

# The Block Center for Technology and Society Future of Work Initiative

<https://www.cmu.edu/block-center/>

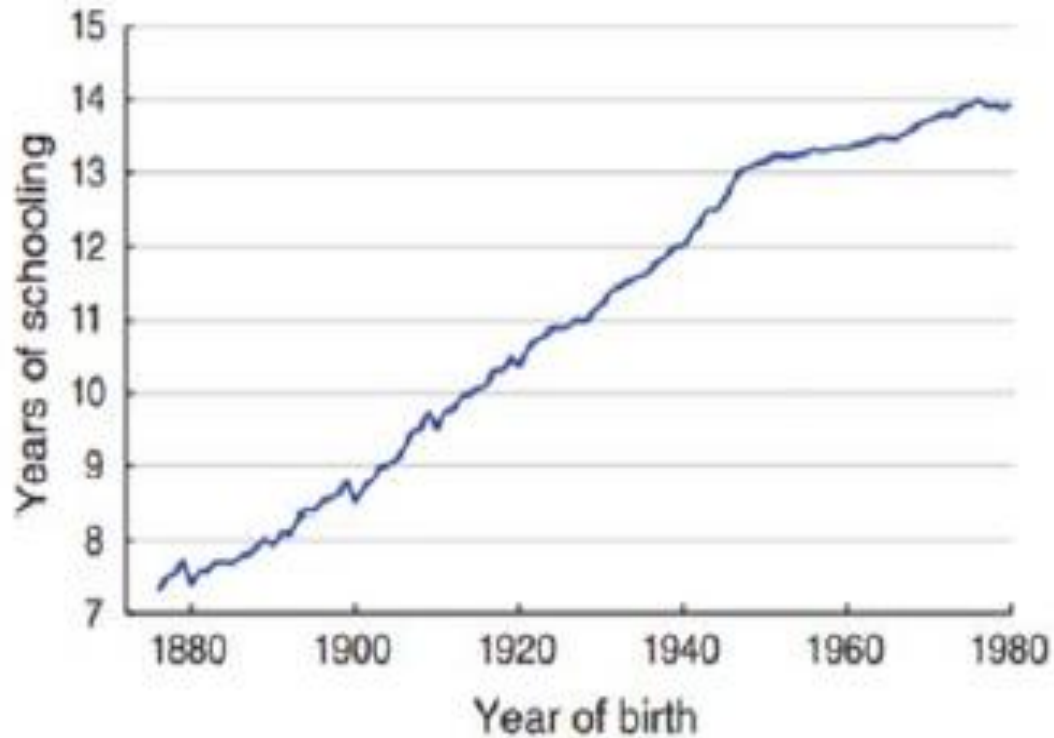


**Professor Lee G. Branstetter, Director**  
**branstet@cmu.edu**

