

# The Digital Learning Imperative:

How Technology and Teaching Meet Today's Education Challenges

DIGITAL  
LEARNING  
SERIES



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ALLIANCE FOR  
EXCELLENT EDUCATION

In February 2010, the Alliance for Excellent Education (Alliance) released a brief entitled “The Online Learning Imperative: A Solution to Three Looming Crises in Education.” Since then, in part because of rapidly shifting educational conditions, the Alliance has increased its focus on digital learning and technology to help ensure that all students graduate from high school prepared for college and a career. In only a short time, the education technology policy landscape has changed greatly. The U.S. Department of Education published its 2010 National Education Technology Plan; the Digital Learning Council released “10 Elements of High-Quality Digital Learning” and “Roadmap for Reform”; the federal Enhancing Education Through Technology funding stream to states was eliminated; seven states enacted legislation promoting digital or online learning or online course requirements; and the number of administrators saying they offered a “blended” learning experience to students nearly doubled.<sup>1</sup> Meanwhile, the United States continues to struggle with budgetary, graduation, and postsecondary completion issues along with faltering academic performance compared to other countries. Because of the current education climate and emerging ideas of how digital learning and technology can help to address these challenges, the Alliance is providing this major updating of the previous brief to incorporate

- **new definitions and data that explore the nuances of the crises outlined in the original brief;**
- **specific benefits of digital learning with examples from schools and districts that are seeing significant improvements in student outcomes;**
- **a broader look at technology and digital learning beyond online courses and content; and**
- **important connections among instruction, learning, and technology, with a specific emphasis on instructional strategies.**

The following definition of digital learning guides the perspective and possibilities presented:

**Digital learning** is any instructional practice that is effectively using technology to strengthen the student learning experience. Digital learning encompasses a wide spectrum of tools and practice, including using online and formative assessment, increasing focus and quality of teaching resources and time, online content and courses, applications of technology in the classroom and school building, adaptive software for students with special needs, learning platforms, participating in professional communities of practice, providing access to high level and challenging content and instruction, and many other advancements technology provides to teaching and learning. In particular, **blended learning** is any time a student learns, at least in part, at a supervised brick-and-mortar location away from home and, at least in part, through online delivery with some element of student control over time, place, path, and/or pace.<sup>2</sup>

For those who care deeply about improving education opportunities for children in this country, it can be both painful and rewarding to look back at the changes and progress made over the last several decades. There is no question that standards have been raised, and efforts to improve high school graduation rates are showing slow progress. Greater emphasis is being placed on ensuring that *all* students, including low-income students and students of color, achieve their potential.



Yet major challenges remain. Far too many public schools have not been able to change quickly enough to meet the needs of students, parents, and employers. More than 1 million children still drop out of school every year, and millions more graduate from high school without the skills they need to succeed in college or the workplace. Even with record unemployment, the economy struggles as employers cite a lack of skilled applicants for vacant jobs. The needle still moves too slowly on increasing equity. All the while, the world continues to change quickly and the U.S. education system lacks the nimbleness to keep pace.

Without significant changes to the entire teaching and learning system, this nation will continue to realize only incremental progress without reaching the major goals of eliminating achievement gaps and ensuring that all students have the skills to succeed in life.

**Schools today face three critical challenges:**

<b>Tomorrow's Needs:</b>	Students are not being prepared to be competitive in a rapidly changing world, and the nation's schools are not changing fast enough to keep up.
<b>Today's Budgets:</b>	Schools have been riding a funding roller coaster for most of the last decade and cannot expect major new funding sources anytime soon.
<b>Teaching:</b>	Many students do not have access to the best teachers, the best teaching strategies, and enriching learning experiences.

