



Learning in the Age of Agility: How U.S. Education Can Prepare Students to Solve the Problems of the Future

From Thinking Forward: New Ideas for a New Era of Public Education

A collection of essays celebrating CRPE's 25th anniversary

Robin J. Lake, Editor

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About the Center on Reinventing Public Education

CRPE is a nonpartisan research and policy analysis center at the University of Washington Bothell. We develop, test, and support bold, evidence-based, systemwide solutions to address the most urgent problems in K-12 public education across the country. Our mission is to reinvent the education delivery model, in partnership with education leaders, to prepare all American students to solve tomorrow's challenges. Since 1993 CRPE's research, analysis, and insights have informed public debates and innovative policies that enable schools to thrive. Our work is supported by multiple foundations, contracts, and the U.S Department of Education.

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At [Amazon Go](#), a grocery store in Seattle, a combination of artificial intelligence, motion cameras, and other technologies has eliminated the need for clerks and lines. Customers scan their phones on entry, grab items off the shelf, and walk out the door. An itemized receipt, fully accurate down to the type of panini sandwich chosen, arrives by phone and is charged to the customer's Amazon Prime account. Automation is not the future; it is now. New technologies are already replacing lower-wage jobs in apple orchards and factories, and may soon make redundant what have been bedrock middle-class jobs as well. But new technologies can also create possibilities in the form of new jobs and new ways of solving problems. America's future depends heavily on whether education, from preschool through adult professional training, can adapt to a rapidly changing world. Our young people are demonstrating that they are willing and able to solve the most complex social, technological, and economic challenges and ready themselves for the future if we give them the chance. This introduction sketches the opportunities and challenges to come and introduces a set of essays about how public education can rise to the occasion and prepare the next generations to lead us forward.

America Faces Unprecedented Change and Uncertainty

What will be the impact of fast-emerging technological advancements such as artificial intelligence and automation on the future global economy, and on political and social stability? The most dire predictions read like a dystopian novel, with rampant unemployment leading to violent civic uprisings. As Nick Hanauer, a billionaire venture capitalist and leading advocate for universal basic income and other economic redistribution policies, has warned fellow elites, "The pitchforks are coming."

Some predict a perfect storm: increasing global competitiveness will make it more difficult for the American economy to thrive, an aging population will put more pressure on health care and social service systems, and the strong likelihood of more climate change will threaten the existence of some communities. These dramatic shifts come at a time when America, it can be argued, is already in a period of economic decline and political instability.

Many, however, have questioned these extreme predictions, pointing out that technological change and productivity gains have always produced both economic disruption and opportunity. In some surveys, younger workers have offered relatively sanguine assessments of the Fourth Industrial Revolution. But they also report

that they are not fully prepared for the changes to come.¹ More optimistic futurists acknowledge that while new opportunities for employment and innovation will certainly be part of the rapid pace of change, there will almost certainly be significant shifts in the types of jobs available, the skills needed for existing jobs, and the wages paid. Despite different prognostications, all agree that the shape of the future depends on the response from policymakers, businesses, labor organizations, and—importantly—education.

In a recent series of reports, McKinsey analysts summarized the findings from their models and industry surveys:

The stakes are high. . . . Failure to address the demands of shifting skills could exacerbate social tensions and lead to rising skill and wage bifurcation—creating a society split between those gainfully employed in rewarding work and those stuck in traditional jobs with diminishing wage prospects. . . . The new imperative of our automation age is the shift to a “learning economy,” in which human capital is paramount. The future prosperity of our societies, and the well being of our workforce, depends on whether we are able to attain that goal.²

