Turning Data into Information

The Vital Role of Research in Improving Education

High-quality information and research help create a culture of evidence that is critical to improving education. Research helps provide answers to some of the most important questions in education today—answers that inform our decisions about programming, staffing, how to use limited resources, and how to support each student's growth. Without high-quality and trustworthy education research, communities will be making decisions in the dark, and more students will be left behind.

This appendix—complementing our paper on the value of research in education, *Turning Data into Information: The Vital Role of Research in Improving Education*—is not intended to be an exhaustive or even fully representative sample of the incredible array of education research that has helped inform policy and practice across the country. Rather, this selection of examples is illustrative of the diversity of education research in terms of topic, scope, methodology, application, and how deeply tied it is to policy and practice decisions.

These examples show the impact of research in three areas:

1. Supporting individual students

2. Making the best programming and policy decisions

3. Building knowledge

1. Supporting Individual Students

Many of the resources that inform educators' professional decisions about how to best teach and engage their students are based on research findings. Below is a selection of examples in which research has helped answer questions about how to support individual students' success.

How Can Schools Keep Students On Track for Success?

Research Warning signs often emerge far before students drop out of school, but these signs frequently are missed. The **Massachusetts** Department of Elementary and Secondary Education partnered with American Institutes for Research (AIR) to identify indicators to use in an early warning system to identify students at risk of dropping out and help find interventions to keep them on track for success. AIR used what it has learned about the precursors of dropping out and data from the state's longitudinal data system to develop the Massachusetts Early Warning Indicator System.

Value When states and districts have actionable information about the middle school and high school precursors of dropping out, they can intercede early with interventions and programs that keep their students on track. Early warning systems provide school and district leaders with a clear picture of how students are progressing toward college and career and an unparalleled opportunity to help all of their students

succeed. As these powerful tools often require data from numerous points along a student's education journey, limited, secure data linkages among all of the state agencies that serve students foster more powerful systems.

Does Early Attendance Predict Later Academic Performance?

Research Research has shown school attendance to be a critical factor in student success, and students who are chronically absent—or miss as few as 10 days of school—are at greater risk of falling off track and failing. For example, a data-sharing agreement between **Baltimore County Public Schools** and the district's Head Start programs allowed the Baltimore Education Research Consortium to discover that students who were chronically absent in prekindergarten and kindergarten continued to be chronically absent in later years. These students also had low academic outcomes when compared to students their age who attended school more regularly. An analysis of the student data also revealed that chronically

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absent students were more likely to be held back at least once by third grade.

Value Understanding the relationship between chronic absence in early childhood and later attendance and academic performance provides policymakers, school leaders, and families valuable information about which students may be at risk of later academic problems. More accurate information on chronic absence is also important for education leaders because high levels can be a key indicator of systemic problems in a school or community such as health issues, limited access to transportation, and school climate challenges like bullying.

Do Community College Students Transfer, and Where Do They Go?

Research Advocates of community college programs claim their students are often able to transfer into a competitive four-year institution after two years. But when researchers used a longitudinal dataset of public high school students to examine the transfer patterns of **Florida** community college students, they found that, relative to high school graduates, community college transfer students were considerably less likely to choose a four-year institution located far away from their community college. In addition, students who attended a two-year college located far away from any four-year institutions were less likely to transfer at all.

Value Concerns about affordability and debt from four-year degrees have sparked a national conversation about the value of community college programs. By better understanding patterns of postsecondary selection, transfer, and completion, state policymakers and community college administrators can invest in college scholarship, recruitment, and transfer programs that help more students complete their postsecondary education. And when aggregate student outcomes are publicly reported for all postsecondary programs families are empowered to better understand their postsecondary options and make the best choice for their student.

Can Securely Linking Data across Sectors Improve Outcomes for Children?

Research As states make investments in their education data systems, new questions are raised about the value of securely linking state data systems across sectors. At the request of the **Maine** state legislature, the Maine Educational Policy Research Institute at the University of Maine undertook a study to investigate the value of linking data from the Maine Newborn Hearing Program with state education data. Researchers discovered that among those students with hearing loss identified through the Newborn Hearing Program, 49 percent performed at the proficient or proficient with distinction level in math in 2013—versus 37.5 percent for similar children whose hearing loss was not identified through the Newborn Hearing Program.

