



 LINCOLN POLICY

# The Case for Reforming and Strengthening Federal K-12 Education R&D

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# Executive Summary

The United States faces unprecedented challenges in elementary and secondary education. Prolonged school closures caused widespread learning losses and other negative effects that threaten the future of a generation of American children. Today's students will grow up in a future where emerging technologies have the potential to change society and the workforce in unforeseen ways. Renewed great power competition with the People's Republic of China and Russia are creating new national security and economic risks for the United States that once again highlight the need to improve learning in science, technology, engineering, mathematics (STEM), and other key sectors to maintain a competitive advantage.

Since the 1950s, the United States has authorized and funded federal K-12 education research and development (R&D) programs aimed at improving STEM education and learning opportunities for American children, particularly those from disadvantaged backgrounds.

This report reviews and analyzes the history of federal K-12 research and development. This history includes several missed opportunities, including a national evaluation that was broadly ignored despite identifying an instructional method that delivered superior results in improving student outcomes. It also reveals that the longstanding strategy of K-12 R&D activities has been to fund academic and empirical research about K-12 education rather than to develop new tools for improving students' learning opportunities. Despite a longstanding, bipartisan commitment to identify "what works" in education, federally funded education research activities appear to have a limited impact in changing K-12 education policy and governance.

In 2022, the United States will spend less than \$1 billion on K-12 education R&D initiatives through the Department of Education and National Science Foundation, an



amount largely unchanged over the past decade.<sup>1</sup> As a nation, the United States spent \$864 billion on elementary and secondary education in 2019, or about 4 percent of Gross Domestic Product.<sup>2</sup>

Congress, the Biden administration, and civil society should take action to reinvent and strengthen federal K-12 education research and development. A first step is to review and evaluate, ideally through congressional or nonpartisan oversight, current federal K-12 education R&D programs to understand their value and impact, as well as to provide actionable recommendations for improving K-12 education and addressing current challenges. Second, Congress and the Biden administration should prioritize funding for K-12 education research and development activities that create new and effective learning models with real-world benefits for students. Third, policymakers and civil society should study the potential for applying an advanced research and development agency (ARPA) model or other innovative approaches to K-12 education R&D.

While the history of federal K-12 R&D activities includes many disappointments and missed opportunities, the United States cannot afford to further neglect the opportunity and urgent need to spur innovation in elementary and secondary education through effective research and development.

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1 This estimate is based on a calculation of K-12 education R&D activities included in the U.S. Department of Education and National Science Foundation FY2022 budget submissions. See: U.S. Department of Education, Fiscal Year 2022 Budget Summary (2021), <https://www2.ed.gov/about/overview/budget/budget22/summary/22summary.pdf>. National Science Foundation, FY2022 Budget Request to Congress (2021), <https://www.nsf.gov/about/budget/fy2022/pdf/fy2022budget.pdf>.

2 National Center for Education Statistics, *Digest of Education Statistics* (2020), Table 106.10, [https://nces.ed.gov/ipeds/data/digest/d20/tables/dt20\\_106.10.asp?current=yes](https://nces.ed.gov/ipeds/data/digest/d20/tables/dt20_106.10.asp?current=yes).



## INTRODUCTION

On Feb. 27, 2020, Bothell High School in Washington state closed after an employee's relative tested positive for COVID-19.<sup>3</sup> Within two weeks, the World Health Organization declared a global pandemic.<sup>4</sup> Public schools across the United States closed, shifting to remote instruction. Millions of students would not see the inside of a school classroom for more than a year.

The pandemic caused an unprecedented disruption for American K-12 education. The overnight transition to remote instruction forced administrators, principals, and teachers to reinvent their teaching methods for Zoom, Google Classroom, and other then unfamiliar technologies. Congress responded to the pandemic by providing more than \$180 billion in aid to state departments of education and school districts to help reopen schools, support teachers and students while schools were closed, and recover learning losses.<sup>5</sup> Most states and school districts have been slow to spend funds, suggesting they did not know how to put the money to work to help children.<sup>6</sup>

For American children, the pandemic and prolonged school closures caused significant problems. Reviews of student test score data show that students lost months of learning while schools were closed, with children from disadvantaged households falling even further behind than their peers.<sup>7</sup> Children also suffered significant social and emotional setbacks during the months away from school. For example, more parents reported their child suffered from anxiety and depression than before the pandemic.<sup>8</sup> Researchers warn that school closures will have long-term costs for affected American children from reduced life expectancy<sup>9</sup> to lower lifetime earnings.<sup>10</sup>

For federal policymakers, the ineffective transition to remote instruction during months of school closures should prompt several backward- and forward-looking questions. For example, what could have been done to better prepare schools and teachers for the transition to remote instruction? And what should now be done to help children recover from learning losses and other setbacks caused by prolonged school closures?

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3 "The Coronavirus Spring: The Historic Closing of U.S. Schools (A Timeline)," *Education Week*, July 1, 2020.

4 "WHO Director-General's opening remarks at the media briefing on COVID," World Health Organization, March 11, 2020.

5 U.S. Department of Education, Education Stabilization Fund (2022), <https://covid-relief-data.ed.gov/>.

6 Dan Lips, "More than \$150 Billion in K-12 Relief Funds Remain Unspent," Foundation for Research on Equal Opportunity, November 17, 2021.

7 Emma Dorn, Bryan Hancock, Jimmy Sarakatsannis, and Ellen Viruleg, "Covid-19 and education: The lingering effects of unfinished learning," McKinsey & Co, July 27, 2021.

8 Ibid.

9 Dimitri A. Christakis, Wil Van Cleve, Frederick J. Zimmerman, "Estimation of US Children's Educational Attainment and Years of Life Lost Associated with Primary School Closures During the Coronavirus Disease 2019 Pandemic," *Jama Network*, 2020, <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2772834>.

10 Dorn, Hancock, Sarakatsannis, and Viruleg, "Covid-19 and education: The lingering effects of unfinished learning," op. cit.





Over the past 50 years, the federal government has spent billions on research and development projects with a goal of improving the quality of elementary and secondary education; however, much of this funding went to program evaluations, academic studies, and collecting statistics. Decades of empirical studies have revealed ways to boost student learning and make tangible progress toward the nation's longstanding goal of promoting equal opportunity in K-12 education. Scientific studies have also shed light on education strategies that do not yield the envisioned benefits that policymakers or educators who champion them hoped for.

But even some of the most promising or important findings of federally supported K-12 R&D projects have been ignored. Instead, decisions about K-12 policy and pedagogy have been made based on other factors, such as the interests of adults in positions of authority in the nation's public education institutions. Despite frequent rhetoric by politicians on both the right and left that they favor evidence-based education reforms and programs, experience shows that prominent Republicans and Democrats have politicized K-12 education research or ignored the findings of empirical research studies when it contradicts their preferences.

A review of the history of K-12 research and development funding and programs reveals significant missed opportunities to recalibrate federal and state policy to encourage promising instructional models and improve student learning. For example, a billion-dollar national study of K-12 instructional models singled out a proven strategy for effectively teaching low-income children.<sup>11</sup> Its findings were broadly ignored and forgotten.

This history also includes missed opportunities of R&D investments not made. A decade ago, President Obama called for the creation of an Advanced Research Projects Agency for Education focused on education technology and modeled after DARPA, which leads the Department of Defense's advanced R&D projects and created innovations such as the Internet and GPS.<sup>12</sup> The ARPA-ED project, which was never authorized or funded, was proposed to create "digital tutors as effective as personal tutors," "[c]ourses that improve the more students use them," and "educational software as compelling as the best videogame."<sup>13</sup> One cannot help but imagine how different the months of remote instruction in 2020 and 2021 would have been had such technologies been created and broadly disseminated over the past decade.

In 2022, the need for identifying effective strategies and developing new tools to improve student learning has never been more apparent. But the urgent need to improve

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11 Cathy L. Watkins, "Project Follow Through: A Case Study of Contingencies Influencing Instructional Practices of the Educational Establishment," *Cambridge Center for Behavioral Studies*, 1997, <https://www.behavior.org/resources/901.pdf>.

12 Jeffrey Mervis, "Obama Proposes Education Technology Agency Modeled After DARPA," *Science*, February 4, 2011, <https://www.science.org/content/article/obama-proposes-education-technology-agency-modeled-after-darpa-rev2>.

13 U.S. Department of Education, *Winning the Future: The Role of ARPA-ED* (2011), <https://www.ed.gov/sites/default/files/arpa-ed-background.pdf>.



American K-12 education was well known long before COVID-19. For example, the recently released results of the long-term National Assessment of Educational Progress, administered in 2020, disclosed that average student test scores had declined since 2012.<sup>14</sup> For years, NAEP results have shown that an alarmingly high percentage of American children are not mastering basic reading and math skills.

