

DAY **ONE** **PROJECT**

**Doubling the R&D Capacity of the
Department of Education**

**Kumar Garg
Rujuta Pandit
Dan Correa
Ulrich Boser**

July 2021

Summary

Congress is actively interested in ensuring that the United States is educating the talent needed to maintain our global economic and national security leadership. A number of proposals being considered by Congress focus on putting the National Science Foundation's Education division on a doubling path over the next 5-7 years.

This memo recommends that the Institute of Education Sciences (IES) — the R&D agency housed within the Department of Education — be put on the similar doubling path with stepladder increases in authorization levels, and targeted program starts (e.g., an “ARPA” housed at ED) focused on major gaps that have been building for years but made even more evident during the pandemic.

This increased funding for IES should be focused on:

- **Establishing New Research Capacity** in the form of an [1] “ARPA-like” Transformative Research Program;
- **Harnessing Data for Impact** through investments in [2] Statewide Longitudinal Data Systems (SLDS), [3] a Learning Observatory, and [4] modernization of the National Assessment of Education Progress (NAEP);
- **Conducting Pathbreaking Data-Driven Research** by [5] building a permanent Data Science Unit within IES, [6] increasing funding for special education research; and [7] investing in digital learning platforms as research infrastructure; and
- **Building the Education Field for Deployment of What Works** by [8] establishing a Center of Learning Excellence for state-level recovery investments in tutoring and more.

Challenge and Opportunity

Despite years of alarm, the stagnation and backsliding of the American public education system has proven difficult to reverse. Both reading and math performance markers remain stubbornly difficult to improve; efforts to remediate inequities have largely failed; and American education lags behind other countries, especially in STEM.

For example, the 2019 National Assessment of Education Progress (NAEP) finds that over 30% of American students are below basic level in math and science competency, with higher numbers for Black and Hispanic students. Less than 5% of students meet Advanced levels, with racial disparities persisting and numbers often rounding to zero for Black and Hispanic students.

The Programme for the International Assessment of Adult Competencies (PIACC) gives us additional insights into the ability of the U.S. to compete in the increasingly global economy and reports some worrying numbers. Across categories such as numeracy and “Problem Solving in Tech Rich Environments,” young Americans (ages 24 or younger) rank consistently lower than their older counterparts (ages 55 and above). We appear to be replacing a skilled cohort with a younger cohort that is far less internationally competitive.

Intensifying these issues of low academic outcomes, America's schools and students have faced an unforeseen level of disruption due to pandemic-induced school shut-downs that have disparate impacts by SES status. Although the full impact is not yet known, COVID-19 closures are likely to have made things much worse — with [one estimate](#) warning that students may have lost up to seven months of learning and other estimates showing that these learning losses will cost the American economy trillions of dollars in lost productivity.

We know beyond any doubt that American students are falling behind, and we also know that education policymakers are lacking the data and the evidence-based insights to reverse that trend.

A big part of the problem is that education policymakers, at both the federal and local level, are operating in the dark. Comparatively little money is spent on education R&D, meaning we just don't know enough about how students learn and what strategies and technologies are beneficial. The Education Department's [R&D budget](#) is only \$313 million, down from \$342 million in 2010. By comparison, the U.S. Department of Agriculture spends over \$3 billion annually on in-house and extramural research related to food and agriculture. Without more funding, opportunities for high-impact education innovation and research will be missed.

The United States under-invests in applied education research: less than 0.05% of total K-12 expenditures are allocated to R&D, a radical under-investment compared to other sectors. As technology is increasingly utilized in classrooms, [research](#) shows that learning analytics are an important tool to provide data on program results and to help identify gaps in learning. Effective data can aid groups in creating appropriate intervention strategies and forms of real-time adaptation as outcomes change.

The time is now, early in the Biden-Harris administration, to boost IES funding in key sectors, transforming the research arm of the Education Department into an innovative, novel space to change people's views about what is possible in learning and to improve education outcomes across the lifespan.