Value The researchers tasked with evaluating the feasibility and value of cross-sector data linkages concluded that "linking birth/early childhood data with education data can provide officials and policy makers with valuable information that can aid their decision making. For example, it can help education officials identify early childhood risk factors impacting student growth and achievement, and inform policy to better target valuable, limited resources in ways that maximize their potential benefit to students."

How Can Schools Ensure That All High Schoolers Are On Track for Graduation?

Research Many predictors of failing to graduate from high school are already apparent in ninth grade, but identifying and acting on these predictors can be challenging for states and districts. In conjunction with the Urban Education Institute's Consortium on Chicago School Research, **Chicago Public Schools** conducted research on ninth-grade predictors of failing to graduate high school. This research fueled the development of the district's on-track indicator, which uses information on student behavior, attendance, and grades to identify students at risk for dropping out of high school and determine the supports they need to keep them on track. Since the development of Chicago Public Schools' on-track indicator, the district's rate of students on track to graduate has risen from 57 percent to 84 percent. Chicago's efforts put nearly 7,000 additional students on track to graduate from high school in just seven years.

Value Identifying students who may be at risk for dropping out years before they do so allows high school teachers and leaders to develop school-specific strategies that support students and keep them on track for graduation. Predictive analytics tools like on-track indicators help ensure that educators, school leaders, and policymakers can use data to open doors for students and keep them on track for success in high school and beyond.

How Can Schools Identify Students Who Are Ready for Advanced Coursework?

Research School decisions about which students to place into advanced courses are often made without access to longitudinal data on student performance; as a result, some students who may be ready for more challenging courses are not provided the opportunity to take them. A school in **North Carolina** analyzed data on its students' outcomes to identify students who were likely to be successful in taking more advanced mathematics courses. Using this information, the school tripled the number of eighth graders taking algebra while still maintaining a 97 percent pass rate on state exams. In addition, the school was able to increase enrollment among low-income students, who were previously underrepresented in advanced courses.

Value Providing teachers and school leaders with more actionable information on which students are likely to be successful in different types of courses helps educators work with families and students as they personalize their path to success. In addition, research that challenges existing assumptions about what different types of students are capable of can help schools make more fair and equitable decisions.

2. Making the Best Programming and Policy Decisions

Research helps states answer critical policy and practice questions like whether to continue investing resources in a particular program or which educator preparation programs produce the best teachers for their students. It also helps states and districts understand the long-term effects of different policy decisions and ultimately use their limited resources more effectively to support their students' learning with practices and strategies that have been proven to work. Below is a selection of examples in which research has helped answer questions about the impact of education policies and programs.

How Does Merit Aid Affect College Choice and Completion?

Research College affordability and the cost benefit of a college degree are important factors influencing whether a young adult decides to pursue postsecondary education. To encourage more high school graduates to enroll in college, **Massachusetts** created an initiative to award tuition waivers at in-state public colleges to high school students who scored in the top 25 percent on the Massachusetts Comprehensive Assessment System exam. When researchers examined data on the program provided by the Massachusetts Department of Elementary and Secondary Education, they found that postsecondary enrollment rates at in-state public colleges increased significantly, even though these colleges had lower completion rates. The researchers were able to conclude that students often chose to accept the scholarship and forego the opportunity to attend a college with a higher graduation rate.

Value Research often helps policymakers improve existing state programs by identifying unintended consequences and unexpected patterns. When state leaders have better information about how their programs and services are implemented, they can ensure that these programs have their intended effect and bring real value to families and the state's investments. With better information about how different types of students fare in different schools, families can make more informed decisions about how to weigh different postsecondary opportunities and make the best choice for their student.

Are Early Childhood Initiatives Cost Effective?

Research States are increasingly turning to early childhood education as a way to improve later academic outcomes, but they also sometimes struggle to balance early education investments and competing funding priorities. Researchers in **North Carolina,** a state that has made significant investments in high-quality early education programming, examined the effects of two of the state's largest early childhood initiatives. Through analysis of longitudinal records for more than 1 million North Carolina public school students, researchers found that students in counties with average investments in these two early childhood initiatives had better educational outcomes equivalent to more than six months of reading instruction and more than three months of math instruction by the fifth grade when compared to students in counties without these investments. The study concluded that state expenditures on early childhood services resulted in considerable cost savings to the state via significantly higher test scores, lower rates of special education placements, and lower rates of grade retention throughout elementary school.