Chaos or opportunity? The outcome depends on American education and ingenuity

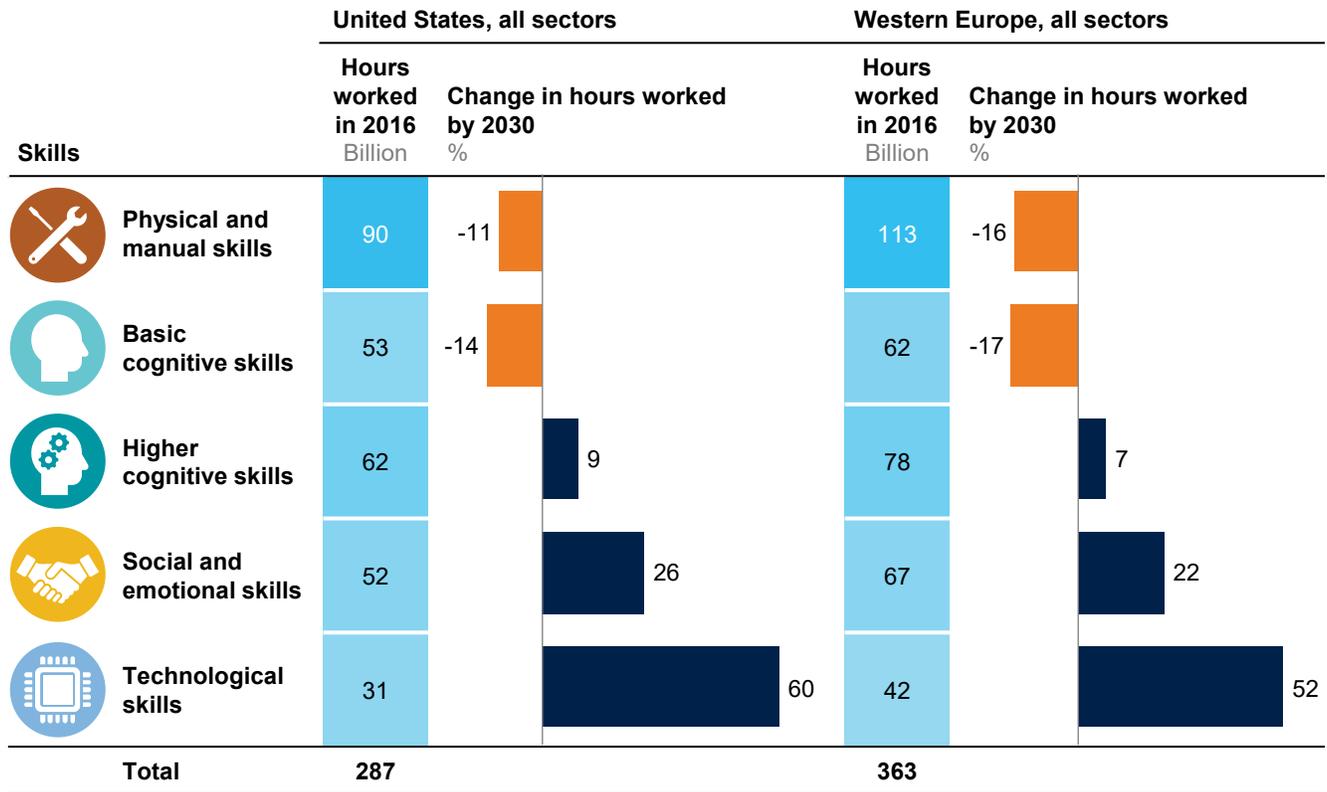
The critical question during this period of what can surely be considered massive uncertainty is: Can America rise to the occasion? A sober assessment of the research to date makes some things clear about which skills and competencies will be most needed in the coming decades, and has important implications for how education will need to change:

1. There will be more of a premium on skills only the human mind possesses. Models predicting what types of jobs will be created and which will disappear are all imperfect, but most suggest that easily automated jobs, including mechanics, machine operators, finance and accounting, and production workers, will likely decline globally. Replacing them will be managerial and professional positions (engineers, scientists, analysts), care workers (elder care, child care, social services), and “creatives” (artists, performers, entertainers). Even jobs that are not wholly replaced will shift in emphasis to tasks oriented toward critical judgement, care, creativity, and communication.

