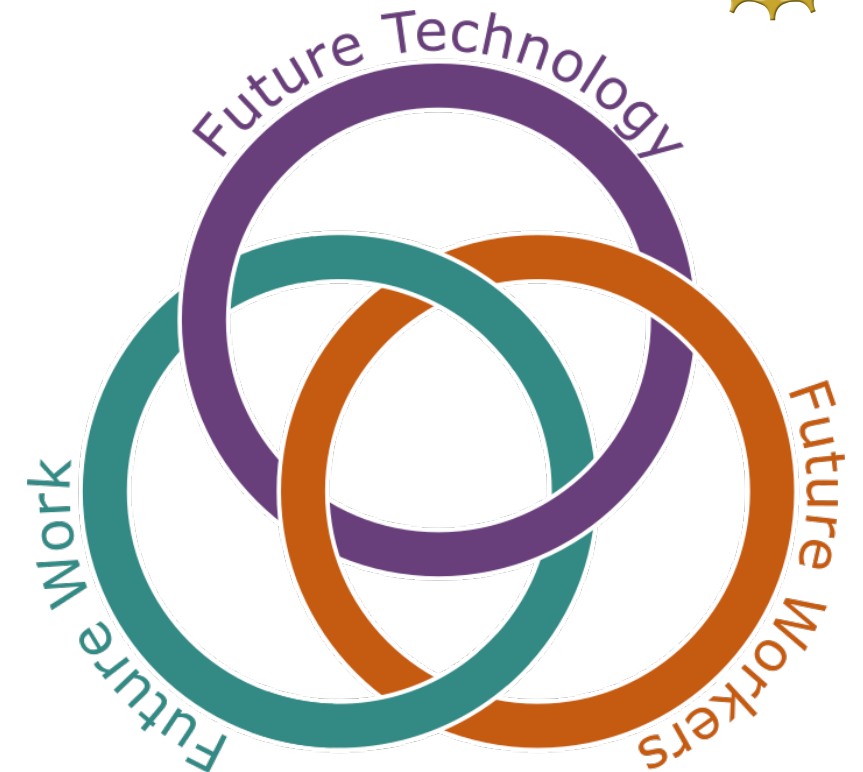


# Future of Work at the Human Technology Frontier



**Convergent** research integrating future work, future technology, and future workers.

- **Future Workers:** Address the worker as an individual or in teams, including education & training
- **Future Technology:** Engineering & computer science technologies that will develop the human-technology partnership in future workspaces, including offices, classrooms, warehouses, farms, & factories
- **Future Work:** Considers a societal, economic, professional, occupational, industrial, or national context



The FW-HTF program occupies the intersection of these elements

# Objectives



The specific objectives of the FW-HTF program are to ...

- **Facilitate convergent research** among engineering, computer science, learning sciences, research on education and workforce training, and the social, behavioral, and economic sciences;
- **Encourage the development of a research community** dedicated to designing intelligent technologies and work organization and modes;
- **Promote deeper basic understanding** of the interdependent human-technology partnership to advance societal needs; and
- **Understand, anticipate, and explore mitigation** of potential risks



# Stakeholder Workshops

- Help NSF learn perspectives of industry, non-profits, workers, researchers, and other government agencies
- Outcomes of workshop will shape FW-HTF and other programs
- Virtual workshops:
  - Restructuring the physical and virtual workspace
  - Exploring the human-technology partnership
  - **Fostering reskilling, upskilling, and lifelong learning**
  - Identifying ethical questions and the implications for policy




Foundational Topics	Future-Oriented Topics
Why are rational numbers so difficult to learn?	How can/will AI shape STEM learning? How can we ensure ethical uses of AI in learning environments? How do we best incorporate learning about ethics in our curricula?
What are research-based progressions for statistics and data analysis that can function as an alternative to calculus pathways for high school students?	What should K-12 students learn about AI? How do we support society as a whole learning relevant knowledge about AI?
How do we prepare elementary teachers to teach science and do this at scale?	How do we design digital learning platforms integrating what we know about cognition and learning of STEM content?
How do we build assessments that are fair, valid, and can be implemented at scale and with low-cost?	<b>What are the cognitive roots, dispositions, and habits of mind necessary for lifelong learning?</b> How should curriculum change to accommodate the lifelong learning reality?

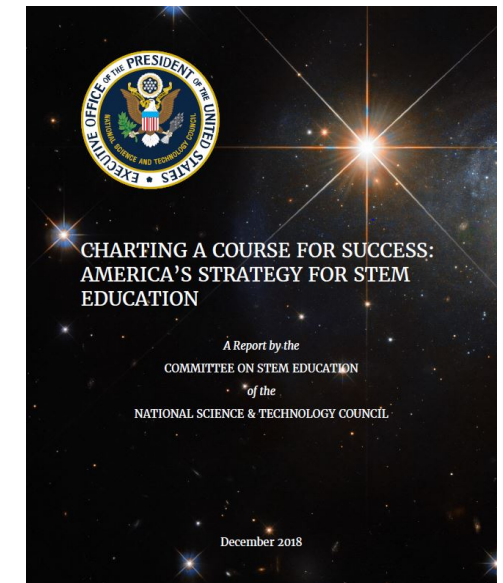
# STEM Education of the Future Report

## EHR Advisory Committee, Spring 2020

**Goals:** lifelong STEM learning, equitable access to sustained success, and a strong American workforce

- Priority One: All learners at all stages of their educational pathways must have access to and opportunities to choose STEM careers and contribute to the innovation economy.
- Priority Two: We must build an ethical workforce with future-proof skills.
- Priority Three: We must ensure technological innovations make it into the classroom guided by educators who understand how modern technology can affect learning, and how to use technology to enhance context and enrich learning experiences for students.