Beyond the obvious societal need to improve children's prospects, the return of great power competition with the People's Republic of China (PRC) and Russia has restored national security as a motivating factor for reforming American K-12 education. Since 1957, federal education R&D activities have been understood to be a priority for national security.<sup>15</sup> Today, the United States is competing with the PRC and other nations to achieve and maintain competitive advantages in advanced technologies, including artificial intelligence and machine learning with their potential to significantly change society and reorder geopolitical power.<sup>16</sup>

For these reasons, national policymakers should reconsider the federal approach to K-12 research and development. This begins by reviewing the lessons learned over the past half-century and identifying new strategies for leveraging R&D to transform student learning. To be successful, implementing a new national strategy for federal K-12 R&D will likely require overcoming resistance from lawmakers on both the left and right. Longstanding ideological concerns and practical political relationships have shaped the trajectory of the federal government's approach to K-12 education for decades.

But the broad outlines of a potential compromise are visible. For example, common ground may be found to significantly increase federal spending on K-12 R&D by shifting the focus of expenditures from empirical research to developing practical applications and new tools to improve learning. This would advance longstanding federal priorities, such as promoting equal opportunity and improving American competitiveness to promote national security. Moreover, the proliferation of new schools and widespread decentralization underway in American elementary and secondary education are creating new opportunities to leverage technology and new learning models to directly benefit students.

Understanding the need for reforming federal K-12 research and development proposals requires studying more than a half-century of federal initiatives and billions spent on research projects to learn from the past and understand the long-term political context.

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14 National Assessment of Educational Progress, NAEP Long Term Trend Assessment Results: Reading and Mathematics, <https://www.nationsreportcard.gov/ltr/?age=9>

15 "Sputnik Spurs the Passage of the National Defense Education Act," U.S. Senate, accessed March 3, 2022, [https://www.senate.gov/artandhistory/history/minute/Sputnik\\_Spurs\\_Passage\\_of\\_National\\_Defense\\_Education\\_Act.htm](https://www.senate.gov/artandhistory/history/minute/Sputnik_Spurs_Passage_of_National_Defense_Education_Act.htm).

16 National Security Commission on Artificial Intelligence, *Final Report* (2021), <https://www.nscai.gov/wp-content/uploads/2021/03/Full-Report-Digital-1.pdf>.



# A Historical Overview of K-12 Federal Research and Development Activities

Fifty years ago, the nation's leading experts on education research and development convened a symposium in Washington, D.C., to discuss how federal investment can improve student learning.<sup>17</sup> The meeting was hosted by the National Institute of Education (NIE), which was established by Congress earlier that year to leverage R&D investments to improve K-12 education in the United States.

One of the attendees was Brookings Institution scholar Alice Rivlin. She would later lead the Congressional Budget Office, Office of Management and Budget, and serve as a vice-chair of the Federal Reserve.<sup>18</sup>

“NIE needs a Salk vaccine,” Rivlin reasoned, “something that really works, that solves a problem everyone knows about.” She continued: “In education, as in health research, a few dramatic wins make up for a lot of failures and, more importantly, for slow undramatic progress on hard problems. One or two visible successes will demonstrate that success is possible and give the public the feeling that education research is more than a luxury; it has the potential for doing good.”<sup>19</sup>

Rivlin's perspective was representative of many experts at the 1972 symposium. To be successful, the new National Institute of Education needed to demonstrate clear evidence that research was solving concrete problems and improving student learning. Moreover, the findings of K-12 education research needed to be shared with the people and education officials in a position to act on and implement them in American classrooms.

At the time, the federal government's K-12 R&D programs were relatively new.

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17 National Institute of Education, *Proceedings of the Symposium on Education Research and Development* (1972), <https://files.eric.ed.gov/fulltext/ED088867.pdf>.

18 “Alice M. Rivlin,” Brookings Institution, accessed March 3, 2022, <https://www.brookings.edu/author/alice-m-rivlin/>.

19 National Institute of Education, *Proceedings of the Symposium on Education Research and Development*, op. cit., p. 203.





During the 1950s, Congress and the Eisenhower administration established new laws and programs for federal education R&D.<sup>20</sup> *The Cooperative Research Act of 1954* and the *National Defense Education Act of 1958* authorized federal funding overseen by the Office of Education to promote K-12 research. (The Office of Education would later become the U.S. Department of Education.) The latter legislation was passed in response to the Soviet Union's launch of the Sputnik satellite and concerns that the United States was falling behind in STEM education fields during the Cold War. By the beginning of the 1960s, the Office of Education's budget for K-12 research was \$10 million.<sup>21</sup>

The Sputnik launch also spurred increased activity within the National Science Foundation to improve math and science instruction in the nation's elementary and secondary schools. President Eisenhower called for additional federal initiatives and funding for science, technology, engineering, and mathematics programs, which led Congress to provide \$60 million for NSF's education activities for 1959, a 300 percent increase.<sup>22</sup> NSF's programs focused on improving K-12 education by including training opportunities for math and science teachers, summer courses for talented high school students, and supporting the development of a new physics curriculum for high schools.<sup>23</sup> NSF's K-12 education activities would continue and grow in the years ahead.

## THE GREAT SOCIETY SPURS NEW SPENDING ON EDUCATION R&D

In 1964, President Lyndon B. Johnson declared a “war on poverty.”<sup>24</sup> Addressing inequality in elementary and secondary education became a priority for federal lawmakers. A presidential task force advising the Johnson administration recommended a significant increase in funding for education R&D efforts, calling for new national laboratories focused on improving learning. The task force urged that the labs not be “small-scale efforts, operating out of a corner of a department of education, rooted in the interests of a few faculty members, and having little connection with the daily practice of education in the community.”<sup>25</sup> Instead, the task force recommended that the labs incorporate “experimental schools” and “extensive pilot programs in regular schools” to have real impact.<sup>26</sup>

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20 Pamela Barnhouse Walters, Annette Lareau, and Sheri H. Ranis, eds., *Education Research on Trial: Policy Reform and the Call for Scientific Rigor* (New York: Routledge, 2009), p. 51.

21 Ibid., p. 52.

22 National Science Foundation, *Annual Report* (1958), [https://www.nsf.gov/pubs/1958/annualreports/ar\\_1958\\_sec2.pdf](https://www.nsf.gov/pubs/1958/annualreports/ar_1958_sec2.pdf).

23 Ibid.

24 President Lyndon B. Johnson, *Special Message to the Congress Proposing a Nationwide War on the Sources of Poverty* (1964), <https://www.presidency.ucsb.edu/documents/special-message-the-congress-proposing-nationwide-war-the-sources-poverty>.

25 Maris A. Vinovskis, *Revitalizing Federal Education Research and Development* (Ann Arbor, MI: The University of Michigan Press), p. 35.

26 Ibid.



*The Elementary and Secondary Education Act of 1965 (ESEA)*, which became the framework for federal K-12 education policy, included a title for research and development. ESEA updated the cooperative research statute of 1954 to expand federal authorities in education research and training. The Office of Education was authorized to fund new research centers and, by 1967, had contracted to establish 19 labs.<sup>27</sup>

One of the focuses of early federal education research was program evaluation. A notable example was the Westinghouse and Ohio University evaluation of the federal Head Start program, which provided preschool and other services to disadvantaged children.<sup>28</sup> The 1969 evaluation found that “Head Start as it is presently constituted has not provided widespread significant cognitive and affective gains,” and recommended “large-scale efforts and substantial resources continue to be devoted to the search for finding more effective programs, procedures, and techniques for remediating the effects of poverty on disadvantaged children.”<sup>29</sup>

This disappointing early review of the fledgling Head Start program (and the program’s continuation and expansion) highlights how even significant federal education research findings are often ignored. In 2012, a broader national evaluation of the Head Start program again found that the program was not providing lasting educational value for the disadvantaged children served.<sup>30</sup> In 2019, Congress spent \$10 billion on Head Start, which served roughly a million children.<sup>31</sup>

## THE OVERLOOKED “SALK VACCINE”

While the 1969 evaluation of Head Start called for large-scale efforts to find ways to improve learning opportunities for disadvantaged children, such a national effort was already underway. In 1967, President Johnson called for a new program, Follow Through, to extend the compensatory education services of Head Start into the early grades. Congress authorized such a program but provided limited funding, which led program managers to transform Follow Through into a national project to identify the best instructional practices for improving academic achievement for disadvantaged kids. While not originally conceived as a research project, Follow Through would become the largest federal K-12 experimental research project. According to Professor

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27 Ibid., p. 36.

28 Office of Economic Opportunity, *The Impact of Head Start: An Evaluation of the Effects of Head Start on Children’s Cognitive and Affective Development* (1969), <https://files.eric.ed.gov/fulltext/ED036321.pdf>.

29 Ibid.

30 Department of Health and Human Services Administration for Children and Families, OPRE Report 2012-45b, *Third Grade Follow-up to the Head Start Impact Study* (2012), [https://www.acf.hhs.gov/sites/default/files/documents/opre/head\\_start\\_executive\\_summary.pdf](https://www.acf.hhs.gov/sites/default/files/documents/opre/head_start_executive_summary.pdf).

31 Department of Health and Human Services, Administration for Children & Families, *Head Start Program Facts: Fiscal Year 2019* (2021), <https://eclkc.ohs.acf.hhs.gov/sites/default/files/pdf/no-search/hs-program-fact-sheet-2019.pdf>.



Maris Vinovskis, the federal government spent more than \$1 billion on the program between 1967 and 1992.<sup>32</sup>

Follow Through resulted in a large, national comparison of how different instructional methods affect the learning and academic achievement of disadvantaged children. The program was a comparative, longitudinal study to determine the most effective way to teach at-risk children using 22 instructional models sponsored by education researchers, including some universities.