FIGURE 1. Automation and AI Will Accelerate the Shift in Skills That the Workforce Needs

Based on McKinsey Global Institute workforce skills model

0  100



NOTE: Western Europe: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom. Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute workforce skills model; McKinsey Global Institute analysis

No matter what kinds of jobs and problems must be solved in the future, basic academic competencies will always be needed—language skills, computation, analysis, and civic education. The U.S. education system is not reliably providing these skills, even for today’s jobs and society. In the future, there will be even more urgency to find ways to guarantee every student a strong foundation in basic computational and literacy skills, and a foundational core of content knowledge.

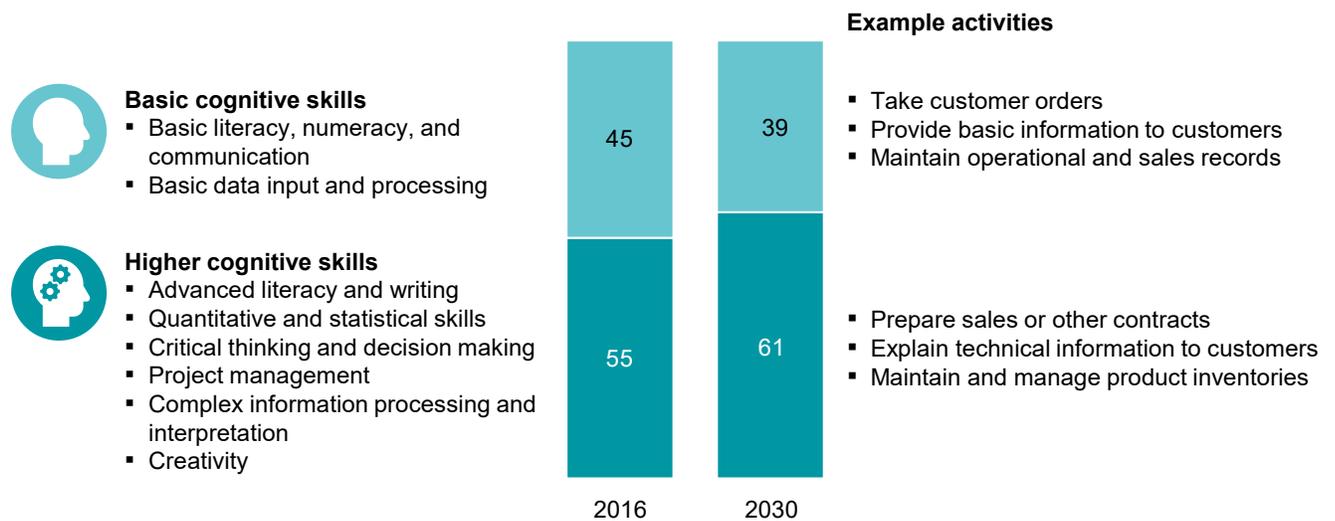
However, “soft skills”—such as creative and collaborative problem solving, social skills, mature judgement, skepticism, and adaptability—will be more important than ever. This means that our schools must find ways to ensure that students are mastering both “hard” *and* “soft” skills, a daunting challenge given that too many students are still not mastering those basics.

FIGURE 2. Higher Cognitive Skills Are Increasingly Displacing Basic Cognitive Skills Across Occupations

Based on McKinsey Global Institute workforce skills model

United States and Western Europe

% of time spent on cognitive skills



NOTE: Western Europe: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom. Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute workforce skills model; McKinsey Global Institute analysis

2. Automation will affect everyone, but will create more problems for different groups. While developing countries are likely to see a growing middle class, the opposite is true for advanced countries where wage polarization is likely to grow. Young people, those less educated, and groups already receiving less training and less education are most at risk to be affected by disruptions in the labor market. A [comment from MIT's Andrew McAfee](#), coauthor of *The Second Machine Age*, reminds us that this trend is already underway: "I'll start to calm down when old-fashioned middle-class jobs come back. I'm just not seeing that."