Value Research is an incredibly important tool for states to ensure that their programs provide a strong return on investment. Specifically, research can help states ensure that large commitments to education programs and services are effective uses of taxpayer funds. As policymakers develop innovative solutions to meet their state's education needs, data and research play an important role in understanding a program's impact and value.

How Well Do Indicators of College Readiness Predict College Success?

Research The ability of high schools to adequately prepare students to succeed in college and career is critically important to families, school leaders, employers, and policymakers. To investigate college readiness indicators, the Baltimore Education Research Consortium established a data-sharing agreement with **Baltimore County Public Schools** and the Maryland Higher Education Commission that allowed it to link individual high school transcript information with college developmental course need. When the researchers compared high school indicators of college readiness (grade point average, Advanced Placement course enrollment, attendance, and SAT® scores) with those students' postsecondary remedial or developmental math, reading, or writing course enrollment, they found that more than half of the students meeting high school college readiness requirements still needed developmental courses before taking credit-bearing classes in college.

Value Improved data feedback loops between high schools and postsecondary programs provide the contextualized information needed to best prepare students to succeed. By examining and improving the alignment between readiness and outcomes indicators, high schools and local colleges have an

opportunity to determine how to best gauge students' college readiness and how to support students as they transition through high school and into college.

Do Mandatory College Entrance Exams Boost College Enrollment?

Research Having to take entrance exams like the SAT and ACT® is a barrier for many students interested in pursuing postsecondary opportunities. After **Maine** adopted the SAT as its state accountability assessment, policymakers wondered if requiring these college entrance exams would help reduce this barrier to college-going. Researchers used data from the College Board, the National Student Clearinghouse, the National Center for Education Statistics, and the U.S. Census Bureau to examine the college-going rates of students in Maine before and after the state required all of its public high school students to take the SAT exam. The researchers found a 2 to 3 percentage point increase in college enrollment at four-year institutions that could be attributed to mandating that public high school students take the SAT.

Value By identifying barriers to college-going, states can find ways to support college enrollment among students who may otherwise be less likely to pursue a postsecondary education. Better understanding these barriers can help states identify cost-effective policies that give more students a chance for college success and increase equitable outcomes for all students.

How Can Community Programs Improve Student Learning?

Research Reading is a fundamental skill needed for success in school and in life, and many community-based programs work to supplement the reading instruction provided by schools. In an effort to evaluate the effectiveness of Reading Partners, a one-on-one volunteer reading tutoring program, researchers at MDRC collected and analyzed student data from 19 schools in **California, New York,** and **Washington, DC.** The researchers administered three reading assessments to students; conducted interviews with Reading Partners, school staff members, and volunteer tutors; observed tutoring sessions; collected student attendance data for the program; reviewed program materials; administered teacher surveys; and analyzed administrative data on program participation. The study revealed that despite different curricula and large disparities in the reading abilities of participants, students saw significant improvements in reading comprehension, sight-word efficiency, and fluency compared to students in other reading support programs in those same schools.

Value Understanding how community programs can support student learning allows school leaders and state policymakers to develop partnerships that best serve their unique student populations and invest in models that fit their community's needs.

How Does High School Size Affect Postsecondary Enrollment?

Research Many policymakers have expressed an interest in small schools and the circumstances under which they may provide benefits to students. A study from MDRC using **New York City** administrative data found that small schools in that city had increased graduation rates, particularly for disadvantaged minority students who often entered high school below grade level. Additional research with college enrollment and degree attainment data from the National Student Clearinghouse indicated that students in New York City's small schools were more likely to enroll and stay in college compared to students attending larger high schools. Since students were more likely to graduate on time, the city's small high schools ultimately spent less money per graduate than larger schools.

Value Different types of schools and programs often help some students more than others. Researching what education initiatives work best for different student populations can help policymakers target services and make investments in models that work best for their students. When student outcome data is disaggregated by different student characteristics, states have a better understanding of which schools best serve different types of students.

How Can States Retain Their Best Teachers?