### *The project revealed a clear winner.*

A 1977 national evaluation of Follow Through data showed that children taught through “Direct Instruction” (a highly scripted teaching method that focuses on mastering basic skills) had higher levels of academic achievement, problem-solving skills, and self-esteem. No other instructional models included in the Follow Through evaluation achieved similar positive results.

To use Alice Rivlin’s argument at the 1972 conference, the Office of Education had found its Salk vaccine: something that really works and solves a problem that everyone understands, in this case improving learning outcomes of low-income students. In the words of Education Commissioner Ernst L. Boyer: “The evaluation found that only one of the 22 models which were assessed in the evaluation consistently produced positive outcomes.”<sup>33</sup>

Reviewing the commissioner’s statement more than four decades later, one might assume that national education officials were quick to highlight and disseminate these findings, as well as update federal education programs to encourage schools to implement Direct Instruction as a proven method for teaching disadvantaged children. The opposite occurred.

Dr. Cathy L. Watkins wrote a case study of Project Follow Through for the Cambridge Center of Behavioral Studies that is worth quoting at length:

*“Rather than endorsing only those models that were successful in increasing achievement of disadvantaged children, government officials proclaimed the program successful as a whole. All models continued to be funded by the federal government, including those models that had actually resulted in negative effects on achievement. ... In other words, the federal government used tax money to provide children with an education that results in greater academic deficits than would be expected if these children attended school*

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32 Vinovskis, *Revitalizing Federal Education Research and Development*, p. 54.

33 Ernst L Boyer, *Letter to Oregon Senator Bob Packwood*, March 31, 1978, [https://www.nifdi.org/images/Boyer\\_1.png](https://www.nifdi.org/images/Boyer_1.png).



*in traditional classrooms. ... Perhaps even more disturbing is the fact that the findings have been disregarded by the educational establishment.”<sup>34</sup>*

Why these promising findings were broadly ignored warrants a serious academic and political science review. However, two political factors likely contributed. First, Direct Instruction’s methods are unpopular in schools of education, where many teachers learn how to teach. Powerful interest groups, such as public school teachers’ unions, would oppose the widespread adoption of a scripted method of teaching. Second, conservatives have traditionally opposed an expansive federal role in education and, therefore, would not have favored a federal strategy to leverage the promising findings of Follow Through.

Nevertheless, the promising education research findings drawn from Project Follow Through about the effectiveness of Direct Instruction have been validated over time. A 2019 meta-analysis of a half-century of research about Direct Instruction showed “strong positive effects” across student groups, subjects, and grade levels.<sup>35</sup> One can only imagine how much different American education would be today if this promising “Salk Vaccine” had been broadly adopted in the late 1970s and the years that followed.

## A NEW DEPARTMENT AND A NATION AT RISK

Between 1965 and 1980, Congress and both Democratic and Republican administrations enacted a series of federal education laws aimed at ensuring equal access to high-quality K-12 education for disadvantaged children, special education students, and other at-risk youth populations.<sup>36</sup> At the time, federal education programs were administered by a sprawling Department of Health, Education, and Welfare.

In 1979, Congress passed a new law establishing the U.S. Department of Education.<sup>37</sup> President Carter had promised to create a new cabinet-level department during the 1976 campaign, an issue that helped him earn the first-ever endorsement of the National Education Association, the nation’s largest teachers’ union.<sup>38</sup>

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34 Watkins, “Project Follow Through: A Case Study of Contingencies Influencing Instructional Practices of the Educational Establishment,” op. cit., p. 80.

35 Robert Pondiscio, Meta-Analysis Confirms Effectiveness of an Old School Approach: Direct Instruction, *Education Next*, February 8, 2018, <https://www.educationnext.org/meta-analysis-confirms-effectiveness-old-school-approach-direct-instruction>.

36 “The Federal Role in Education,” U.S. Department of Education, accessed March 3, 2022, <https://www2.ed.gov/about/overview/fed/role.html>.

37 Ibid.

38 Mike Antonucci, “Analysis: The U.S. Department of Education—Born in the NEA,” *The 74 Million*, January 11, 2017, <https://www.the74million.org/article/analysis-the-us-department-of-education-born-in-the-nea/>.



Upon signing the legislation to create the new department, President Carter highlighted the power of a new education secretary to provide national leadership. “For the first time, there will be a Cabinet-level leader in education, someone with the status and the resources to stir national discussion of critical education concerns.”<sup>39</sup>

The new department opened its doors on May 4, 1980. Six months later, California Gov. Ronald Reagan won a landslide victory to become president. During the campaign, Reagan had referred to the department as “President Carter’s new bureaucratic boondoggle,” which he suggested abolishing.<sup>40</sup> As president, Reagan sought to limit and reduce the federal government’s role in K-12 education, but he faced opposition from congressional Democrats. The Reagan administration ultimately legitimized the federal government’s role in education.<sup>41</sup>

In 1983, the Reagan administration released the findings of a national review of the conditions of the nation’s schools conducted by a commission of department-appointed education leaders. “If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war,” warned the report.<sup>42</sup> The release of the seminal *A Nation at Risk* report has been described as the dawn of the modern school reform era.<sup>43</sup>

Like previous federal reviews of American K-12 education, *A Nation at Risk* presented alarming evidence of widespread underperformance in American schools. From disappointing international test scores to high teen and adult illiteracy rates, millions of American students were falling behind their peers around the world and were ill-prepared to succeed in the workforce.

The commission recommended that the federal government’s role in education focus on “several functions of national consequences that States and localities are unable to meet,” one of which was “supporting curriculum improvement and research on teaching, learning, and the management of schools.”<sup>44</sup> The commission further found that “new instructional methods should reflect the most current application of technology in appropriate curriculum areas, the best scholarship in each discipline, and research in learning and teaching.”<sup>45</sup>

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39 President Jimmy Carter, *Department of Education Organization Act Statement on Signing S. 210 Into Law*, October 17, 1979, <https://www.presidency.ucsb.edu/documents/departement-education-organization-act-statement-signing-s-210-into-law>.

40 Edward B. Fiske, “Reagan Record in Education: Mixed Results,” *The New York Times*, November 14, 1982.

41 Kevin Kosar, *Ronald Reagan and Education Policy*, Studies in Governance and Politics, 2011.

42 National Commission on Excellence in Education, *A Nation at Risk: The Imperative for Educational Reform* (1983), <https://files.eric.ed.gov/fulltext/ED226006.pdf>.

43 Anya Kamenetz, “What a Nation at Risk Got Wrong, And Right, About U.S. Schools,” National Public Radio, April 29, 2018, <https://www.npr.org/sections/ed/2018/04/29/604986823/what-a-nation-at-risk-got-wrong-and-right-about-u-s-schools>.

44 National Commission on Excellence in Education, *A Nation at Risk: The Imperative for Educational Reform*, op. cit.

45 Ibid.



The Reagan administration undertook a revamping of the National Institute of Education, including a greater focus on statistical collection and a review of ongoing education research projects. Chester “Checker” Finn was appointed to lead a reorganized Office of Educational Research and Improvement.<sup>46</sup> The Reagan administration focused on strengthening the National Center of Education Statistics, which has since served as a valuable statistical agency within the Department of Education. Finn also directed an external review of the education labs, which had been the focus of growing criticism during the 1980s. Finn testified before Congress that the labs were providing little value and had become “entrenched institutions whose primary goal seems to be self-perpetuation.”<sup>47</sup> These concerns highlighted the common view among prominent national policymakers that federal K-12 R&D investments were yielding little value.

## THE TENNESSEE STAR CLASS SIZE REDUCTION EXPERIMENT DRIVES POLICY REFORM

Some education R&D projects during this period did spur meaningful policy change. In the 1980s, the highly influential Tennessee Student Teacher Achievement Ratio (STAR) experiment randomly assigned children in early years (kindergarten through third grade) to classes of different sizes. The experiment, which involved four years of schooling and approximately 7,000 children, found that smaller class sizes had positive effects, including higher academic achievement, reduced grade retention, and improved student engagement, with greater positive effects for economically disadvantaged and ethnic minority children.<sup>48</sup> Follow-up studies found positive long-term effects, including high school graduation,<sup>49</sup> for children who were randomly assigned to significantly smaller classes.

There were reasons to be cautious about basing policy reforms and interventions on the Tennessee STAR experiment. For example, Eric Hanushek of Stanford University analyzed the study findings and other experimental and nonexperimental data of class size reductions. “The surprising finding,” Hanushek explained, “is that the evidence does not offer much reason to expect a systematic effect from overall class size reduction policies.”<sup>50</sup> Hanushek argued that general class-size reductions (including those not focused on early grades like the Tennessee STAR intervention) “will depend

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46 Vinovskisk, *Revitalizing Federal Education Research and Development*, op. cit., p.49.

47 Ibid., p. 49.

48 Charles M. Achilles, “Class-Size Policy: The STAR Experiment and Related Class-Size Studies,” *National Council of Professors of Educational Administration*, October 2012.