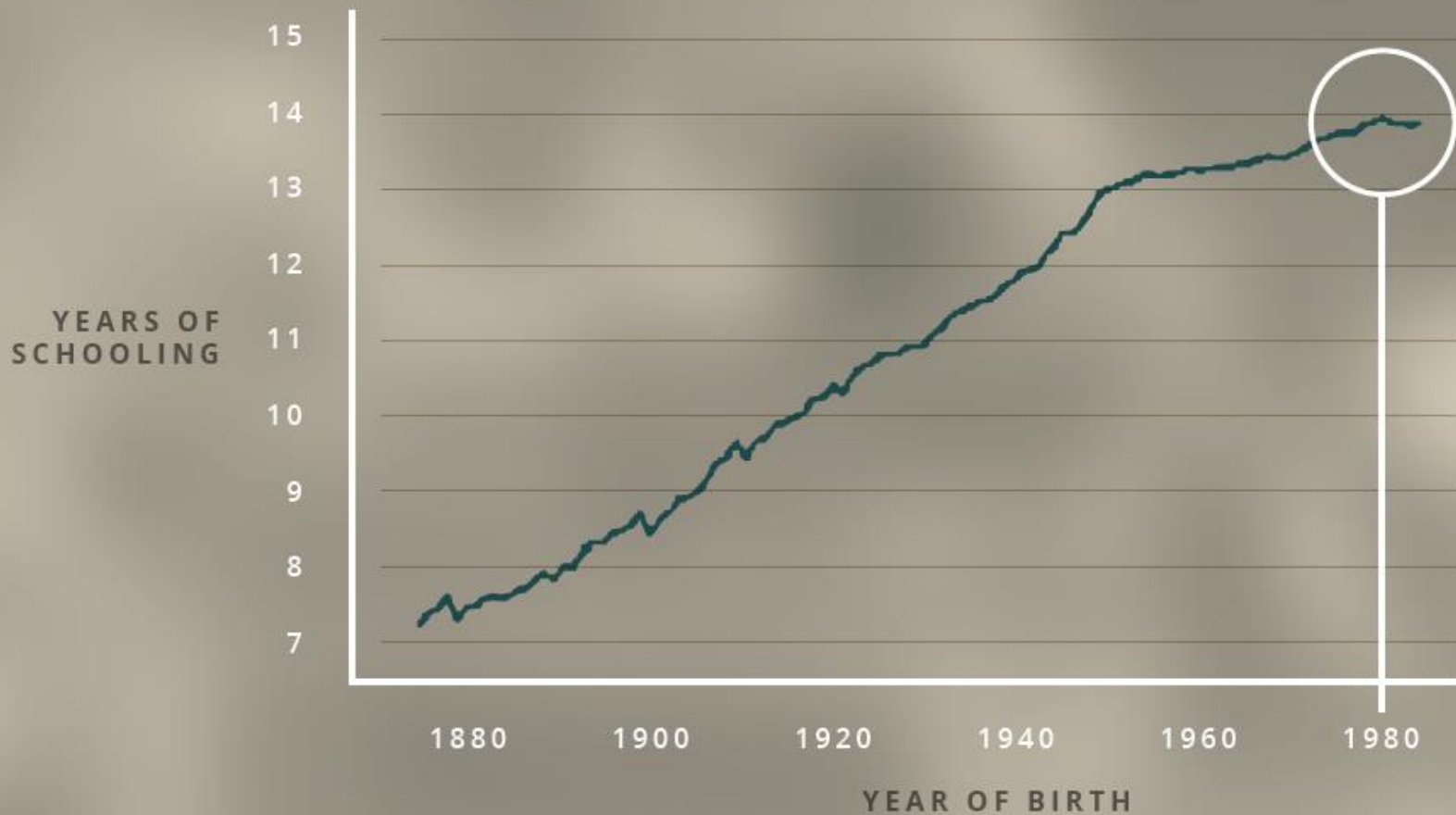
Carnegie Mellon University  
**HeinzCollege**

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**For more than 100 years, America led the world in educating its citizens**