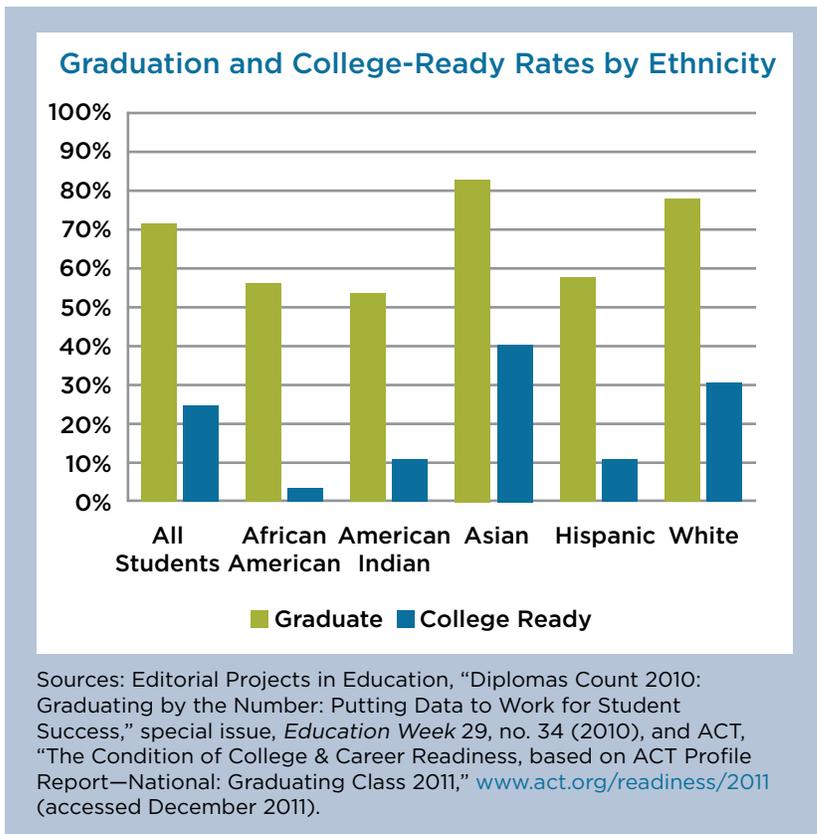
Independently, these challenges are significant, but in combination they create a national imperative for swift action to create a more innovative, effective, and efficient education system that meets the needs of all students.

## REMAINING COMPETITIVE FOR TOMORROW

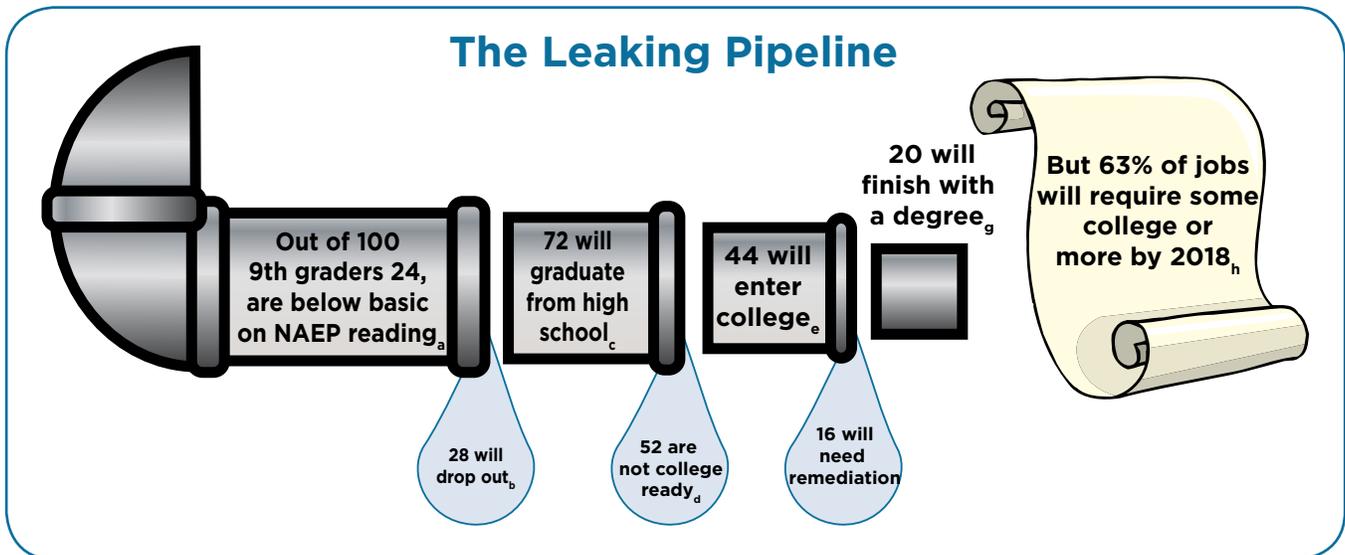
There is a moral and economic imperative to change the way teachers teach and students learn in the United States. All children should graduate from high school ready for college and a career, possessing the deeper learning skills they need in order to compete in today’s rapidly changing economy. These skills include not only mastery of core content but also the ability to think critically, solve complex problems, work collaboratively, communicate effectively, and be self-directed and incorporate feedback.<sup>3</sup> Too many low-income students are still not developing the tools they need to succeed in modern life. Nationwide, only 72 percent of students earn a high school diploma. In the class of 2011, more than 1 million students dropped out before graduation. Among minority students, only 58 percent of Hispanic, 57 percent of African American, and 54 percent of American Indian and Alaska Native students in the United States graduate with a regular diploma, compared to 77 percent of white students and 83 percent of Asian Americans.<sup>4</sup>