The President's budget request represents a promising start, including [an increase of 14.79%](#) for IES in FY2022, building on the \$100 million allocated by the American Rescue Plan allocated to battle learning loss. But more can be done. A more ambitious proposal would ensure that the American education system has the data, research insights, and tools to combat overwhelming learning loss and create a flexible, diverse, and globally competitive workforce for the future.

Plan of Action

IES' current portfolio focuses on education data collection and analysis to improve learning outcomes that lays the groundwork for a suite of new initiatives. IES is currently conducting the [2021 NAEP school survey](#), a mandated assessment on the impact of COVID-19 on school operations and learning outcomes. Through the National Center for Education Evaluation and Regional Assistance (NCEE), [IES has developed programs](#) including Regional Education Laboratories (RELs) and the What Works Clearinghouse™ that work to develop and use research to improve academic outcomes.

However, the FY2022 budget holds funding for RELs, SLDS, statistics, and special education static from previous years. The IES needs large scale investment to enable investments in the entire pipeline from data and research to impact.

DAY ONE PROJECT

An additional **\$300 million in FY22 investments**, collectively growing to over **\$800 million in FY26**, would span transformational new research capacity, data for impact, pathbreaking data-driven research, and building the education field:

New Research Capacity

[1] Establish an “ARPA-like” Transformative Research Program - Proposed \$100 million investment in FY22, growing to \$300 million in FY26. Understanding student needs and learning science is half the battle, but applying it to build real breakthrough solutions at scale is essential to achieve meaningful impact for students, and requires far more focused R&D activity than ED has traditionally supported. A Transformative Research Program would help ED develop and implement high-risk, high-reward ideas in partnership with industry, universities, or other innovative organizations, selected based on their potential to create a dramatic breakthrough in learning and teaching. The program would build off of promising initial steps such as IES’ transformative research Request for Applications and its pathbreaking work on challenges with the XPRIZE Foundation. From the initial investment, a substantial portion would be allocated to salaries and expenses to ensure IES could build core capacity to effectively drive the field. Many organizations on the left, such as the Center for American Progress, and on the right, such as The Thomas B. Fordham Institute, have supported the creation of an “ARPA-ED”, modeled after [DARPA](#) and [the Advanced Research Projects Agency – Energy \(ARPA-E\)](#), in the form of “Transformative Research Program” to support higher-risk projects that require a nimble management approach.

Some examples of ambitious projects that such an ARPA-ED-type entity could pursue include:

1. Closing the kindergarten readiness gap, by using voice recognition and developing online assessments that rapidly assess emerging reading gaps and dyslexia,
2. Using advances in natural language processing to allow automated feedback on student writing and math homework, giving teachers new digital aids to support student improvement,
3. Utilizing AI-based digital tutors to support adult English language and basic skill learning by assessing and rapidly filling gaps with responsive teaching methods, and
4. Instrumenting large-scale digital learning platforms to create a research infrastructure that drives continuous improvement in the use of the learning sciences.

This initial investment would allow IES to stand up a new dedicated Transformative Research Program and rapidly identify several key projects for R&D investment across both the academic and private sectors, and build on the [bipartisan interest](#) in expanding education R&D.

Data for Impact

[2] Invest in Statewide Longitudinal Data Systems (SLDS) - Proposed \$50 million in FY22, growing to \$100 million in FY26. SLDS investment will aid in tracking longitudinal outcomes of K-12 investments to allow for programming that reflects data-based findings. Based on hard evidence generated by modernized SLDS, subsequent funding could be better targeted on effective programs with demonstrated positive outcomes and decreased for programs that fail to benefit students. Moreover, to the extent to which a modernized SLDS becomes the backbone for merging other data systems, a more comprehensive assessment of the payoff for education investments could be undertaken, for example, by exploring labor