Research Recruiting and retaining credentialed math and science teachers is a source of concern for many school districts, especially in high-poverty areas. University of Pennsylvania researchers with the Center for Evaluation and Research in Social Policy examined 10 years' worth of data on all **Missouri** teachers to understand the characteristics and career trajectories of science, technology, engineering, and mathematics (STEM) teachers who began their careers in one of Missouri's five largest cities. The researchers found that after 10 years, 14 percent of STEM teachers who started teaching in one of the five biggest cities in Missouri were still teaching STEM in the same school, compared with 31 percent of STEM teachers who began teaching in another part of the state. In addition, only 28 percent of math teachers and 30 percent of science teachers were still teaching anywhere in the state at the end of the study period.

Value Studying educators' career trajectories can help policymakers understand and calculate their state's human capital needs and help them work more effectively with their state's educator preparation programs to recruit and retain high-quality teachers where they are needed across the state. When feedback about a state's educator workforce needs and the performance of the state's educator preparation programs' graduates are shared, these programs are better able to drive the development of high-quality teachers who can meet diverse student needs. This information also helps states invest in policies that help districts recruit and retain the best teachers.

How Can States Support Students in Foster Care?

Research Students in foster care often have unique education needs. To better understand and improve the education outcomes of students in foster care in **California,** the Center for the Future of Teaching and Learning at WestEd and the University of California, Berkeley, securely linked child welfare and education data and analyzed student performance. The researchers identified a previously invisible achievement gap between children in foster care and other students, including those with other risk factors. The researchers found that students in foster care were more likely than low-income students to change schools during the school year and to attend the lowest performing schools. These research findings spurred significant state-level reforms, including a change to the local control formula governing school funding to include students in foster care as a targeted group in need of support. The state also implemented a legislative requirement for the California Department of Education to regularly report on the education outcomes of students in foster care.

Value By understanding the needs and outcomes of different student populations, policymakers and school leaders are better equipped to support each student. States can use high-quality data linkages among the agencies and departments that serve students to support cross-agency collaboration on programming and services for at-risk students to help provide better support for students in foster care.

3. Building Knowledge

Research on emerging issues like educational equity and how the structure and administration of our nation's education system affect students is helping answer some of the most powerful questions being asked in education policy today. Below is a selection of examples in which research has helped shape the field's understanding of how education policies affect students and how they learn.

What Is the Best Way to Teach Reading?

Research Beginning in the 1950s reading was largely taught in one of two ways: whole language or phonics, with little regard for which method might be most effective. Researchers used more than four decades of longitudinal student data to conduct major studies of early reading instruction methods. In 1997, the federal government convened a group of scientists, practitioners, and parents to create the **National Reading Panel,** which reviewed the research and concluded that phonics should be integrated with other reading instruction methods to create a balanced reading program. The research on how students best learn to read allowed Congress to act in service of students and hold districts accountable for student learning by tying federal spending guidelines to evidence.

Value Research on how children learn can have a direct impact on classroom practices, curriculum decisions, and even the approaches teacher candidates are trained to employ in the classroom. In-state research partnerships can help policymakers make evidence-based decisions about the programming and interventions they adopt to improve their schools' performance and boost student outcomes.

Are School Discipline Practices Applied Inequitably?

Research In recent years schools have increased the use of both zero-tolerance and behavior management policies in school discipline; however until recently there was little understanding of why one method was selected over another for any particular student. Through analyzing student data from more than **60,000 schools in more than 6,000 districts,** researchers from Penn State University discovered that schools and districts with larger minority and low-income populations were more likely to use zero-tolerance disciplinary policies, including expulsions or police referrals, than behavior management tools, such as therapy or rehabilitation. The researchers concluded that white students who misbehave were more likely to be medicalized (e.g., receive medical attention or psychological intervention), while black students who misbehave were more likely to be criminalized (e.g., receive suspension, expulsion, or a referral to law enforcement).

Value Understanding educational inequity is key to addressing it. More accurate data on inequitable practices in schools allows school leaders and policymakers to begin to address school environment factors that promote a school-to-prison pipeline and other inequitable outcomes. In addition, equity data can illuminate school needs; the Penn State study reported that low-income schools often made harsher disciplinary decisions because they cost less and require fewer school resources such as teachers and administrator time. Clearer information about inequities can help inform larger decisions about school resources and funding allocations.