49 Ibid.

50 Erik A. Hanushek, “Some Findings from an Independent Investigation of the Tennessee STAR Experiment and From Other Investigations of Class Size Effects,” *American Educational Research Association*, 1999.





much more importantly on the quality of new teachers hired than on the effects of class size reductions per se.”<sup>51</sup>

Nevertheless, the broad findings of the Tennessee STAR study were often cited in reform efforts to reduce class sizes. Two dozen states enacted measures to mandate or incentivize smaller class sizes in the years that followed.<sup>52</sup>

## THE ERA OF BIPARTISAN CONSENSUS IN FEDERAL SCHOOL REFORM

While it may not have been apparent to people closely following education reform at the time, the period spanning the late 1980s and 1990s was an era of general bipartisan consensus in American K-12 education reform. This broad consensus included establishing academic standards, testing and accountability mechanisms, and taking the initial steps toward a more student-centered approach to education, including the proliferation of more choices within the traditional public education system.

In late September 1989, President George H.W. Bush convened a summit of 49 governors in Charlottesville, Va., to discuss education reform.<sup>53</sup> Arkansas Gov. Bill Clinton, then chair of the National Governors Association, co-hosted the meeting. The summit, and subsequent policy development by the Bush administration and the governors, spurred the standards-based education reform movement. President Clinton would later champion ideas developed by the Bush White House to encourage education standards, which influenced the 1994 reauthorization of ESEA. While President Bush’s attempts to expand private school choice proved unsuccessful in Washington, President Clinton championed the creation of 3,000 public charter schools -- a new concept at the time -- and significantly expanded school choice.

Federal education R&D funding increased modestly during the Bush years. In 1992, the National Academies of Sciences reviewed the Office of Educational Research and Improvement and the role of federal education R&D and recommended that research centers “engage in more sustained efforts by applied research, development, aimed at nurturing new methods, approaches, and tools to full maturity.”<sup>54</sup> In 1994, Congress reauthorized OERI in the Goals 2000 Educate America Act, which spurred another reorganization. After Republicans won control of Congress that fall, the value of education research became a greater focus for lawmakers. President Clinton signed

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51 Ibid.

52 Matthew M. Chingos and Grover J. “Russ” Whitehurst, “Class Size: What Research Says and What it Means for State Policy,” *Brookings Institution*, May 11, 2011, <https://www.brookings.edu/research/class-size-what-research-says-and-what-it-means-for-state-policy/>

53 Alyson Klein, “Historic Summit Fueled Push for K-12 Standards,” *Education Week*, September 23, 2014, <https://www.edweek.org/teaching-learning/historic-summit-fueled-push-for-k-12-standards/2014/09>.

54 Vinovskisk, *Revitalizing Federal Education Research and Development*, op. cit. p. 57.



legislation that required scientifically based intervention strategies for improving reading instruction and for school-wide reform initiatives.<sup>55</sup> These moves demonstrated the growing interest in improving the academic rigor of K-12 research and using scientific evidence to improve learning, a trend that would accelerate in the following decades.

Other federal education R&D activities also increased during the 1990s. In 1990, NSF's education programs were reorganized into a new Directorate of Education and Human Resources.<sup>56</sup> According to the Government Accountability Office, funding for the NSF's Education and Human Resources directorate doubled from \$243 million in 1990 to \$512 million by 1992.<sup>57</sup> At the request of the Senate Appropriations Committee, NSF also reviewed how the directorate evaluated its programs, highlighting the broader interest in understanding the value of federal education R&D funding.<sup>58</sup>

## NO CHILD LEFT BEHIND AND THE ERA OF “SCIENTIFICALLY-BASED” K-12 EDUCATION RESEARCH

The bipartisan compromise by President George W. Bush's administration with Sen. Ted Kennedy and Rep. John Boehner established No Child Left Behind. A theme of the sweeping school reform legislation was using research and scientific evidence to guide policymaking and instruction. “[T]here was little disagreement on the call for using scientifically-based or research-based programs and practices,” writes Maris A. Vinovskis. “Indeed, those terms were used more than 100 times in the final bill, and the legislation included a rather rigorous definition of scientifically-based research.”<sup>59</sup>

NCLB was a precursor to the *Education Sciences Reform Act of 2002*. This bipartisan law reorganized the research enterprise within the Department of Education, creating the Institute of Education Sciences (IES). The law established rules for the new institute, which was to be led by an appointed director. The law stated that education research programs were required to be “scientifically-based” or “scientifically-valid,” demonstrating Congress's renewed interest in improving the rigor and quality of

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55 Ibid., p. 61.

56 NSF Federal Advisory Committee for Education and Human Resources, *A Report to the Directorate for Education and Human Resources* (2014).

57 U.S. General Accounting Office, GAO/RCED-94-95, *National Science Foundation: Better Use of Existing Resources Could Improve Program Administration* (1994), <https://www.gao.gov/assets/rced-94-95.pdf>.

58 Ibid.

59 Vinovskis, *Revitalizing Federal Education Research and Development*, op. cit., p. 65.



education research.<sup>60</sup> In 2002, IES launched the What Works Clearinghouse, which aimed to highlight and disseminate scientifically based best practices identified through rigorous research.<sup>61</sup>

The Bush administration's commitment to scientifically based education policy was undermined by criticism and a series of reviews of its flawed implementation of the Reading First program, a \$1 billion annual program intended to improve reading instruction.<sup>62</sup> Despite claims from the Bush administration that the Reading First program improved student outcomes<sup>63</sup>, reviews by the Inspector General and Government Accountability Office identified problems with how the department managed the program.<sup>64</sup> A 2007 Senate review of the program highlighted conflict of interest problems and found that the administration's management undermined program integrity.<sup>65</sup>

## THE OBAMA YEARS AND THE ARPA-ED PROPOSAL

President Obama entered the White House with broad goals to improve American education by increasing federal funding and focusing on “what works.” Less than a month into his administration, President Obama signed the American Recovery and Reinvestment Act, which included more than \$80 billion in funding for K-12 and pre-kindergarten education programs. This funding package included \$4 billion for the administration's Race to the Top initiative, a competitive grant program that encouraged states to adopt a range of the administration's favored approaches to K-12 education reform. Among them: adopting common standards, increasing support for public school teachers, expanding charter schools, and establishing state longitudinal data systems.<sup>66</sup>

Education Secretary John B. King Jr. commented that “one of the hallmarks” of the administration's approach to education has been “investments in innovation” and

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60 Jeffrey J. Kuenzi and Adam Stoll, R43398, Congressional Research Service, *The Education Sciences Reform Act* (2014), <https://sgp.fas.org/crs/misc/R43398.pdf>.

61 Government Accountability Office, GAO-10, 644, *Department of Education: Improved Dissemination and Timely Product Release Would Enhance the Usefulness of the What Works Clearinghouse* (2010), <https://www.gao.gov/assets/gao-10-644.pdf>.

62 Congressional Research Service, RL332246, “Reading First: Implementation Issues and Controversies (2008), [https://www.everycrsreport.com/reports/RL332246.html#\\_Toc228070588](https://www.everycrsreport.com/reports/RL332246.html#_Toc228070588).

63 Shepard Barbash, “The Reading First Controversy,” *Education Next*, 2008, <https://www.educationnext.org/the-reading-first-controversy/>.

64 Congressional Research Service, RL332246, Reading First: Implementation Issues and Controversies (2008), [https://www.everycrsreport.com/reports/RL332246.html#\\_Toc228070588](https://www.everycrsreport.com/reports/RL332246.html#_Toc228070588).

65 Kathleen Kennedy Manzo, “Senate Report Cites “Reading First” Conflicts,” *Education Week*, May 24, 2007.

66 William G. Howell, “Results of President Obama's Race to the Top,” *Education Next*, July 14, 2015, <https://www.educationnext.org/results-president-obama-race-to-the-top-reform/>.



“supporting interventions and approaches that are backed by evidence of success.”<sup>67</sup> However, the administration’s handling of specific high-profile education programs involving research contradicted this rhetoric.

In the first instance, the Obama administration attempted to end the D.C. Opportunity Scholarship program, which allowed low-income children to attend private schools, despite extensive federally funded academic research showing that children offered scholarships benefitted academically.<sup>68</sup>

In the second instance, the Obama administration delayed the release of the findings of a congressionally mandated national evaluation of Head Start, the most comprehensive evaluation of the program in its history. The evaluation determined that participation in the program did not yield long-term benefits, a finding that undermined the administration’s case for additional federal spending for Head Start or other preschool programs.<sup>69</sup> The Department of Health and Human Services released the long-anticipated report more than a year after it was scheduled to be finalized, and only after Republican lawmakers demanded its release.<sup>70</sup>

In 2011, the Obama administration proposed a new federal initiative to create an ARPA-ED, based on the existing R&D model of DARPA and ARPA-E, by using \$90 million in new funding to “fund projects performed by industry, universities, or other innovative organizations, selected based on their potential to create a dramatic breakthrough in learning and teaching.”<sup>71</sup> The plan was originally called for by the President’s Council of Advisors on Science and Technology. The proposal highlighted the opportunity to fund breakthrough R&D to achieve key outcomes, including creating “[d]igital tutors as effective as personal tutors,” “courses that improve the more students use them,” and “[e]ducational software as compelling as the best videogame.”<sup>72</sup>

At the time, the ARPA-ED proposal received some positive feedback, including from conservative education thought leaders. For example, the American Enterprise Institute’s Rick Hess wrote favorably about the proposal, explaining that a DARPA

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67 Secretary John B. King Jr., *Giving Every Student a Fair Shot: Progress Under the Obama Administration’s Education Agenda* (2017), [https://www2.ed.gov/documents/press-releases/cabinet-exit-memo.pdf?utm\\_content=&utm\\_name=&utm\\_term=](https://www2.ed.gov/documents/press-releases/cabinet-exit-memo.pdf?utm_content=&utm_name=&utm_term=)

68 Editorial, “White House ignores evidence of how D.C. school vouchers work,” *The Washington Post*, March 29, 2011, [https://www.washingtonpost.com/opinions/white-house-ignores-evidence-of-how-dc-school-vouchers-work/2011/03/29/AFFsnHyB\\_story.html](https://www.washingtonpost.com/opinions/white-house-ignores-evidence-of-how-dc-school-vouchers-work/2011/03/29/AFFsnHyB_story.html).

