

A Changed Science and Engineering Landscape

Three foundational trends have changed the U.S. S&E landscape and urgently require a national response. What new models, new investments, new partnerships, new approaches will equip the U.S. to meet the moment – both its opportunities and challenges? How can we ensure U.S. leadership in critical and emerging technologies and a robust STEM workforce?

Federal investment is the foundation but business funds most U.S. R&D

Only the federal government can invest across all fields, across the nation, at scale, and over sufficiently long-time horizons to create new knowledge and invent new technologies that will help us to address current and future security, health, and economic challenges. Federal investment in basic research enables the creation of emerging industries.

However, business funding of U.S. R&D surpassed federal funding in the 1980s and now dominates the U.S. S&E enterprise. Nearly 80% of business investment is in experimental development – the stage when near-term commercial benefit is real.

Industry is well positioned to advance knowledge



in targeted fields, and the business sector funds 37% of total U.S. basic research. But industry investments are focused in specific areas and cannot replace Federal investments' breadth.

► KEY CONSIDERATIONS:

The nation needs new partnerships and collaborations across sectors. How might they join forces to meet national needs?

Robust federal funding of basic research is urgently needed. How can it be most impactful? Leverage other sectors? Advance critical areas?



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The People's Republic of China (PRC) is our biggest competitor...and collaborator

The rise of the PRC's prominence in S&E is transformative, and U.S. leadership is no longer a given. It began with rising, sustained funding of R&D – and those investments are bearing fruit. The PRC has surpassed the U.S. in international patents and is a formidable competitor in technology areas critical to national security – including artificial intelligence, semiconductors, quantum computing, and biotechnology. The PRC now patents more than the U.S., including in fields like AI. And, for the first time, we see the PRC awarding more doctoral awards in S&E than the U.S. does. Yet the U.S. and the PRC are also each other's strongest collaborators in published research, including in AI.



► <u>KEY CONSIDERATIONS:</u>

Maintaining leadership requires identifying and making strategic recommendations on emerging areas of S&E research where the U.S. must be preeminent and government actions are required. How can the U.S. remain a global leader in critical technologies? As the U.S. competes for the discoveries of tomorrow, what new models are required to quickly identify and mature high-potential ideas?

Staying at the frontiers of discovery requires leaning into internationalism. What are the most beneficial and strategic international collaborations, and how should they be sustained?

A need to re-build STEM education and build a robust STEM workforce

STEM talent, the foundational component of the entire S&E enterprise, is in trouble. At every education level and career stage, our nation is leaving potential STEM talent on the bench – failing to sufficiently educate, train, and retain.

After 20 years of progress on math abilities, we see regression, exacerbated by the COVID-19 pandemic . Meanwhile, thanks to our nation's unparalleled ability to attract the best and brightest from around the globe, our S&E enterprise is running on foreign-born talent to an unprecedented degree. The share of U.S. S&E doctorate-level workers who are foreign-born has grown from 27% in 1993 to 43% in 2021.

Average Scores of U.S. Students in Grade 8 on the Main NAEP Mathematics Assessment



KEY CONSIDERATIONS:

The nation needs a new version of the 1958 National Defense Education Act – and America's future STEM-capable workforce must engage all Americans. What would be essential components of a NDEA 2.0?

The U.S. must make education a federal, state, and local priority. What short-term actions would have a major impact? What requires long-term investment?