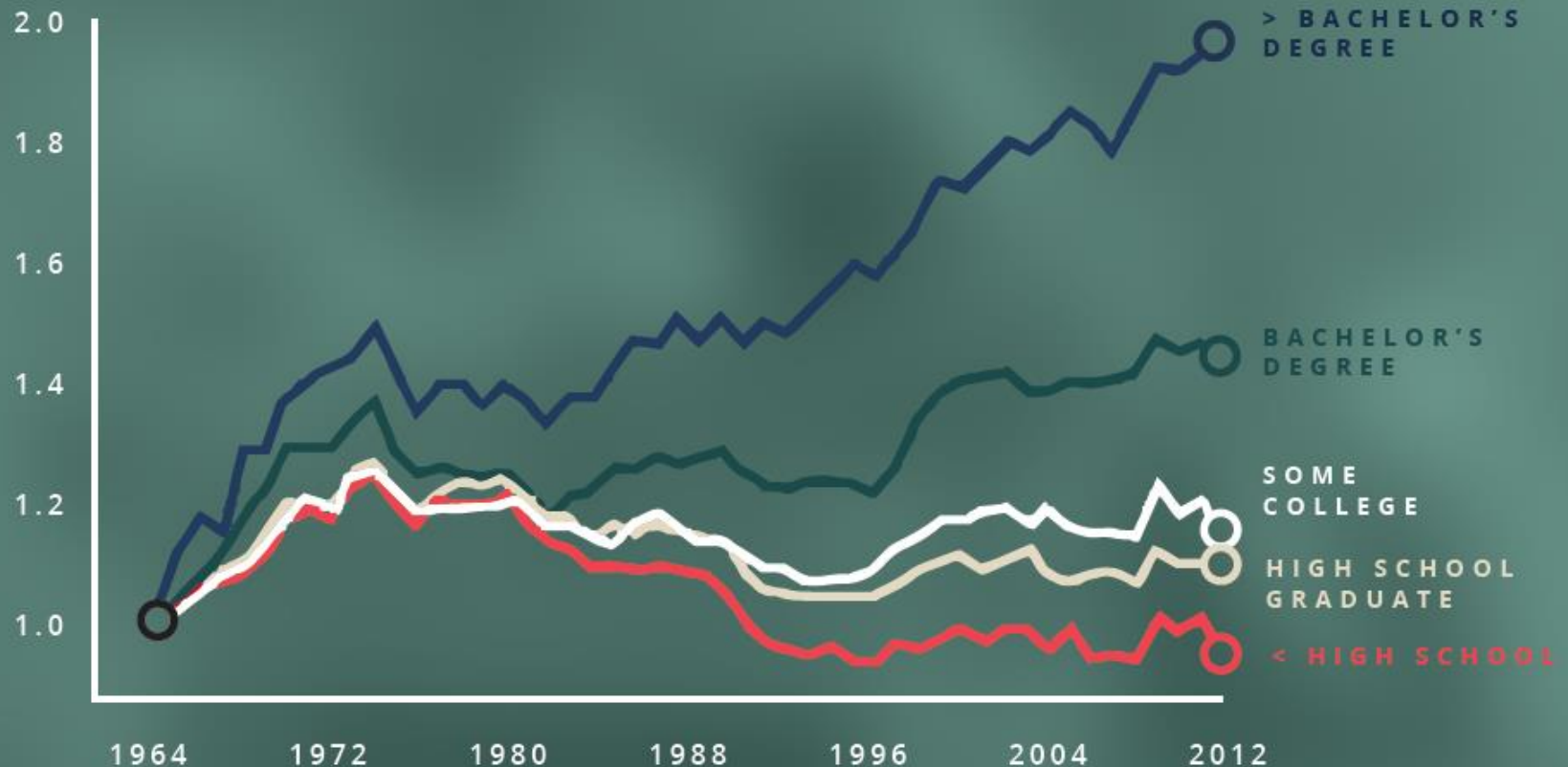
# But the supply of skill has grown far more slowly in recent decades