Again, no one can know how things will play out, but the history of rising inequality does not bode well for social and political stability and may already be testing the strength of well-established democracies. It may be that opportunities for social mobility—preschool preparation, K-12 quality, access to advanced education and jobs—will be not just a moral and civil rights issue, but also take on new practical urgency.

Civic education will be more important than ever. Democracy cannot function in a world where health, environmental, and population issues are increasingly complex, but adults are so unable or unwilling to engage in the debate and are easily drawn to simplistic solutions. Democracy also cannot thrive when people don't accept that debate, disagreement, and respect for unpopular views benefit everyone and are essential to a free society.

3. We will need many more "creatives," innovators, and effective leaders. The scenarios ahead may not result in doom and gloom. New innovations and technologies create new jobs. Policies and programs can help people adapt to new circumstances, find new opportunities, and address inequalities. But the realities and challenges ahead are complicated and will depend on leaders and innovators. We will need as many of those as possible, from all walks of life.

Traditional ways of identifying and cultivating talent and leadership (e.g., "gifted" programs) will not be enough. We must find new, radically personalized ways to help every student realize their untapped potential, ideas, and problem-solving capacities. We must cultivate individual passions, talents, and potential in ways that go beyond the opportunities only available now to students who end up in elite programs, who have extensive social networks, whose families have the time to piece together customized tutoring, enrichment, and social opportunities. We must challenge ourselves to look at children who might seem rebellious, disabled, or unmotivated as potential leaders and innovators, not troublemakers. We must reorient our school systems to stop using labels and boxes and instead create pathways and possibilities that recognize and build on what scientists know are essential to unlocking potential.

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4. Change will be the new normal. Employment losses and new opportunities will arise very quickly. According to a McKinsey Global Institute report, by 2030 between 400 million and 800 million individuals could be displaced by automation and need to find new jobs. If anything is certain about the future of work, it is that it will be

disrupted for many people. Those at the beginning or early stages of their professional careers are likely to face employment instability and volatility. Older adults and educators will need continual retraining to update their understanding and skill sets.

These shifts could also produce a dynamic economic environment in which people are increasingly liberated from menial tasks and move into new jobs that focus more on creative and uniquely human pursuits. But that can happen only if workers start out with the knowledge and skills to capitalize on these shifts and have access to opportunities to gain new knowledge and skills continuously throughout their careers.

Predicting individual jobs and skills and aligned training will require constant rethinking, evidence building, and adjustment. Partnerships with industry will be essential so that education can stay connected to emerging skills and employment opportunities. As Darrell West of the Brookings Institution and author of the book *Future of Work: Robots, AI, and Automation* wrote, “The traditional model, in which people focus their learning on the years before age 25, then get a job and devote little attention to education thereafter, is rapidly becoming obsolete. In the contemporary world, people can expect to switch jobs, see whole sectors disrupted, and need to develop additional skills as a result of economic shifts. The type of work they do at age 30 likely will be substantially different from what they do at ages 40, 50, or 60.”³

There can no longer be “one best way” for everyone. State and local education systems must adapt to rapidly shifting workforce needs. Partnerships with industry will be essential to anticipate and address students’ need for comprehension and skills. Young adults will also need flexible opportunities for retraining well beyond high school. “Lifelong learning” will take on new urgency and meaning. The traditional lines between high school, college, and career must shift. Students and their families will need the power and resources to craft individualized plans for education and re-education to access career training in a way that saves the most time and money possible. Public funding must flex to support this. Educators and schools must be adept at shifting course, partnering, and adapting based on individual needs, economic opportunity, and core purposes.

Education can be a key element of a successful response—or the reason we fail

Other countries facing these challenges might simply decide to create a national program to ensure their schools focus more on soft skills, or create a national system of apprenticeships. In the U.S. our federal system of education, pluralist traditions, and deference to elected school boards and local control in most states mean that shifting quickly does not come easy. We must therefore find ways to adapt and compete within a highly decentralized system. This is a challenge but, as we will show, can also be an advantage.