But even a diploma is not enough. ACT data shows that just 25 percent of students are meeting college-readiness benchmarks in English, reading, mathematics, and science.<sup>5</sup> Of those who do graduate from high school, 69 percent will enroll in postsecondary courses.<sup>6</sup> However, fully half of the students entering a community college will need remediation; 20 percent will need help when they enter a four-year institution. Not surprisingly, students who start their college career in remedial classes are far less likely to graduate.<sup>7</sup>

Yet according to the Georgetown University Center on Education and the Workforce, 30 million new and replacement jobs—and 63 percent of all jobs—will require some college or above. Inexorably the number of new and replacement jobs that can be obtained with a high school diploma or less is rapidly shrinking. Georgetown projections indicate that 36 percent of new jobs will require only this minimum level of schooling,<sup>8</sup> but 44 percent of the U.S. population is currently competing for those jobs.<sup>9</sup>



Meanwhile, as the U.S. economy struggles to recover from a deep recession, progress is stalled by the fact that employers who are trying to hire continue to report that applicants lack specific qualifications or required experience. The most troublesome positions are those in science, technology, engineering, and mathematics (STEM) as well as those requiring application of statistics and mathematics in a wide range of business activities. Skill gaps are also found in other fields, ranging from welders to nursing aids, nutritionists to nuclear technicians.<sup>10</sup> In addition, employment projections indicate that U.S. jobs will increasingly require deeper learning skills—including the ability to solve problems and communicate effectively<sup>11</sup>—that are not taught sufficiently in American schools.



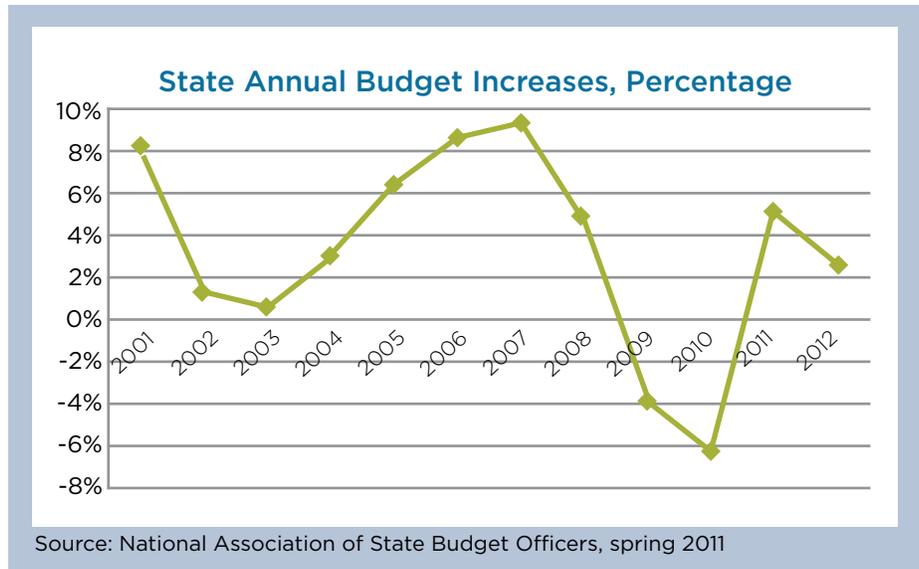
Sources for “The Leaking Pipeline”: a) 2011 eighth-grade reading results from the U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics (NCES), National Assessment of Educational Progress; b) data from Editorial Projects in Education (EPE); c) 71.7 percent graduation rate from EPE; the Averaged Freshman Graduation Rate, according to NCES, is 75.5 percent; d) 25 percent of high school graduates met all four of ACT’s college readiness benchmarks in English, reading, mathematics, and science; e) National Center for Higher Education Management Systems (NCHEMS) student pipeline data; f) 36 percent of undergraduate students report taking a remedial course, NCES, “2007-08 National Postsecondary Student Aid Study” (NPSAS:08) (Washington, DC: Author, 2009); g) NCHEMS student pipeline data; according to the U.S. Census Current Population survey, 42 percent of people between the ages of twenty-five and thirty-four have an associate’s, bachelor’s, or advanced degree; h) data from Georgetown University Center on Education and the Workforce.