69 Department of Health and Human Services Administration for Children and Families, OPRE Report 2012-45b, *Third Grade Follow-up to the Head Start Impact Study* (2012), [https://www.acf.hhs.gov/sites/default/files/documents/opre/head\\_start\\_executive\\_summary.pdf](https://www.acf.hhs.gov/sites/default/files/documents/opre/head_start_executive_summary.pdf)

70 Editorial, “Another Sandy Relief Trick,” *The Wall Street Journal*, January 13, 2013. <https://www.wsj.com/articles/SB10001424127887324081704578236132869279590>.

71 U.S. Department of Education, *Winning the Future: The Role of ARPA-ED* (2011), <https://www.ed.gov/sites/default/files/arpa-ed-background.pdf>.

72 Ibid.



model could be effective in developing new learning tools to address specific problems. “I find it much easier to envision a promising program to help students master conversational Mandarin or the principles of calculus in six weeks than one which “turns around” schools or figures out “optimal” pay systems,” Hess reasoned. “I could imagine projects that help an ELL student make up three years of English acquisition in three months, an iPad app that can help identify and remediate problems in early reading, or an assessment that can capture cognitive development in more robust, compelling ways.”<sup>73</sup>

Congress did not authorize or fund the ARPA-ED initiative.

The *Budget Control Act of 2011* resulted in budget reductions, which meant opportunities for funding new education initiatives were limited.<sup>74</sup> Moreover, Education Secretary Arne Duncan focused most of the administration’s political capital in education on the administration’s Race to the Top initiative and efforts to encourage states to adopt Common Core standards and other reforms. Given the politics of federal education policy at the time, many conservatives would likely have resisted the Obama administration’s attempt to significantly expand federal education spending and R&D, due to concerns about how such new authority would be used in concert with other aspects of its policy reform agenda. Looking back with hindsight from 2022, the ARPA-ED proposal to create breakthroughs in education technology and instructional software appears to be another missed opportunity, considering the nation’s overnight shift to remote schooling in 2020.

The Obama administration’s education R&D initiatives were narrower in scope. For example, the Investing in Innovation (i3) program, authorized and funded by the ARRA, was a competitive grant program that funded innovative projects managed by school districts or nonprofit organizations.<sup>75</sup> The projects were required to address specific education intervention goals and fund work to develop, scale-up, or validate such interventions. Initial grant recipients included organizations such as Teach for America and the KIPP charter school network.<sup>76</sup> A 2014 GAO review of the i3 program reported that 92 grants for a total of \$937 million had been awarded as of November 2013.<sup>77</sup> Fifty-nine of these grants, and roughly a quarter of the funding, involved development activities.<sup>78</sup> The Obama administration also created the “Next

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73 Rick Hess, “ARPA-Ed: A Qualified Thumbs Up,” *Education Week*, March 2, 2012.

74 Bill Heniff Jr., Elizabeth Rybicki, Shannon M. Mahan, Congressional Research Service, R41965, *The Budget Control Act of 2011* (2011).

75 “Investing in Innovation (i3),” U.S. Department of Education, accessed January 19, 2022, <https://www.ed.gov/open/plan/investing-innovation-i3>.

76 Neil Campbell and Abby Quirk, “Lessons Learned from the Investing in Innovation Program,” *Center for American Progress*, November 5, 2019, <https://www.americanprogress.org/article/lessons-learned-investing-innovation-program>.

77 U.S. Government Accountability Office, GAO-14-211R, *K-12 Education: Characteristics of the Investing in Innovation Fund* (2014), <https://www.gao.gov/assets/gao-14-211r.pdf>.

78 Ibid.



Generation High Schools” initiative, which involved public and private sector funding to develop new models for high school.<sup>79</sup>

## THE EDUCATION INNOVATION AND RESEARCH PROGRAM

While the Obama administration did not find congressional support for its ARPA-ED model, the White House and Congress found common ground in establishing a new program aimed at developing new learning models informed by research, continuing the approach of the i3 grant program. The *Every Student Succeeds Act* (ESSA), which became law in 2015 with broad bipartisan support, established a new Education Innovation and Research (EIR) program. According to the Congressional Research Service, the EIR program:

*“provides competitive grants to eligible entities to create, develop, implement, replicate, or take-to-scale entrepreneurial, evidence-based, field-initiated innovations to improve achievement and attainment for high-need students. Three types of grants (early phase, mid-phase, and expansion grants) are awarded primarily based on the past demonstrated success of the grantee in meeting these goals.”<sup>80</sup>*

The EIR program’s authorization highlighted bipartisan interest in focusing federal education R&D spending on practical solutions to improve learning opportunities.

## EDUCATION R&D DURING THE TRUMP ADMINISTRATION

The Trump administration did not fundamentally change the trajectory of federal education R&D. However, the administration’s approach to federal education R&D is reflected through the appropriations and budget process. Under the leadership of Secretary Betsy DeVos, the Department of Education maintained the EIR program and, with congressional support, increased its funding substantially. Between FY2017 and FY2021, the EIR program received \$719 million for new awards with annual funding more than doubling from \$95 million in FY2017 to \$194 million in FY2021.<sup>81</sup>

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79 “Fact Sheet: Obama Administration Announces More than \$375 Million in Support for Next-Generation High Schools,” The White House, November 10, 2015, <https://obamawhitehouse.archives.gov/the-press-office/2015/11/10/fact-sheet-obama-administration-announces-more-375-million-support-next>

80 Congressional Research Service, R45977, *The Elementary and Secondary Education Act (ESEA), as Amended by the Every Student Succeeds Act: A Primer* (2020), <https://crsreports.congress.gov/product/pdf/R/R45977>.

81 U.S. Department of Education, Office of Elementary and Secondary Education, *Education Innovation and Research: Funding and Legislation* (2021), <https://oese.ed.gov/offices/office-of-discretionary-grants-support-services/innovation-early-learning/education-innovation-and-research-eir/funding-and-legislation/>.





But based on White House budget requests, the Trump administration's view of the value of the EIR program appears to have changed over time. For example, in its FY2020 budget request, the White House proposed \$300 million for EIR, an increase of \$170 million over prior year appropriations.<sup>82</sup> However, for FY2021, the White House proposed zeroing out funding for the program. Congress appropriated \$194 million for EIR, a modest increase over prior years' funding.<sup>83</sup> The Trump administration's changing views about the value of federal education R&D activities may reflect internal debate within the administration.

The Trump administration's FY2021 budget request for the Institute of Education Sciences proposed \$565 million for the Institute of Education Sciences, or a 9.3 percent reduction from prior year funding.<sup>84</sup> The administration's budget specifically proposed eliminating funding for regional educational laboratories (to save \$56 million) and statewide longitudinal data systems (to save \$33 million).<sup>85</sup> Congress provided EIS with \$642 million, a 3 percent increase over prior year funding, and maintained funding for both programs.<sup>86</sup>

The Trump administration strongly supported broader increases in federal spending on R&D beyond education, proposing \$142 billion for federal R&D projects—including funding increases for nondefense artificial intelligence (AI) and quantum information science (QIS). The White House cited the need to maintain the nation's "leadership in science and technology for generations to come" during a "time of great power competition."<sup>87</sup> The Trump administration's final budget request for the National Science Foundation proposed a minor reduction in the budget for NSF's Directorate of Education and Human Resources.<sup>88</sup>

The Biden administration has not yet established a firm plan for how it will approach federal education R&D programs and funding. The *American Rescue Plan Act*, which passed Congress in March of 2021, provided significant funding increases for K-12 education, largely to provide emergency assistance for public school systems. The

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82 U.S. Department of Education, *Fiscal Year 2020 Budget Summary* (2019), <https://www2.ed.gov/about/overview/budget/budget20/summary/20summary.pdf>.

83 U.S. Department of Education, *Department of Education Fiscal Year 2022 President's Budget* (2021), <https://www2.ed.gov/about/overview/budget/budget22/22pbapt.pdf>.

84 U.S. Department of Education, *Department of Education FY2021 President's Budget* (2020), <https://www2.ed.gov/about/overview/budget/budget21/21pbapt.pdf>.