 NATIONAL SCIENCE BOARD





# The future of classroom work: Automated Teaching Assistants



“Kurt VanLehn, the Diane and Gary Tooker Chair for Effective Education in Science, Technology, Engineering and Math in the school of computing, informatics and decision systems engineering, is researching how computer tutoring can be used in the classroom with multiple groups of students working with an instructor.”

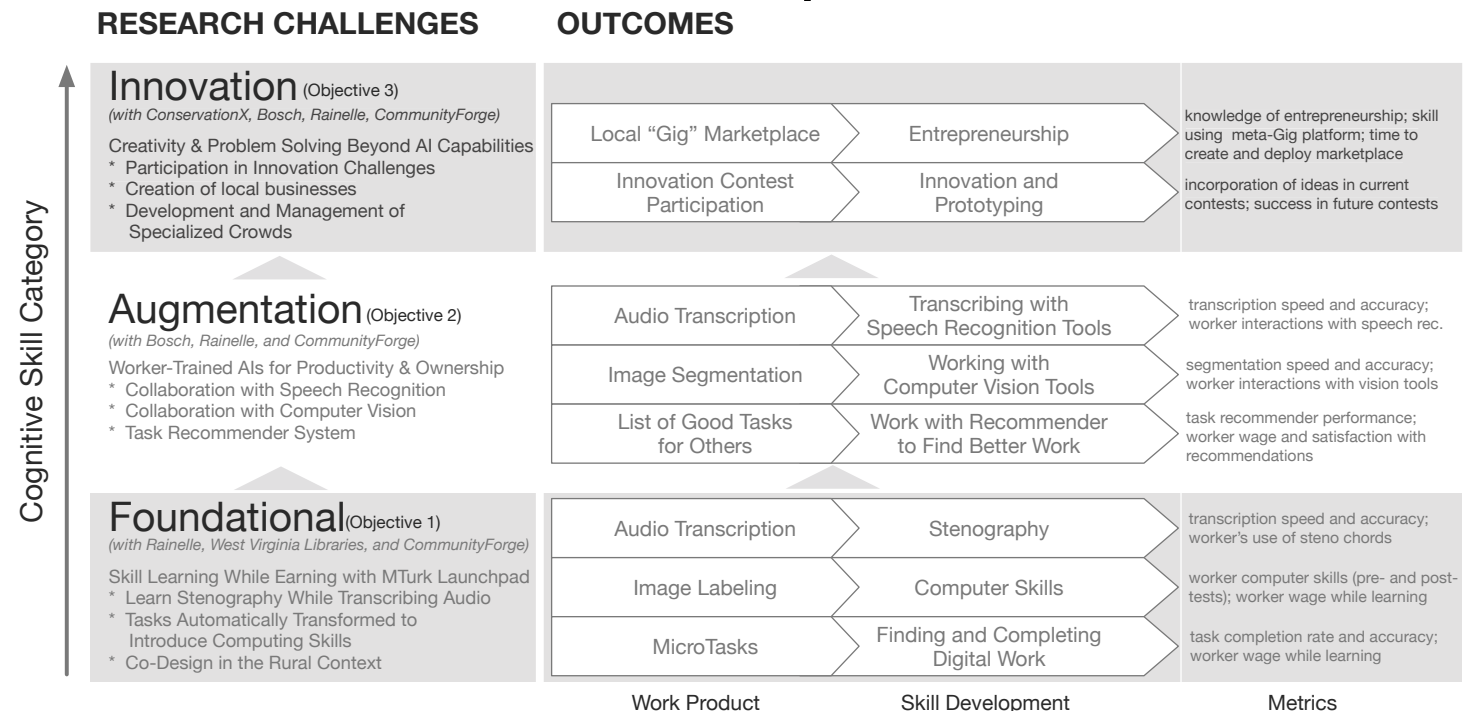
Credit: Jessica Hochreiter/ASU

<https://fullcircle.asu.edu/faculty/kurt-vanlehn-intelligent-tutoring-research-revolutionizes-teaching/>

# Up-skilling and Re-skilling Marginalized Rural and Urban Digital Workers: AI-worker collaboration to access creative work



- Carnegie Mellon U., West Virginia U., PSU, U
- Vision: scaffold workers through basic computer fluency, working with AI tools, and finally enhance innovation and creativity skills
- Work partners:
  - Bosch
  - Rupert Public Library
  - Conservation X





# Panel and Discussion

- Jeff Grann
  - Credential Solutions Lead, Credential Engine
- Kyle Dalpe, PhD
  - Vice President, Instruction and Instructional Effectiveness, Western Nevada College
- Chris Dede, EdD
  - Timothy E. Wirth Professor in Learning Technologies, Harvard Graduate School of Education
- Nicole Smith, PhD
  - Research Professor and Chief Economist, Center on Education and the Workforce, Georgetown University
- Stefano Scarpetta, PhD
  - Director, Employment, Labour, and Social Affairs, Organisation for Economic Co-operation and Development



# Breakout Sessions

- Small group facilitated discussions, followed by report back
- Themes for this workshop
  - Increased responsibility by firms for training
  - Improved access to education and training
  - New modes of delivery for education and training
  - Refined matching of workers to skills
  - New definitions for credits, credentials, and qualifications



# Breakout Sessions

- Questions

- What challenges do you face? Your industry? Your workforce? Other stakeholders?
- What are the broader social, educational, and economic changes that you foresee for workers and the workplace of the future?
- What technology gaps do you anticipate as these changes occur?
- What are the different effects felt by educators as well as other workers: manual laborers, service workers, information workers, and/or professionals?



# Questions?