America’s edge has always been ingenuity, grit, independent thinking, and innovation. These are the attributes—in both schooling and human development—that are born from bottom-up solutions, not centrally planned solutions. American ingenuity is our best hope. Innovative educators, the business community, and community partners are

ready and willing to come together to design new approaches to workforce training, talent identification and development, social and emotional development, and social mobility.

Innovative educators across the country are already demonstrating what is possible. At [Workspace Education](#) in Bethel, Connecticut, students and their families have access to a curated set of learning opportunities ranging from homeschooling curriculum and exchange programs to locally developed dual-credit college courses and “micro-schools” focused on core STEM or humanities skills. At [ReSchool](#) in Colorado, families are provided resources and advocate networks to identify student social, mental health, and learning needs, as well as goals and opportunities for each student. In Florida, education savings accounts allow students with special needs to choose therapists, tutors, and instructional settings that fit their unique needs.

Instead of traditional classes, students at [Purdue Polytechnic Institute](#) in Indianapolis work on a series of community-based projects throughout the year that aim to incorporate the skills Indiana high schoolers are supposed to learn. As they pursue projects, students interview community members, work with peers to hone their ideas, and eventually pitch their plans to business leaders. Students still have assignments and tests to show they have mastered concepts such as conservation of energy or linear equations, but they also have a lot of freedom. Each week they set their own schedules, and in addition to some regular classes, they spend hours working independently.

At Seattle’s [Downtown School](#), a spinoff of the city’s premier college prep program where Bill Gates and Paul Allen went to high school, there are no electives or other expensive extras. Students attend core classes from 9:00 a.m. to 2:00 p.m. The shorter day allows students to access a strong core curriculum and build social connections. After school, students, along with their parents and advisors, design their own customized internships, service learning, and extracurriculars to fit their career and personal development interests.

It’s too early to know which of these and other emerging innovations will be most effective, but they have important common threads:

- They treat every student as an asset to be maximized.
- They view “coproduction” with students and families as the primary theory of action.
- They customize solutions for each student based on their unique talents and capacities.
- They see learning as a permeable endeavor, necessarily pulling from community, global, and technology-based resources.
- They assume that students need to learn to debate, think deeply, and take ideas from concept to fruition to be leaders and problem solvers.
- They focus more on curation and management of a wide array of learning opportunities than a set delivery model.

And critically, *all of these examples operate outside the traditional public education system*. Most are privately operated or operate with special charter school-like flexibilities. A good portion of them serve already advantaged student populations. There have been efforts to create similar models within school districts and traditional higher education settings, but those efforts have struggled

As has always been our core concern at CRPE, the challenge ahead is how to create opportunities for these kinds of customized and focused solutions at scale and for every student. Without systemic solutions, we will fail to meet the challenges ahead. We will simply not prepare enough leaders, employees, and problem solvers in a system where talent is evenly distributed but opportunity is not.

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Our educators are ready to innovate, but our systems are not

Designed more than 100 years ago, America's public education system is not preparing students for today's realities of civic and global competitiveness, much less tomorrow's. A few facts:

- U.S. students score poorly in math and science compared to other industrialized countries. Out of 71 countries the U.S. ranked 39th in math and 25th in science.⁴
- Students are not graduating high school with the necessary skills and knowledge to succeed in college. According to the Center for American Progress, remedial college courses cost families across the country about \$1.3 billion every year.⁵
- Thirty-one percent of 12th grade students report never participating in debates or panel discussions about current events. Another 70 percent report never having written a letter to give an opinion or help solve a problem.⁶
- Higher education is prohibitively expensive for too many students. Students who do attend college can encounter crushing debt. In 2014, U.S. student loan debt exceeded \$1.2 trillion, with over 7 million debtors in default.⁷