85 Ibid.

86 U.S. Department of Education, *Department of Education Fiscal Year 2022 President's Budget* (2021), op. cit.

87 "President Trump's FY 2021 Budget Commits to Double Investments in Key Industries of the Future," The White House, February 11, 2020, <https://trumpwhitehouse.archives.gov/briefings-statements/president-trumps-fy-2021-budget-commits-double-investments-key-industries-future/>

88 National Science Foundation, *FY2021 Budget Request to Congress*, (2020), <https://www.nsf.gov/pubs/2020/nsf20005/nsf20005.pdf>.



spending bill included \$100 million for the Institute of Education Sciences to study learning losses during the pandemic.<sup>89</sup>

The Biden administration's FY2022 budget proposal proposed flat funding for the EIR program and \$95 million in additional funding for the Institute of Education Sciences, suggesting that the White House favors increasing support for the traditional approach to federal education R&D.<sup>90</sup>

However, the Biden administration may intend to increase funding support and its focus on K-12 research and development initiatives, particularly regarding STEM education fields. In August 2021, the heads of the Office of Management and Budget and Office of Science and Technology Policy sent a memo to executive departments and agencies providing guidance on R&D priorities for the FY2023 budget. The memo highlighted the administration's interest in promoting STEM education learning:

*“Agencies should develop measurable strategies to promote diversity, inclusion, equity, and accessibility across all R&D focus areas, while building supportive STEM education and engagement ecosystems; this goal would be accomplished by identifying and showcasing Models of Equitable STEM Excellence – a new initiative to highlight successful largescale practices to improve diversity, inclusion, equity, and accessibility in STEM while reducing barriers for STEM learners and workers.”<sup>91</sup>*

The White House's direction should result in new initiatives related to federal education R&D with this focus in the FY2023 budget.

Congress is considering several reforms to federal K-12 education R&D programs. For example, the America COMPETES Act, which passed the House of Representatives in early February, included language authorizing changes to NSF's education R&D activities.<sup>92</sup>

For its part, the Department of Education's Institute of Education Sciences is continuing the traditional approach to funding education R&D. On Dec. 28, 2021, IES announced that contracts for eight regional educational laboratories would commence in January with traditional labs maintaining funding awards, which would allow the

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89 Mark Schneider, Institute of Education Sciences, “The Road to Learning Recovery,” March 16, 2021, <https://ies.ed.gov/director/remarks/3-16-2021.asp>.

90 U.S. Department of Education, *Fiscal Year 2022 Budget Summary* (2021), <https://www2.ed.gov/about/overview/budget/budget22/summary/22summary.pdf>.

91 Shalanda D. Young and Dr. Eric S. Lander, *Memorandum for the Heads of Executive Departments and Agencies, Executive Office of the President*, August 27, 2021, <https://www.whitehouse.gov/wp-content/uploads/2021/07/M-21-32-Multi-Agency-Research-and-Development-Priorities-for-FY-2023-Budget-.pdf?source=email>.

92 House of Representatives Committee on Rules, *America Creating Opportunities for Manufacturing, Pre-Eminence in Technology, and Economic Strength (America COMPETES) Act of 2022: Section by Section* (2022), <https://rules.house.gov/sites/democrats.rules.house.gov/files/BILLS-117HR4521RH-RCP117-31-SxS.pdf>.



labs to “conduct applied research in partnership with stakeholders to address local and regional needs; provide training, coaching, and technical support for applying research to education improvement; and widely disseminate findings from high-quality research.”<sup>93</sup> In this aspect at least, the federal government’s approach to education R&D remains largely unchanged since the 1960s.

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93 Institute of Education Sciences, “IES Announces New Regional Educational Laboratories to Work with States, Districts, and Communities,” email announcement, December 28, 2021.



# Lessons Learned

Over the past half century, the federal government has attempted at various times to use science to inform and improve how American children learn. But the broad trends remain unchanged. The federal government continues to fund academics and scientists to evaluate approaches to education and publish their findings in hopes that lessons learned will inform what happens in the more than 100,000 elementary and secondary schools across the nation.<sup>94</sup>

While valuable histories have been written about federal education R&D initiatives over the past half century, more should be learned about this often-overlooked aspect of the United States' approach to improving elementary and secondary education. Recent decades have witnessed high-level reviews of federal education R&D projects, numerous congressional hearings, and congressional actions to update and modernize these programs. However, more can likely be learned through nonpartisan oversight, congressional investigations, and independent scholarship to study what has worked and what has not. In other words, the evidence-based evaluations accepted as the norm for education research is needed for the federal education R&D enterprise itself. Thorough reviews, including by Congress and the nation's leading scientific bodies, are clearly needed.

A review of the broad history of federal education R&D provides insights that should inform future congressional and executive branch action.

1

**There is longstanding bipartisan support for federal spending on K-12 education research to improve student learning, yet federal education funding for R&D remains a small fraction of overall federal spending on R&D.**

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94 National Center for Education Statistics, Digest of Education Statistics (2020), Table 214.10, [https://nces.ed.gov/programs/digest/d20/tables/dt20\\_214.10.asp?current=yes](https://nces.ed.gov/programs/digest/d20/tables/dt20_214.10.asp?current=yes).



Since the 1960s, Congress and Republican and Democratic administrations have supported federal research and development programs focused on elementary and secondary education. Yet total federal spending on education R&D is a small fraction of what the United States spends on elementary and secondary education. The federal government spends less than \$1 billion on the Department of Education's and NSF's K-12 education R&D initiatives, while the nation spends \$832 billion, or 4 percent of its Gross Domestic Product, on elementary and secondary education.

2

**Historically, federal education R&D within the Department of Education has focused on supporting research, rather than development.** Most federal Department of Education K-12 R&D initiatives have involved academic research and evaluations. For example, the longstanding regional educational labs largely focus on studying education and providing recommendations to practitioners. The Institute of Education Science's primary R&D activities mainly focus on research and the dissemination of research findings.

3

**Over the past decade, the federal government's funding for education R&D has increasingly focused on developmental projects, such as the i3 and EIR programs, which have the potential to spur innovations across the K-12 education sector.** Since the Obama administration, a growing focus of federal education R&D initiatives has involved identifying and developing programs aimed at improving student learning. These initiatives demonstrate a growing interest among federal policymakers to use research funding to develop practical applications for improving elementary and secondary education. While more should be learned about these activities and their impact, this approach to federal education R&D holds promise for spurring innovation and improvement across the K-12 sector.

4

**Education research has guided national K-12 education policy reforms only when research findings align with existing priorities of major interest groups or policymaker goals and objectives.** Federal education activities have revealed promising findings. For example, the historic Follow Through project revealed an effective method of classroom instruction to improve disadvantaged students' academic outcomes. However, this compelling empirical evidence did not lead to widespread adoption and application of Direct Instruction in American schools. Other research findings, such as a notable study that suggested smaller class sizes improve learning, led to widespread policy change. The latter policy recommendation, which included a significant increase in teacher hiring, was preferred by major interest groups and their policymakers.



**Political factors, such as liberals' and conservatives' views about the role of the federal government in K-12 education, have influenced federal K-12 research and development programs and will continue to do so.** Federal education R&D efforts are unsurprisingly affected by the political dynamics of K-12 education policy, including liberal and conservative policymakers' differing perspectives about the appropriate role for the federal government in education and priorities for reforming education. This reality should be understood as policymakers and scholars consider options for strengthening federal education R&D.





# Opportunities for Future Government Oversight or Independent Reviews

One way that policymakers, philanthropists, and scholars can work to strengthen federal K-12 research and development activities would be to engage in fact-finding and substantive reviews of current programs and their impact. Congressional committees could engage in constructive oversight, ideally on a bipartisan basis, to develop a common understanding of how current federal funds are being used and what impact they are having in the nation's schools. Moreover, Congress could engage its watchdogs, including the nonpartisan Government Accountability Office and Inspectors General, to conduct these reviews. Independent scholars could also conduct these reviews, assuming sufficient information is publicly available.

- 1** The longstanding Regional Educational Labs program, which receives \$57 million annually in federal funding, should be evaluated to better understand to what extent this work is improving student learning.
- 2** The Institute of Education Science's 20-year-old What Works Clearinghouse should be reviewed to assess to what extent its efforts to highlight and disseminate best practices are informing and improving elementary and secondary education. A particular focus should be an assessment of how IES's research about education interventions are addressing current challenges, such as students' learning losses caused by schooling disruptions during the COVID-19 pandemic.
- 3** The Education Innovation and Research program and its predecessor, the i3 program, should be studied to better understand the impact of these new approaches to federal education R&D. A focus of such reviews should be to identify to what extent funded projects are having an impact on improving learning opportunities for students.