Source: Goldin and Katz, 2008

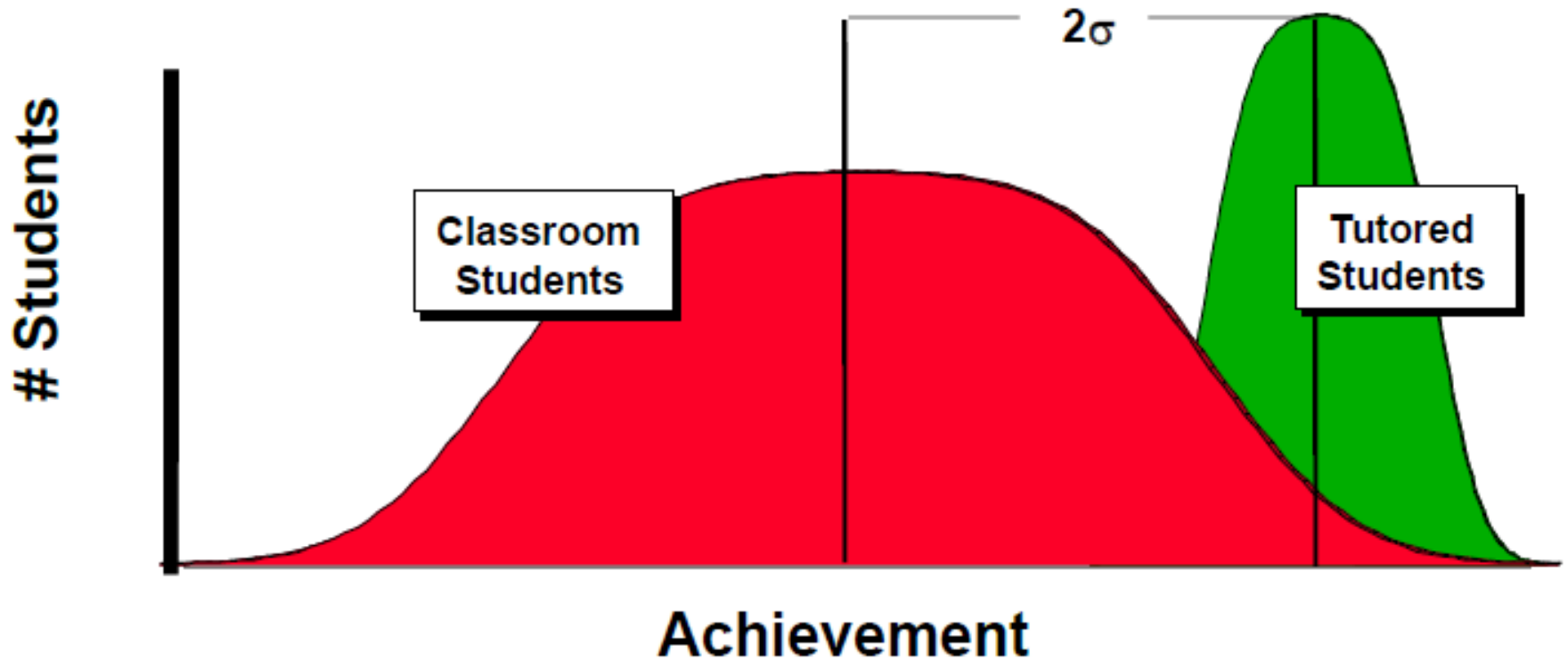
# A growing imbalance between skill supply and skill demand has exacerbated income inequality

CHANGE IN REAL WAGE LEVELS FOR MALE U.S. WORKERS



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Foundational research on the impact of personalized learning suggests the possibility of revolutionary advances in education



(Bloom, 1984)