Pathways to excellent higher education and social mobility still exist, but access remains largely determined by one's race, disability, or economic status. The result is that while talent is evenly distributed among students, outcomes are not:

- Children from high-income (top 1 percent) families are ten times more likely to become inventors as those from below-median-income families.⁸

- Children from racial and ethnic minority groups, children living in poverty, and children who are English language learners are 2.5 times less likely to be identified for gifted programs, despite achieving at the same levels as their peers in gifted programs.⁹
- NAEP fourth grade achievements (1998 to 2013) show that 8.6 percent of students with disabilities scored proficient in reading, versus 26 percent of nondisabled peers.¹⁰
- Rural students have less access to high-speed internet, AP coursework, and extracurricular opportunities. They tend to feel self-conscious about their academic abilities and are more likely to “undermatch” themselves when applying to colleges.¹¹

There is no single solution, but for every solution tried there is one common theme: educators, students, and families who want something better are thwarted by an outdated delivery model. A recent CRPE study of schools trying to personalize learning illustrates the problem.¹² Despite strong support from teachers and students, central office policies and supports stifled innovation in schools, instructional rigor remained stagnant, and students on the margin typically stayed there.

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Education reforms to date are necessary, but not sufficient

Despite these daunting challenges, the education reform initiatives of the last two decades have shown that progress is possible: creating new, innovative schools, giving schools flexibility to innovate, allowing families and educators to find the right “fit,” ensuring that public goals are accomplished via public oversight, and providing equitable funding and opportunity.

The myth that poverty is inextricably linked to outcomes has been shattered by innovative charter schools and autonomous district-run schools. New ideas are taking hold around the country: that students should be able to move at their own pace, that brain science has critical implications for educational learning environments, and that families from all backgrounds can become active participants in choosing schools and improving their school systems.

But recent strategies don’t go far enough. A significant “college for all” push provided impressive numbers of students from low-income backgrounds with new opportunities to attend college, yet career readiness indicators have hardly budged.

American charter schools have largely improved outcomes for disadvantaged students, but many early successes are plateauing.¹³ Accountability systems based on standardized end-of-year exams and measuring memorized knowledge are clearly outdated. Efforts to “personalize” education have taken off in many school districts but have too often failed to produce rigorous instruction in a truly customized manner.¹⁴

Overwhelming evidence now supports what every parent knows by experience: that each child is a complex package of talents, experiences, quirks, and interests—what Todd Rose has termed in [The End of Average](#) as a “jagged profile.” If America is to be successful, our education system must be reimagined away from mass delivery of content knowledge and toward developing individual talents and capabilities.

The past two or three decades have been focused on the *all*. What do *all* students need to know and be able to do before graduation? What do *all* schools need to be accountable for? How can we assure *all* students have equal access to high-quality instruction? These were important goals, and reformers made progress in these areas. But our focus now must seriously and urgently turn from *all* to *each*. Does *each* child have what they need? If not, what will it take?

It is time to fundamentally rethink our assumptions about educational delivery. We cannot successfully face an age of agility and customization if our education system remains moribund through rigidity and sameness. The need to reinvent public education is more urgent than ever—and yet the roadmap is unclear.

What Should An Agile Public Education System Look Like?

To some degree, all students need the same thing from an education: to be able to read, write, and compute. To be prepared to solve the problems of the future, they will need to think critically, originate ideas, participate in American civic society, and work in teams to create solutions. But ultimately, the job of public education must be to customize and individualize, to embrace and cultivate complexity, and to create schools that are the right fit—rather than ask kids to fit in. Public education must enable every child to reach their full potential.

The work ahead will require educators, policymakers, researchers, philanthropists, and others to set aside all current assumptions and consider how our education system, designed for the challenges of 100 years ago, can become a learning system built to prepare every student for the certainties and uncertainties of the coming decades.