- 4 Congress, nonpartisan watchdogs, and researchers should examine the effectiveness and impact of research and development activities of other Department of Education programs, including Research in Special Education, Comprehensive Literacy Development Grants, Innovations in Literacy, English Language Acquisition, and Indian Education.<sup>95</sup>
- 5 Congress and/or nonpartisan watchdogs should review and evaluate research and development programs within the National Science Foundation's Education and Human Resources directorate<sup>96</sup> and Department of Defense Education Activity to identify potential activities that could inform education research and development initiatives in other federal agencies.<sup>97</sup>

Establishing a stronger public understanding of the value of these federal initiatives, ideally through bipartisan or nonpartisan oversight or independent scholarship, would be a critical step toward identifying future policy options to strengthen or reform federal education R&D efforts. Learning from these efforts would lay the groundwork for future initiatives and to demonstrate that increases in federal K-12 education R&D appropriations are necessary and will be well-spent.

While additional oversight and scholarship is needed, particularly about aspects of current federal education R&D activities that have not already been studied, policymakers do not have the luxury of waiting to shape federal education R&D programs in 2022 and beyond. As the following pages explain, the United States is facing pressing and, in some respects, unprecedented challenges in K-12 education.

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95 U.S. Department of Education, *Fiscal Year 2022 Budget Summary*, op. cit..

96 National Science Foundation, *FY2022 Budget Request to Congress*, <https://www.nsf.gov/about/budget/fy2022/pdf/fy2022budget.pdf>.

97 Department of Defense, *Fiscal Year 2022 President's Budget: DoD Dependents Education* (2021), [https://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2022/budget\\_justification/pdfs/01\\_Operation\\_and\\_Maintenance/O\\_M\\_VOL\\_1\\_PART\\_1/DoDDE\\_OP-5.pdf](https://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2022/budget_justification/pdfs/01_Operation_and_Maintenance/O_M_VOL_1_PART_1/DoDDE_OP-5.pdf).



# Current Challenges

The history of federal K-12 education policy has been shaped by factors external to, but inextricably linked to, the K-12 education sector. Since the civil rights era, national policymakers have focused federal laws, programs, and funding on reducing inequality in American society and promoting equal opportunities for all children to learn. Since the Sputnik launch, geopolitical competition and national security concerns have spurred federal efforts to improve American STEM education. Similarly, technological advances and the implications for American workers have driven federal education activities.

In 2022, each of these factors has reemerged as central challenges facing the United States. Despite the mixed results of the past half century, federal K-12 education R&D can play an important role in helping the United States answer these challenges.

## THE LACK OF EQUAL OPPORTUNITY IN AMERICAN K-12 EDUCATION

Since 1965, the guiding national policy of federal elementary and secondary education policy has been to promote equal opportunity and ensure that all children have a high-quality opportunity to learn. Starting with the *Elementary and Secondary Education Act*, Congress and Republican and Democratic administrations have established laws and programs intended to ensure all student groups have an equal opportunity to learn. Academic reviews of long-term measures of student performance, however, have found the inequality in students' academic achievement persists. "The achievement gap between haves and have-nots in the U.S. remains as large as it was in 1966, when James Coleman wrote his landmark report and the nation launched a 'war on poverty' that made compensatory education its centerpiece," wrote Erik A. Hanushek and his



coauthors in 2019. “That gap has not widened, as some have suggested. But neither has it closed.”<sup>98</sup>

Many factors contribute to this discouraging trend.<sup>99</sup> One likely cause of persistent outcome inequality in American K-12 education is the inability of children from lower-income households to attend a school of their parent’s choice. While progress to expand parental choice has been made since the early 1990s, many children continue to attend schools based on where they live, which results in children from lower-income households attending lower-quality schools than their more affluent peers. For example, the historical practice of housing discrimination known as redlining continues to be a barrier to equal opportunity.<sup>100</sup> Another often overlooked factor is socioeconomic differences in children’s access to outside-of-school enrichment or learning opportunities.<sup>101</sup> Given federal policymakers’ longstanding focus and bipartisan agreement in this area, promoting equal opportunity in American elementary and secondary education should remain an urgent national priority moving forward.

An expansive body of academic and empirical evidence indicates that allowing children to attend a school of their parents’ choice yields benefits for children.<sup>102</sup> In this respect, decades of academic research, including some federally funded studies, has provided critical guidance for federal, state, and local policymakers about how to improve educational opportunities for disadvantaged children. However, government R&D investment, particularly initiatives focused on informing how new schools or learning models are developed, has the potential to improve learning opportunities and reduce inequality.

## THE NEGATIVE EFFECTS OF THE COVID-19 PANDEMIC ON AMERICAN CHILDREN

Unfortunately, the COVID-19 pandemic has had a widespread negative impact on American children, which exacerbated inequality. Evidence continues to mount that

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98 Eric A. Hanushek, Paul E. Peterson, Laura M. Talpey, and Ludger Woessmann, “The Achievement Gap Fails to Close,” *Education Next*, March 19, 2019, <https://www.educationnext.org/achievement-gap-fails-close-half-century-testing-shows-persistent-divide/>.

99 Dan Lips, “The State of Equal Opportunity in American K-12 Education,” *Foundation for Research on Equal Opportunity*, November 3, 2019, <https://freopp.org/the-state-of-equal-opportunity-in-american-k-12-education-42c78f5b67d2>.

100 Tim DeRoche, “Where’s all the reporting about educational redlining?” *Kappan Online*, November 11, 2020, <https://kappanonline.org/where-is-the-rigorous-reporting-about-educational-redlining-in-our-cities-deroche-russo/>.

101 Dan Lips, “Reducing Inequality in Outside-of-School Learning,” *Foundation for Research on Equal Opportunity*, June 26, 2020, <https://freopp.org/reducing-inequality-in-outside-of-school-learning-and-college-savings-58dac9404dd9#>.

102 For example, see: Patrick J. Wolf, PhD, *The Academic Effects of Private School Choice: Summary of Final Year Results from Experimental Studies*, University of Arkansas, May 6, 2021, <https://cpb-us-e1.wpmucdn.com/wordpressua.uark.edu/dist/9/544/files/2018/10/the-academic-effects-of-private-school-choice-summary-of-final-year-results-from-experimental-studies.pdf>.



widespread and, in many cases, prolonged school closures since March 2020 have had a serious and negative effect on a generation of children and adolescents. A recent working paper found that student test scores declined during the 2020-21 school year and that “declines were larger in school districts with less in-person instruction.”<sup>103</sup> The authors warned that this could exacerbate inequality since school districts with larger populations of minority children had less access to in-person learning. A 2021 McKinsey analysis reached similar conclusions, finding that students had lost on average five months of learning by the end of the last school year. Children attending majority African American schools or majority low-income schools suffered even larger learning losses.<sup>104</sup>

Beyond these alarming educational effects, prolonged school closures have harmed children in other ways. According to the American Academy of Pediatrics, school closures impacted children’s “social, mental, emotional, behavioral and physical health.”<sup>105</sup> The U.S. surgeon general issued an advisory in November 2021 that reported an alarming increase in mental health challenges among American children.<sup>106</sup> The surgeon general also warned that “socioeconomically disadvantaged children and adolescents...are two to three times more likely to develop mental health conditions than their peers with higher socioeconomic status.”<sup>107</sup> A recent Government Accountability Office report indicated that school closures have had negative effects on children’s behavioral health.<sup>108</sup>

The negative effects of pandemic school closures are expected to have lasting negative consequences for a generation of American children and the nation’s economic prospects. For example, medical experts predicted that school closures will result in lower life expectancies for affected children.<sup>109</sup> A 2021 Federal Reserve Bank of San Francisco study projected that the nation’s annual economic output would be a quarter

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103 Clare Halloran, Rebecca Jack, James C. Okun, and Emily Oster, “Pandemic Schooling Mode and Student Test Scores: Evidence from US States,” *National Bureau of Economic Research*, November 2021, [https://www.nber.org/system/files/working\\_papers/w29497/w29497.pdf](https://www.nber.org/system/files/working_papers/w29497/w29497.pdf).

104 Dorn, Hancock, Sarakatsannis, and Viruleg, “Covid-19 and education: The lingering effects of unfinished learning,” *op. cit.*

105 Dr. Lee Beers, Testimony Before the House Energy and Commerce Oversight and Investigations Subcommittee, “Putting Kids First: Addressing COVID-19’s Impact on Children,” September 22, 2021, [https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/Witness%20Testimony\\_Beers\\_OI\\_2021.09.22.pdf](https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/Witness%20Testimony_Beers_OI_2021.09.22.pdf)

106 Department of Health and Human Services, U.S. Surgeon General, *Youth Mental Health: The U.S. Surgeon General’s Advisory* (2021), <https://www.hhs.gov/sites/default/files/surgeon-general-youth-mental-health-advisory.pdf>.

107 Ibid.

108 U.S. Government Accountability Office, GAO-22-104437, *Behavioral Health and COVID-19: Higher-Risk Populations and Related Federal Relief Funding* (2021), <https://www.gao.gov/assets/gao-22-104437.pdf>.

109 Christakis, Van Cleve, Zimmerman, *Estimation of US Children’s Educational Attainment and Years of Life Lost Associated with Primary School Closures During the Coronavirus Disease 2019 Pandemic*, *op. cit.*



of a percent lower on average over the next 70 years because of learning losses caused by the pandemic.<sup>110</sup>

State education agencies and school districts received more than \$180 billion in emergency funding to support K-12 education during the pandemic, and most of those funds remain unspent.<sup>111</sup> If unaddressed, the negative effects of the pandemic will unfairly limit the opportunities of a generation of American students. State and district education officials could use evidence-based interventions to address learning losses. For example, empirical evidence shows that high-dosage tutoring results in significant learning gains.<sup>112</sup>

As mentioned above, the American Rescue Plan included \$100 million in funding for the Department of Education's IES to study learning losses. At a minimum, federal education R&D activities can help policymakers understand the scope of the problem and highlight promising interventions that have the potential to reduce learning losses and other negative effects of the pandemic. Promising education development activities could yield progress overcoming these challenges.