market outcomes associated with different programs. Modernization efforts could include updating systems to leverage industry-grade, cloud-based technology to build more interoperable and accessible data platforms that can speed the cycle from insight to innovation in education. Additionally, building state research practice partnerships, which could build on the existing Regional Educational Laboratories, would create a sustainable infrastructure to test and continuously improve the equitable delivery of education. These partnerships should bring both real-time learning and longitudinal data together through interoperability with digital learning and advising platforms, engaging industry to open data currently locked behind paywalls. And most importantly, these partnerships should include practitioners to better ground education research in the ever-changing needs of an increasingly diverse student population. Read more on this proposal [here](#).

[3] Create a Learning Observatory at IES - Proposed \$25 million in FY22, growing to \$100 million in FY26.

One of the biggest problems with applied research in education is the lag between the implementation of new teaching strategies and technologies and research results. This creates a dynamic where new programs are implemented and sometimes abandoned before adequate data is available for policymakers to make informed judgments. The learning observatory, or “Learning Pulse,” would be a center that tracks and publishes near-live data on how students are progressing with a given program or learning technique, allowing policymakers and educators to make informed decisions in a timely manner. Investment would allow school, district, and institutional leaders to monitor student progress and be proactive when students are being left behind in key subjects. This would be especially useful in tracking approaches to remediating COVID-19-related learning loss in the coming years.

[4] Modernize NAEP - Proposed \$40 million in FY22. The National Assessment of Educational Progress has been conducted since 1969. It is the largest nationally representative and continuing assessment of American students’ knowledge and achievement. Unfortunately, it is out of date both with respect to data collection techniques and the availability and usability of data. This funding would help IES modernize and upgrade the assessment in preparation for the postponed 2021 NAEP. In particular, advances in artificial intelligence (AI), especially machine learning (ML) and predictive analytics, as well as innovations in the technologies of online engagement, including crowdsourcing (collective intelligence or CI), may offer better ways of making NAEP assessment more effective, inclusive and less expensive. Practical examples include AI tools that can be used to systematically generate and/or validate multiple choice items. AI software can also be used to process written, spoken, or multiple choice responses within NAEP and compare those responses to a set of criteria in order to assign each response a score and aggregate those scores.

Pathbreaking Data Driven Research

[5] Build a Permanent Data Science Unit within IES and Create IES Training Grant Program - Proposed \$25 million in FY22, growing to \$50 in FY26. IES is the nation’s leading entity for educational science research and statistical analysis, but lacks robust data science capabilities capable of harvesting insights through the integration of approaches from fields such as computer science, data mining, statistics, and predictive analytics. Building an initial \$25 million permanent data science capacity as a core IES function to leverage the organization’s rich data assets can deliver fresh insights. In subsequent years, an additional \$25 million in annual funding would support IES training grants to train academic researchers to be “bilingual” across data science and domain challenges in education. Much of this training money could be directed to HBCUs and MSIs to build up a cadre of skilled education researchers now underrepresented in today’s education research community.

DAY ONE PROJECT

[6] Fund Special Education Research - Proposed \$10 million in FY22, growing to \$40 million in FY26.

Special needs students were among the hardest hit by the COVID-19 crisis. Online learning platforms were mostly designed and implemented without these learners in mind. IES's National Center for Special Education Research (NCSE) supports research to improve outcomes for students with disabilities. It has a long track record of supporting the development and testing of successful educational technologies, but in FY 2012 its funding was cut by \$20 million. Restoring this funding would help ensure educators have the best information and tools at their disposal to support the learning of special needs students.

[7] Invest in Digital Learning Platforms as Research Infrastructure - Proposed \$50 in FY22, growing to \$100 million in FY26.

Digital learning platforms [offer researchers](#) an opportunity not only to test research hypotheses rapidly and at scale, but to deploy what works based on those insights. IES research infrastructure grants would allow researchers to take better advantage of digital learning platforms to rapidly interrogate new research inquiries at scale.