## TODAY'S BUDGETS

Today, states face an ongoing funding roller coaster as the economic recovery remains fragile and federal funding has moved from stimulating to shrinking. Faced with an uncertain revenue base, any enterprise must make a choice: continue doing the same with less and hope to weather through, or innovate and institute changes that result not only in survival but also in growth.

### The Funding Roller Coaster

Education funding has been challenged with multiple sources of instability at local, state, and federal levels. First, local property tax collections, a major K–12 education revenue source, have been deeply affected by the housing crisis. Year-over-year comparisons show property taxes nose-diving in 2002, recovering during the housing bubble, plummeting again in 2009, and now slowly returning to prior levels.<sup>12</sup>

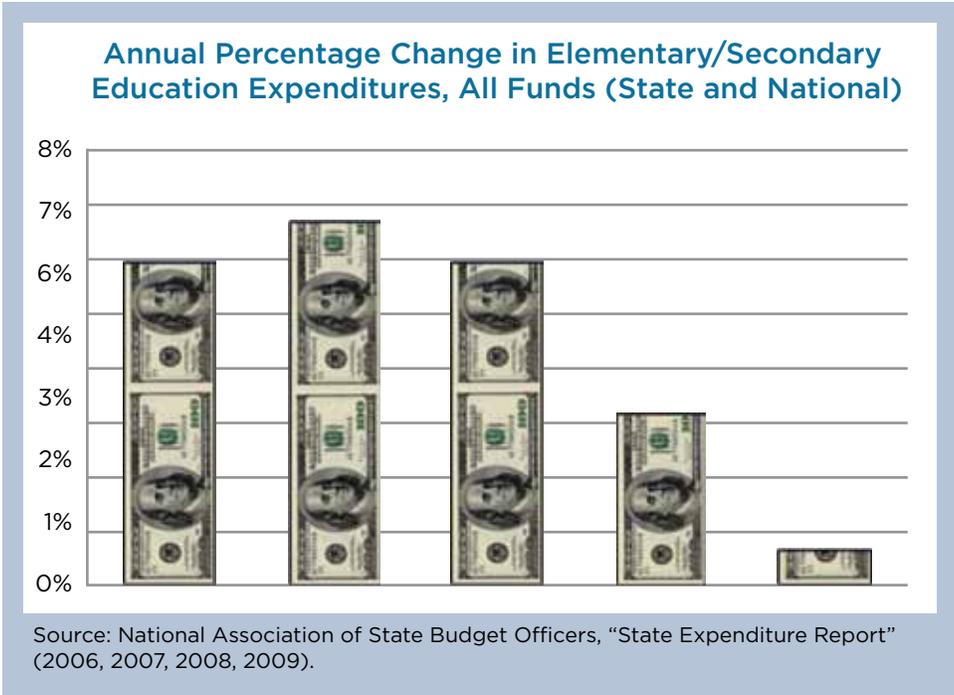


State revenues are also continuing to face severe shortfalls. In Fiscal Year (FY) 2012, forty-two states and the District of Columbia either have closed or are working to close \$103 billion in budget gaps. These gaps come on top of the large shortfalls states faced in FY 2009 through FY 2011, according



to the Center on Budget and Policy Priorities. Finally, while the 2009 American Recovery and Reinvestment Act—the stimulus package—provided a much-needed boost that sustained education through the worst of the recession, the federal budget situation remains contentious and divisive. Congress continues to have budget showdowns multiple times a year, and an increasing number of political voices demand serious budget cuts to all programs. Investing in Innovation grants, School Improvement Grants, and other federal boosts have stimulated impressive innovations and efforts to improve schools, but state and local leaders now

face the challenge of continuing to make improvements in the face of funding cutbacks. Quite simply, most school systems cannot count on federal funding increases to help with the continued state shortfalls and must deal with continuing instability in local tax revenues.



In fact, in FY 2011, when states had to make midyear general fund expenditure cuts, even the usually untouchable K–12 education funding went under the knife. Out of the twenty-three states that made midyear cuts, eighteen states reduced funding for K–12 education, according to the National Association of State Budget Officers.<sup>13</sup> Since 2008, thirty-four states and the District of Columbia have cut K–12 education spending.<sup>14</sup>

## ACCESS TO GREAT TEACHING

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Teachers are a school’s most critical resource. Research continues to show that effective teaching is the most important school-related factor in student achievement, yet access to effective teaching remains widely uneven and inequitably distributed. The teaching profession faces multiple challenges while serving at the front line of improving outcomes for students.