How Can Schools Improve Teacher Effectiveness?

Research Teacher effectiveness is widely recognized as an important factor in student achievement, and many policymakers are interested in identifying the supports and school elements that improve it. Brown University researchers used 10 years of longitudinal administrative data from **Charlotte-Mecklenburg Public Schools** and responses to the North Carolina Teacher Working Conditions Survey to determine the impact of school environment on teacher effectiveness. The researchers found that teachers who worked in a school with higher professional environment ratings

increased their effectiveness significantly more over the course of 10 years than similar teachers at schools with lower professional environment ratings.

Value While educator preparation programs bear a large responsibility in preparing teachers for the classroom, teachers' professional development takes place across their careers. Equipping states and districts with information on ways to grow their teachers' effectiveness empowers them to implement policies and professional development initiatives that benefit student learning. Understanding how much the professional environment of a school contributes to the effectiveness of its teachers gives school leaders and policymakers information to create professional development models, data literacy supports, and school environments that help grow teachers' effectiveness throughout their careers.

How Do Teacher Layoffs Affect Student Learning?

Research When school district budgets necessitate teacher layoffs, decisions are frequently based on teacher seniority, with little consideration for their impact on student achievement. To examine teacher layoff patterns in **Washington,** researchers used data from the state's Professional Education Standards Board (PESB) and the state longitudinal data system that links teachers to their schools and their students. The researchers found that a significant proportion of the teachers receiving layoff notices were more effective than the average teacher in the state. The researchers in Washington then used these findings to develop a process to make layoff decisions based on effectiveness rather than seniority, a change that would result in the equivalent of 2.5 to 3.5 additional months of learning each year for students in the affected classrooms.

Value Understanding how staffing and layoff decisions affect student performance can empower state and district leaders to make decisions that best serve their students. Building a high-quality teacher-student data link allows states to securely connect state-level data about their educators and students by course and discover connections between student academic growth and teacher training, qualifications, and practice.

How Does Teacher Quality Affect Student Outcomes in Adulthood?

Research It is widely acknowledged that teacher quality can affect student learning in the classroom, but researchers are increasingly shedding light on the effects of teacher quality

on students' outcomes for years after. In one of the most prominent studies of the impact of teachers' value add on the lives of their students, researchers at the National Bureau of Economic Research analyzed 2.5 million district records of student test scores and classroom and teacher assignments in grades three through eight, as well as the tax records of the students' parents and the students' adult outcomes. The researchers found that students assigned to teachers with higher value-add scores in grades four through eight were more likely to attend college, attend higher ranked colleges, earn higher salaries, live in higher socioeconomic status neighborhoods, and save more for retirement.

Value Knowing the tremendous impact of teacher quality on student learning and on a wide array of adult outcomes highlights the importance of teacher preparation program, school leader, and policymaker efforts to support and improve teacher efficacy and teacher recruitment, training, and retention policies. In addition, the research affirms the value of using teacher value-add scores to study issues of educational quality and student outcomes.

How Do State Policies Affect Equity?

Research While districts are responsible for hiring teachers, state laws exert enormous control over the quality of teachers that different types of students are taught by. Aided by research, inequities in teacher distribution have been the subject of several high-profile lawsuits including the *Vergara v. California* case. With the help of Students Matter, nine **California** public school students filed this statewide lawsuit to strike down several teacher tenure, dismissal, and layoff laws that the plaintiffs alleged protected ineffective teachers at the expense of students. The initial ruling in this case agreed with the nine students and found that state policies contributed to an inequitable distribution of teachers that often resulted in the lowest performing teachers teaching the most disadvantaged student populations.

Value The initial *Vergara v. California* ruling relied in part on the testimony of researchers and their work analyzing student-level data to better understand the achievement gap, the impact of teachers on student success, the effect of seniority-based layoffs on students, and measurements and long-term implications of teacher effectiveness. Working with research partners in the state to study the impacts of their teacher recruitment, hiring, tenure, dismissal, and layoff policies can help ensure that these policies are not perpetuating inequities and harming students.

For more information on the importance of research in education, see the accompanying paper *Turning Data into Information: The Vital Role of Research in Improving Education.*