Build the Education Field for Deployment

[8] Establish an IES Center of Learning Excellence to Help States Effectively Manage Federal Recovery Dollars, Starting with Tutoring - Proposed \$10 million in FY22.

Tutoring has emerged as the frontrunner for helping remediate COVID-19 learning loss, with significant federal recovery money flowing to states through ARP and other vehicles. But not all tutoring programs are created equally. A Center of Learning Excellence housed at IES can help identify tutoring programs that work, further build the evidence base, and guide states and localities in their investments. The Center's scope would eventually evolve to encompass other evidence-based interventions.

Conclusion

The above steps represent a new trajectory for impact at IES: expanding its scope with transformational new R&D, data and field-building capacity, supported by a stepwise budget increase from approximately \$650M currently to \$1.45B annually by 2026.

About the Authors



Kumar Garg is Managing Director and Head of Partnerships at Schmidt Futures. In this role, Kumar works to help all major Schmidt Futures programs find successful leverage, as well as helping to run the Technology and Society portfolio. He previously helped shape science and technology policy for the Obama Administration for nearly eight years, serving in a variety of roles in the White House Office of Science and Technology Policy (OSTP). Garg led the Obama Administration's efforts to bolster science, technology, engineering, and math (STEM) education, including the Educate to Innovate campaign, with more than \$1 billion in in-kind and philanthropic investment; development of major State of the Union initiatives to train 100,000 excellent STEM teachers and bring computer science to all K–12 students; and creation of iconic events such as the White House Science Fair. Prior to his time in government, he worked on behalf of parents and children seeking educational reform as an education lawyer and advocate. He received a bachelor's degree from Dartmouth College and a law degree from Yale Law School.



Rujuta Pandit is an Intern for the Day One Project. She is a rising sophomore at Dartmouth College pursuing degrees in Engineering Sciences, Public Policy, and International Studies. At Dartmouth, Rujuta has worked with the student consulting group, the humanitarian engineering group, and the undergraduate journal of international affairs, among other ventures. Her research interests include technology, national security, and international affairs.



Daniel Correa is Director of the Day One Project and Acting President of the Federation of American Scientists. He previously directed the Technology and Public Policy Project at Stanford University, and served as Assistant Director for Innovation Policy at the White House Office of Science and Technology Policy where he led development of President Barack Obama’s 2015 innovation strategy. A 15-year veteran of the S&T policy community, he holds law and economics degrees from Yale University.



Ulrich Boser is the founder and CEO of [The Learning Agency](#) and a senior fellow at the [Center for American Progress](#). He also leads the [Learning Agency Lab](#), a nonprofit devoted to scaling the science of learning. In 2017, Boser wrote a book on the science of learning titled [Learn Better](#). The book was featured in many media outlets, including *Wired*, *Slate*, *Vox*, *Fast Company*, and *The Atlantic*. Amazon called it simply “the best science book of the year.” Boser’s work has been influential, and his writing and research have appeared in a variety of outlets ranging from “The Tonight Show with Jay Leno” to the front page of *USA Today*. Sen. Mark Warner (D-VA) drafted a change to federal education law based on Boser’s work. Boser has served as an adviser to many institutions including the Bill and Melinda Gates Foundation, the Reboot Foundation, and the Hillary Clinton presidential campaign. Boser’s career has also included stints as a reporter, editor, and English language instructor. He graduated from Dartmouth College with honors.

About the Day One Project



The Day One Project is dedicated to democratizing the policymaking process by working with new and expert voices across the science and technology community, helping to develop actionable policies that can improve the lives of all Americans, and readying them for Day One of the next presidential term. For more about the Day One Project, visit dayoneproject.org.

The Day One Project offers a platform for ideas that represent a broad range of perspectives across S&T disciplines. The views and opinions expressed in this proposal are those of the author(s) and do not reflect the views and opinions of the Day One Project or its S&T Leadership Council.