First, the nation’s teaching force is increasingly less experienced; today’s typical teacher has just one to two years of experience, compared to fifteen years in 1987.<sup>15</sup> Compounding the lessening content and pedagogical experience in the classroom, school districts also face shortages of teachers in critical areas like physics and chemistry, meaning that many students do not have access to those courses taught by an experienced, certified teacher. In 2007–08, nearly 60 percent of public school classes in high school physical science were taught by teacher who did not major in that subject area.<sup>16</sup> The challenge of finding certified teachers is particularly difficult in rural areas. The state of Georgia, for example, has 440 high schools but only 88 physics teachers.<sup>17</sup> Even Minnesota, which is considered a high-achieving state, has only 182 certified physics teachers for its 971 high schools.<sup>18</sup> And it is not surprising that schools with lower socioeconomic status have a harder time filling vacancies in key areas such as science.<sup>19</sup>

Faced with increased administrative, bureaucratic, academic, and social responsibilities with fewer years of experience, teachers find they are not always able to personalize instruction as much as they would like. Fewer than half (46 percent) of math teachers say they can differentiate instruction a great deal. Seventy percent of teachers who say their students are likely to go to college report that they can offer significantly differentiated instruction, compared to only 50 percent of teachers who are in schools with less of a college-going culture. Even more worrisome, 45 percent of students who say they have considered dropping out of school give their teachers a D or an F in differentiating instruction to meet students’ individual needs. Recent studies of high-performing urban schools and evaluations of successful high school reform models have identified “personalization” and “instructional improvement” as the twin pillars of high school reform. Creating a personalized high school experience requires high expectations for all students, reliable information about school performance and students’ needs and interests, the capacity to individualize instruction and support, and multiple pathways to a high school diploma.<sup>20</sup> Research continues to indicate that student engagement is critical to preventing dropouts.<sup>21</sup>

Simply slapping a netbook on top of a textbook, however, will not necessarily lead to significant outcomes.

### Growing Opportunities to Improve Learning for All Students

Multiple forces are converging to create a significant opportunity with the power to affect education greatly within the next two to three years. First, the technology available for instruction is improving continuously. Second, the cost of the technology continues to decrease. This paper would become dated instantly if it listed exact items and prices, but the price of computer memory is a useful reference. In 1980, a gigabyte of information cost around \$200,000. In 2011, a terabyte—more than a thousand gigabytes, and about 2,000 hours of high-quality audio data—cost around \$100.<sup>22</sup> Additionally, more and more students today are what could be called “digital natives,” already accustomed to the rapid feedback, collaborative nature, and ease of use of many digital technologies.<sup>23</sup>

Meanwhile, forty-six states and the District of Columbia have adopted the common core state standards, affecting 90 percent of the nation’s students. The commitment to ensuring that students graduate from high school college and career ready will require unprecedented work to implement new content, instructional strategies, teacher preparation, and assessments. The benefit is that curriculum developers, who have had to address fifty different sets of standards in the past, can work from one clear set of standards. Sustained professional learning for teachers will also be able to utilize this uniform set of expectations. Just as significantly, almost all states are now working through two assessment consortia to develop online assessments for the common core state standards to be put in place by 2014. The technology exists to make this implementation possible and to lead a significant transformation of the nation’s education system.

### The Gap

Simply slapping a netbook on top of a textbook, however, will not necessarily lead to significant outcomes. Critical for learning success with digital learning is developing a comprehensive strategy that has a foundation of involvement and sustained career training for teachers—not occasional professional development—which concentrates not just on the technology, but also on the pedagogical skills needed to use the technology in teaching and learning. As Greg Whitby, an executive director of schools in Australia who is implementing a widespread digital learning program across a 40,000-student district in Sydney, stressed, “It’s first about the pedagogy, then comes the technology.”<sup>24</sup>

As this paper will demonstrate, effective digital media combined with powerful teaching, rich content, and engaged students has the potential to take learning in the United States to a much higher level and provide all students with experiences that allow them to graduate prepared for college and a career.

But education is still slow to adopt these technologies. While the National Center for Education Statistics reports that 97 percent of all teachers had access to a computer in their classroom in 2009, only 72 percent of all teachers, and 64 percent of secondary school teachers, said they used computers for instruction.<sup>25</sup> The use of technology—defined as information technology such as computers, devices that can be attached to computers (e.g., LCD projector, interactive whiteboard, digital camera), networks (e.g., internet, local networks), and computer software—for higher-order skill development was much lower. Specifically,

- **only 45 percent reported that students used technology to solve problems;**
- **42 percent reported that students used technology to develop multimedia presentations;**
- **25 percent reported that students used technology to conduct experiments or create art, music, movies, or webcasts;**
- **17 percent reported use for developing demonstrations or simulations; and**
- **13 percent reported use for designing and producing products.**<sup>26</sup>