# What if we used AI to accelerate math learning by personalizing math instruction?

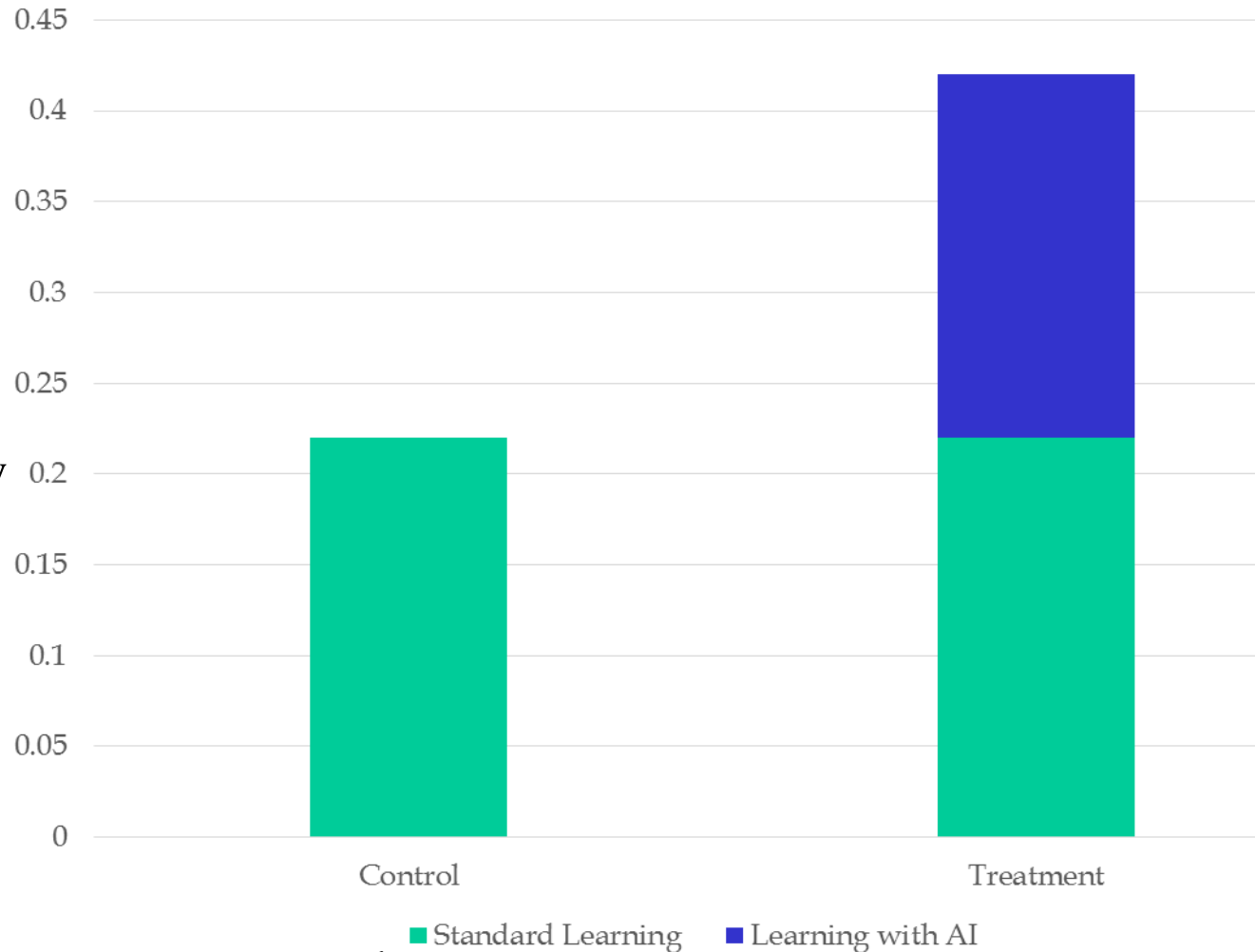
AI systems double the rate of math learning



Prof. Ken Koedinger

Carnegie Mellon University

**CARNEGIE  
LEARNING**  
LONG + LIVE + MATH



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## **Math skills deficits are a barrier to success in community colleges and vocational training centers**

- Colleges of all kinds find as many as 60% of entering freshman unprepared for college work, most often in mathematics.
- When students are assigned to remedial classes, the pass rate is low (only 38%, according to one study).
- The City University of New York found that the graduation rate for freshman required to take remedial courses was only one quarter that of students who faced no such requirement.
- Mathematics remediation may be the single biggest barrier to increasing graduation rates and this barrier falls especially heavily on members of historically underrepresented groups (Attewell et al., 2006).

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## We will partner with CCAC to deploy our technology in a community college setting...



- CCAC serves more than 40,000 students (including part-time and noncredit students) annually across 9 campuses and training centers.
- It offers 160 programs of study, and annually awards nearly 2,000 associates' degrees per year to its graduates, as well as over 600 additional certificates and diplomas.
- But many incoming students struggle with serious math skill deficits.