## THE RETURN OF GREAT POWER COMPETITION

Like the Cold War of the 20th century, the United States is once again engaged in a global geopolitical competition with great powers, principally the People's Republic of China and Russia. "China increasingly is a near-peer competitor," explained the U.S. intelligence community in its 2021 unclassified threat assessment, "challenging the United States in multiple arenas—especially economically, militarily, and technologically—and is pushing to change global norms. Russia is pushing back against Washington where it can globally, employing techniques up to and including the use of force."<sup>113</sup>

The Intelligence Community's assessment further warned that "[e]merging and disruptive technologies, as well as the proliferation and permeation of technology in all aspects of our lives, pose unique challenges."<sup>114</sup> If the American people were once alarmed by the lights of Sputnik in the October sky, the regular reports of nation-

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110 John Fernald, Huiyu Li, and Mitchell Ochse, "Future Output Loss from COVID-Induced School Closures," Federal Reserve Bank of San Francisco, February 16, 2021, <https://www.frbsf.org/economic-research/publications/economic-letter/2021/february/future-output-loss-from-covid-induced-school-closures/>.

111 Dan Lips, "More than \$150 Billion in K-12 Relief Funds Remain Unspent," op. cit.

112 Carly d. Robison, Matthew A. Kraft, Susanna Loeb, and Beth E. Schueler, "EdResearch for Recovery: Design Principles Series," Annenberg Institute at Brown University, February 2021, [https://annenberg.brown.edu/sites/default/files/EdResearch\\_for\\_Recovery\\_Design\\_Principles\\_1.pdf](https://annenberg.brown.edu/sites/default/files/EdResearch_for_Recovery_Design_Principles_1.pdf).

113 Office of the Director of National Intelligence, *Annual Threat Assessment of the U.S. Intelligence Community* (2021), <https://www.dni.gov/files/ODNI/documents/assessments/ATA-2021-Unclassified-Report.pdf>.

114 Ibid.





state-sponsored cyber-attacks and the ongoing spread of digital authoritarianism around the world should serve as a wake-up call about what is at stake in the current geopolitical competition.<sup>115</sup>

Comparisons of international student achievement such as the Trends in International Mathematics and Science Study show that students in many advanced nations, including the Russian Federation, score higher than American students on math and science exams.<sup>116</sup> The 2018 Program for International Student Assessment found that American 15-year-olds performed above average in literacy but below average in mathematics compared to students in 20 other countries.<sup>117</sup>

For federal education policy, the increasing focus on renewed great-power competition will likely increase support for initiatives to improve education for the sake of the nation's security and economic competitiveness. These concerns have been used to justify federal education R&D activities since the 1950s. Current policymakers have the benefit of learning from the past to leverage how federal education R&D is used to answer the nation's current geopolitical challenges.

## THE AGE OF ARTIFICIAL INTELLIGENCE

Advances in artificial intelligence (AI), or the ability of computers or related technologies to do tasks traditionally done by human beings, have the potential to fundamentally transform society and the ways that people work in ways that are only beginning to be understood.<sup>118</sup> “AI may better or—if wrongly deployed—worsen humanity, but the mere fact of its existence challenges and, in some cases, transcends fundamental assumptions.”<sup>119</sup>

The dawn of the AI era raises broad questions about how education systems are preparing children for the future. For starters, how well are the nation's schools equipping students with the skills needed to manage this transition? How can schools prepare students for future jobs when they will be competing with robots and other sources of technological automation?

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115 Committee on Foreign Relations, U.S. Senate, Democratic Staff, *The New Big Brother: China and Digital Authoritarianism* (2020)

116 National Center for Education Statistics, *Trends in International Mathematics and Science Study (TIMSS)* (2021), <https://nces.ed.gov/timss/results19/index.asp#/math/intlcompare>.

117 OECD, *United States Student performance (PISA 2018)*, <https://gpseducation.oecd.org/CountryProfile?primaryCountry=USA&treshold=10&topic=PI>.

118 Henry A. Kissinger, Eric Schmidt, Daniel Huttenlocher, *The Age of AI and Our Human Future* (New York: Little, Brown, and Company, 2021).

119 Ibid. p.368.



Federal education R&D could be used to highlight current best practices for helping students to prepare for this future. It can also be used to develop new learning models and tools to ensure more American children succeed in the AI era.

## LOOKING FORWARD

While some of these issues are not entirely new, few would argue that the challenges facing American education in 2022 are simpler than those faced in the past. Given national leaders' longstanding support for funding K-12 education research and development activities (in part to address similar challenges), rethinking the federal government's approach to education R&D should be a priority for contemporary policymakers.



# Recommendations and Principles for Reform

In 2022, the Biden administration and Congress should take steps to strengthen and reinvent the federal government's approach to K-12 education research and development. As argued in the preceding pages, the history of federal education R&D initiatives includes significant missed opportunities and decades of academic research that have yielded limited value. Moreover, the K-12 public education sector has proven to be resistant to change based on empirical research evidence, in part due to political factors.

Learning from this history, Congress and the administration have an opportunity to reform and strengthen federal K-12 education R&D in 2022 and beyond by doing the following.

- 1** **Congress and the Biden administration should focus an increasing share of education R&D resources on initiatives that develop practical applications, including technology or instructional models, that address federal government K-12 education priorities.** The potential economic, national security, and societal benefits that could be yielded by federal K-12 R&D development warrants an increase in federal expenditures. However, history suggests that needed breakthroughs are unlikely to be spurred through empirical research and program evaluations alone. Instead, resources should increasingly be focused on developing practical applications or new learning tools or environments that have a real-world impact on and benefit for American students.
- 2** **Congress and the Biden administration should act on available research evidence to reform federal programs and activities and reallocate resources to more promising efforts.** Decades of educational research and program evaluations have yielded significant findings. This evidence should guide policymakers to reform federal programs and focus resources on initiatives with the potential to improve students' opportunities.



3

**Congress and the U.S. Department of Education should focus current education research and program evaluation activities on the immediate challenges in American K-12 education.** Throughout its grant awards and program management, the Department of Education's IES should focus resources on current, critical challenges, including the urgent need to help students recover learning losses caused by prolonged school closures during the pandemic. The \$100 million appropriation for IES to study learning losses demonstrates that Congress recognizes this should be a priority.

4

**Congress should commission an independent and authoritative review of past federally funded research that would share recommendations for best practices with education stakeholders, school leaders, and parents.** More than a half century of federally funded education research studies and program evaluations should provide meaningful guidance for ways to improve American education. A congressionally mandated review of this research could provide actionable guidance for policymakers, educators, school leaders, and parents that can be used to benefit current and future students.

5

**Congress and the Biden administration, to inform future federal education R&D expenditures, should conduct horizon scanning to anticipate and understand how emerging technology and artificial intelligence will affect American education and the workforce.** For example, Congress could engage the Government Accountability Office's Center for Strategic Foresight or Science, Technology Assessment, and Analytics team to study these issues and provide foresight for policymakers.

6

**Congress, the Biden administration, and civil society should study how an Advanced Research Project Agency (ARPA) model or similar models could be applied to improving K-12 education, drawing lessons from the defense, intelligence, homeland security and energy sectors.** An ARPA model for K-12 education has the potential to spur meaningful innovation and improvement to address specific challenges. Congress, the Biden administration, and civil society should draw lessons from other sectors to carefully design an ARPA-ED. A deliberate approach to designing an ARPA-ED model will be necessary to attract the bipartisan support required to authorize such an initiative.

While pursuing these recommendations, federal policymakers should be mindful of the purposes and proper scope of the federal government's role in K-12 education. Specifically, policymakers should consider the following principles for future K-12 R&D initiatives:

1. Focus on addressing federal K-12 education policy goals, including promoting equal opportunity for at-risk student groups, promoting



American competitiveness in key subject areas, and serving the children of military personnel.

2. Recognize the federal government's traditionally limited role in K-12 education and the importance of federalism in American governance.
3. New schools and learning tools should be made broadly available to the extent possible. New schools established through federal education R&D initiatives should be schools of choice with enrollment determined by parents, prioritizing at-risk student groups and by using lotteries to address enrollment scarcity.
4. Federal K-12 education development activities should focus on establishing models that can be used by states, school districts, charter schools, private schools, parents, and other civil society actors.
5. Federal K-12 education research and program evaluation activities should focus on answering key national questions, and findings should be broadly disseminated to inform ways to improve student learning.



# Conclusion

While the history of federal K-12 R&D activities is full of disappointments and missed opportunities, the United States cannot afford to further neglect the opportunity and urgent need to spur innovation in elementary and secondary education. Congress, the Biden administration, and civil society should take action to reinvent and strengthen federal K-12 education research and development.