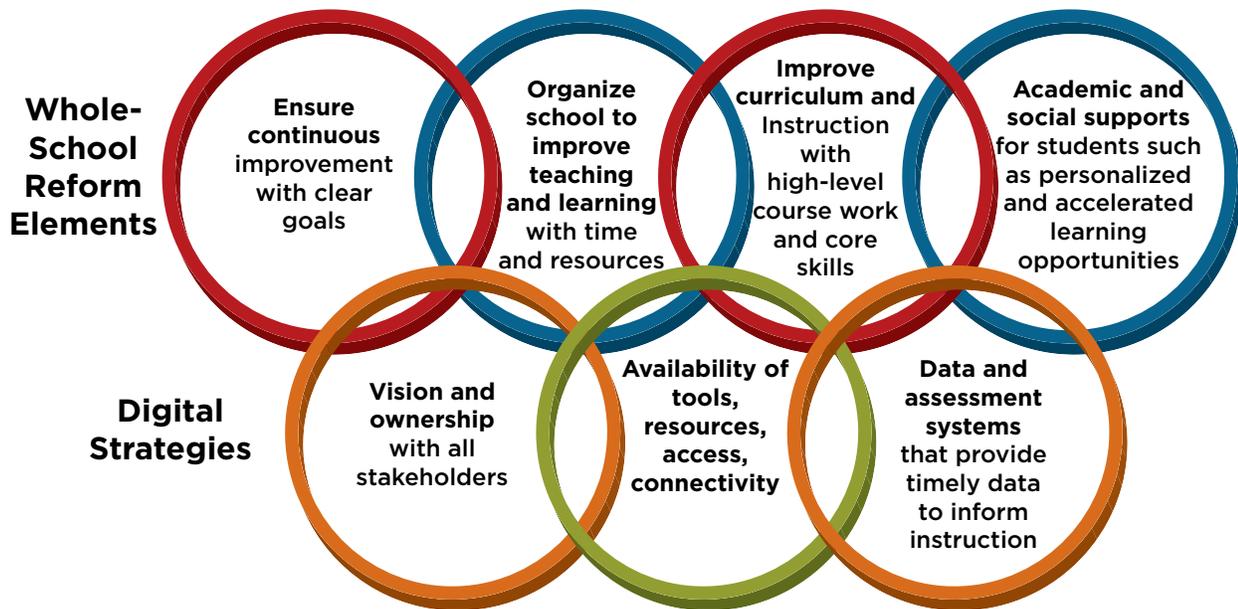
In the information age, education and technology affect every aspect of life, and all students—especially those at risk of dropping out, but also those simply less likely to have access to good teaching and learning—should experience the benefits of digital learning so they can be truly prepared for college and the twenty-first-century workplace.