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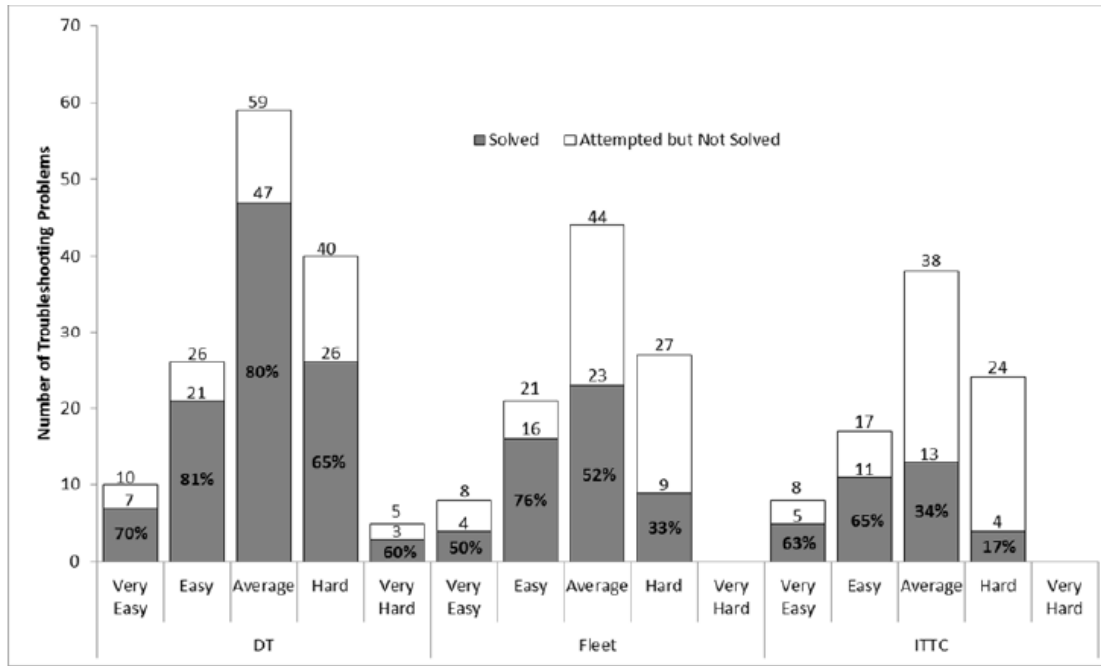
**We will also partner with Pittsburgh's Manchester Bidwell Corporation to deploy this technology in a vocational training setting...**



Bill Strickland, Founder



# Cognitive tutors can also be used to provide more job-specific skills



DT = Digital Tutor

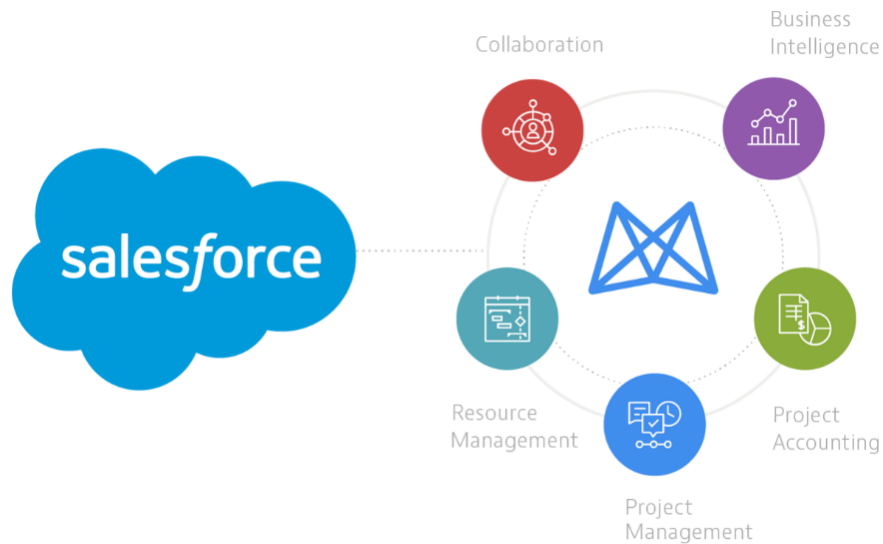
ITTC = Information Technology Training Continuum

Figure 6. Troubleshooting Problems Attempted and Solved by Difficulty Level



Accelerating Development of Expertise: A Digital Tutor for Navy Technical Training

# We will develop cognitive tutors that can prepare students for entry-level jobs in the digital economy



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## **New learning technologies and advances in learning science open up the possibilities for a major breakthrough in learning outcomes**

- We can accelerate math learning in the K-12 grades.
- We can provide much more effective remediation of math skill gaps in community colleges and vocational training centers.
- We can create new learning models that accelerate job-specific skill formation, providing a new pathway for disadvantaged adults to take advantage of emerging opportunities in the digital economy.
- Getting there will take time and a significant investment in research.

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