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The goal of achieving customized pathways for every student has profound implications for the way we think about service delivery, governance, and policy. Much has been written (see for example the excellent treatise *The Futures of School Reform*) about “unbundling” education to better suit individual student needs and preferences.¹⁵ But if we are serious about change, we also must tackle

the “rebundling” questions—the system questions that will determine how quickly education can change and who will benefit from those changes.

Can America’s public schools and higher education systems respond effectively to these challenges, or will they drag students and communities down? We think education can adapt, but it will not be easy. This collection of essays suggests how we can approach the unknowns and draws implications, both immediate and long-term, for research and development, investment, and policy. The seven essays we present here point toward new principles and priorities:

1. Schools should teach to the extremes, not the mean, so they capture talents that are now being lost, and motivate many kids who are now settling for mediocrity. From the earliest ages, student learning opportunities should be customized to build on individual talents and potential. This implies that schools may not always be the best positioned to deliver all of those opportunities, and thus must be reoriented to curate portfolios of learning, growth, and career preparation opportunities—rather than deliver all instruction and supports.
2. The traditional lines between high school, college, and career must be completely reimagined to allow students a more affordable and direct pathway to high-paying jobs.
3. Schools cannot be the sole learning space. Students and their families should be able to access learning experiences now locked up in community resources, such as businesses, hospitals and clinics, social service organizations, cultural institutions, colleges, and churches.

This concept of a more agile, permeable system carries much opportunity for students who, because of poverty, disability, language barriers, exposures to trauma, or other life experiences, now face grim statistical probabilities. It also opens up new pathways for students from more advantaged backgrounds. Yet it also carries risk. In the name of customization, critical common experiences and skills could be missed. Teachers and schools would need very different capacities. If students increasingly have learning experiences outside of school and money follows them, who should be accountable for learning outcomes and responsible use of government funds? Our essays point to ideas, nongovernmental and governmental, that could minimize those risks:

4. Families must have the power to opt out of rigid systems that refuse to change. Those without the time and agency to package together customized solutions will need help from “navigators”—community-based groups that advocate and inform. Nonprofit, community-based organizations and school providers, working with or without government, would have to step in to ensure that unmet family and school needs are addressed.

5. Schools teaching younger students would have outcome requirements focused only on a limited set of core gateway skills. Older students should be able to select or build personalized learning pathways toward careers.
6. Teachers must be of two kinds—those who build deep relationships with students and curate personalization, and specialists who are experts at teaching specific bodies of knowledge. The former group should be in schools, while the latter should serve in (or as) independent providers.
7. Funding must increase, be more flexible, and follow students longer. This is especially true for students with more significant learning and developmental needs. New sources of total funding must be developed, including health and welfare funding and leveraging creative partnerships with industry.

In the abstract, these ideas may seem radical, but they are the logical extension of the most innovative schooling available today outside of public education and for more advantaged students. Giving every student access to advanced learning, internships and professional networks, and social development opportunities will require a radical reimagining of education and shifts in the flow of funding and power. That will not be without pain and controversy, but the alternative is bleak.

More than ever, America needs creative, talented teachers, school leaders, entrepreneurs, and thought leaders who can solve complex problems. Every school and classroom has students with the potential to become these leaders, but we are losing too many of them. We will pay a very high price tomorrow for failing to attend to social mobility, customized opportunity, and systems change today.

If the challenges before the education system seem daunting, the students themselves offer hope. Recent surveys of teenagers have found they are inclined toward lifelong learning and eager to have an impact on the world through their work. The question is whether the institutions charged with educating them can harness those inclinations in ways that allow them to thrive in our new economic and social realities. CRPE is committed to putting our best imagination and analyses forward to reimagine the systems and structures that can ensure that the next generations of American students are prepared to solve the complex problems of the future. This is the beginning.

As CRPE looks ahead to its next quarter century, these essays and the questions they explore represent a beginning to identifying new ways to help our nation's public education system prepare for an age of agility. It is our hope that these ideas will help inform conversations among educators, policymakers, funders, and community leaders—conversations that CRPE will continue to inform and drive in service to our nation's students.

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