### Benefits of Technology and Digital Learning

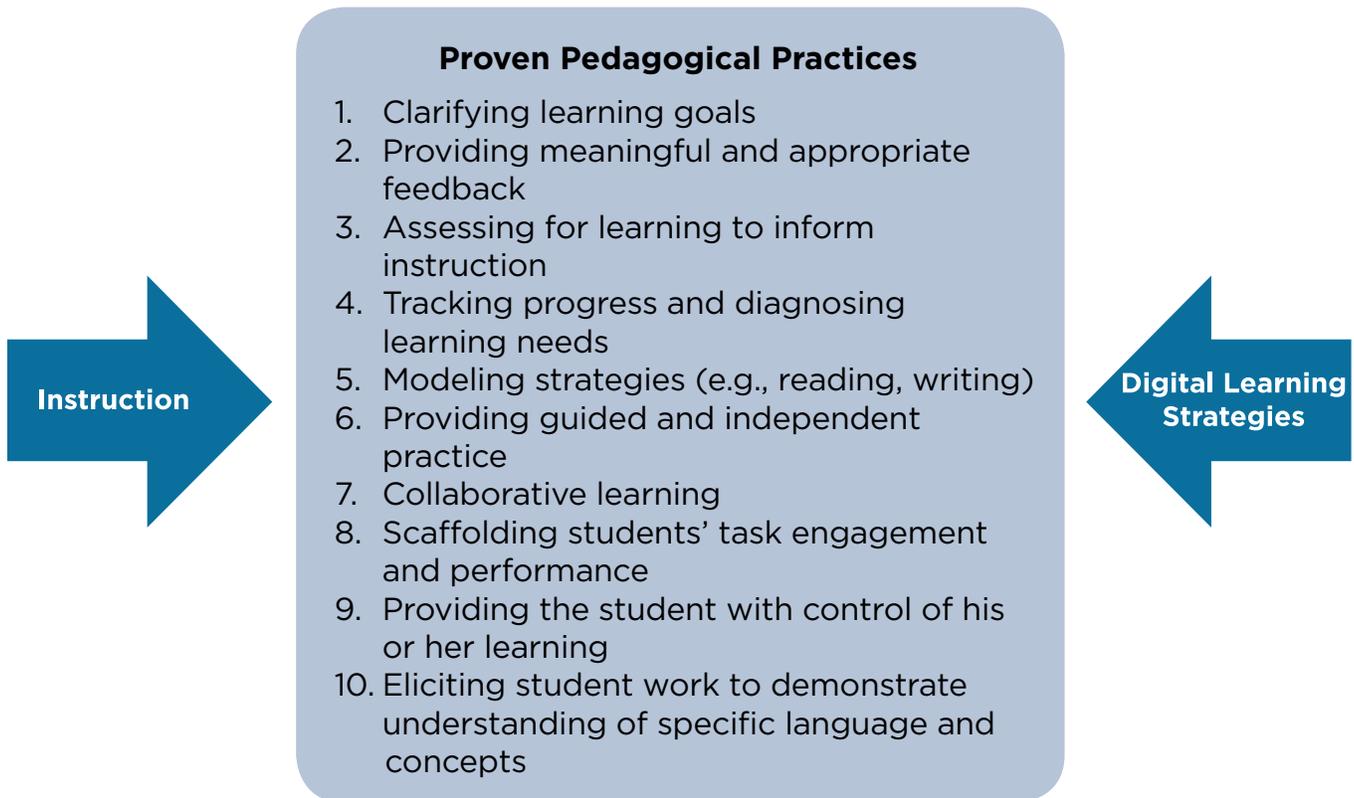
History has demonstrated, of course, that quality teaching and learning can happen without technology. If individual students had full access to a Plato or a Socrates, then pen and paper would most likely be adequate. But modern education is no longer the preserve of a relatively few number of fortunate students joined with great teachers. While there are current-day examples of great teaching and learning occurring without the use of technology, for most students the more relevant issue is why effective technology would not be applied to enhance their educational process. Just having access to the technology, however, is not sufficient; a thoughtful and well-planned-out implementation is critical for digital learning to lead to improved student outcomes.

Simply stated, the use of technology and digital learning, when implemented effectively, provides opportunities to employ the elements deemed necessary for whole-school reform and effective instruction. In 2009, the Alliance policy brief “Whole-School Reform: Transforming the Nation’s Low-Performing High Schools” outlines strategies for improving student achievement, summarized in the chart below. While the activities through which these strategies are implemented must fit the unique needs of each school, the core is a coherent combination of organizational, systemic, and instructional efforts requiring the cooperation of school leaders, teachers, parents, and community members and flowing from a cohesive design. Like any other type of educational initiative, the effective application of technology and digital learning in a blended environment requires each classroom, school, district, and state to have a clear strategy for how these new concepts and capacity will be implemented. As the chart below indicates, these strategies must utilize and build upon time-tested elements of whole-school reform, and strategies specific to digital learning must look systemically at resources, ensure a common vision, and be driven by data.

### Powerful Digital Learning Links with Successful Whole-School Reform



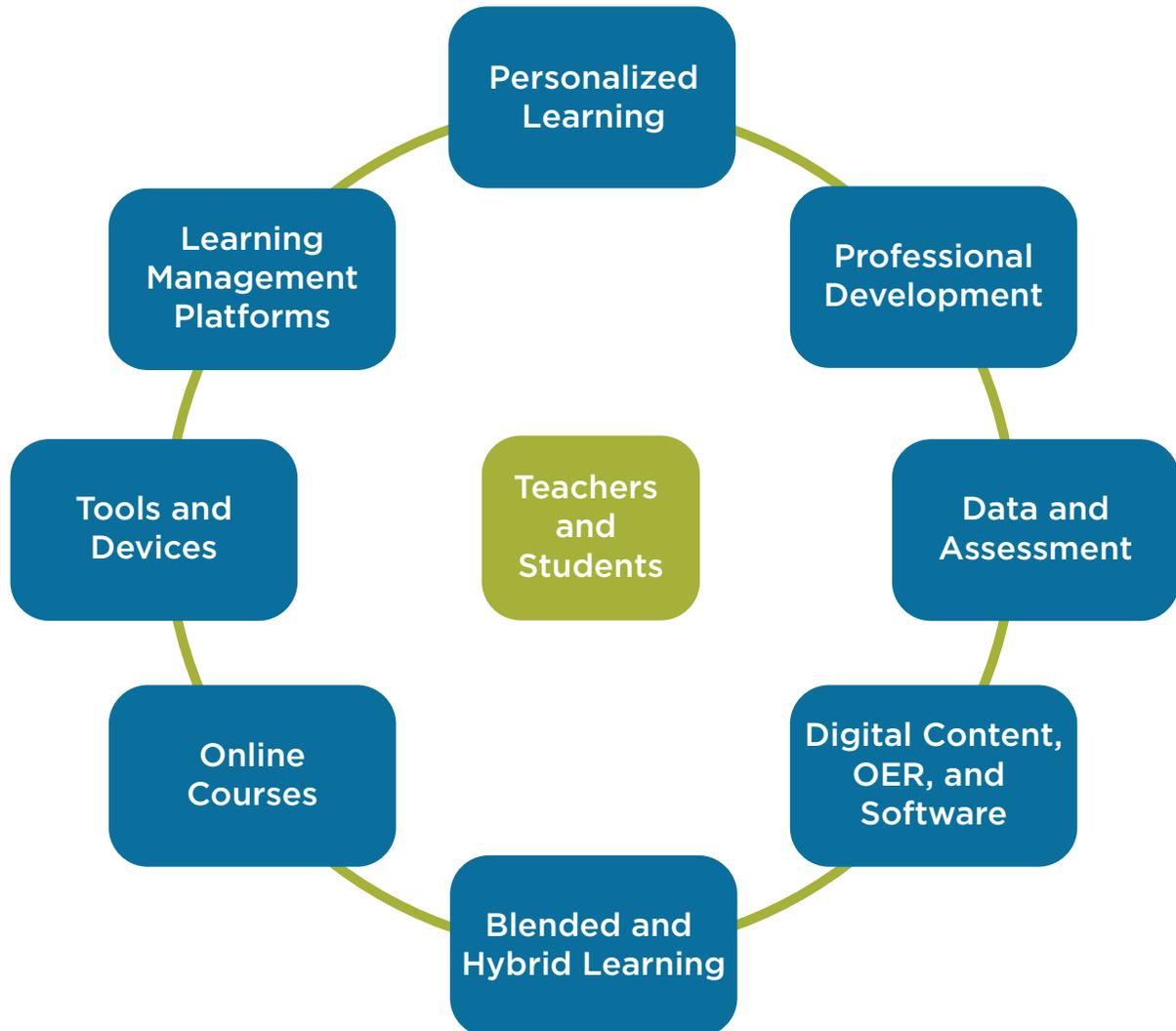
As important as it is to consider the elements of whole-school reform, a look at the benefits of the effective application of technology demands a thoughtful review of instructional practices and the ways in which technology can provide more opportunities for teachers to design learning experiences that incorporate practices demonstrated to be important. In a digital learning environment, the teacher assumes increased professional responsibilities. Some researchers refer to teachers moving from “sages on stages” to “guides on the side” or “facilitators,” but a fuller description is that the teacher now becomes a true “educational designer.”<sup>27</sup> Applying technological tools of real-time data and assessments, adaptive software, online and digital content from many sources, and constant communication with students, parents, and others involved in a student’s education process, the teacher is able to design the pathway that works best for each student to realize his or her maximum learning potential.



Although this discussion only highlights some of these instructional practices, digital learning and technology can provide opportunities for teachers to apply evidence-based practices that support effective teaching and learning. The work of many researchers, including Charles Fisher,<sup>28</sup> David Berliner,<sup>29</sup> Robert Marzano,<sup>30</sup> and John Hattie,<sup>31</sup> demonstrates that well-designed and well-implemented instructional practices produce gains in learning by increasing the amount of “relevant instructional time.” Students need extended opportunities to engage in meaningful and appropriate learning experiences that incorporate proven practices.

As schools and districts explore the many opportunities that digital learning affords teachers and students, especially with today’s global economy and demands for innovation, they see the potential for meeting the needs of increasingly diverse students more effectively. Although the use of technology in the education system is constantly evolving, districts and schools in many states have already implemented programs that are changing the teaching and learning process and outcomes for students. Technology and digital learning both provide the opportunity for improved teaching for tomorrow with today’s budget challenges.

## Facets of Digital Learning



Digital learning and technology encompass many different facets, tools, and applications to support and empower teachers and students in education. As the chart below illustrates, digital learning and technology include data systems and assessment to better understand a student’s achievement and determine the best instruction to meet his or her needs. Equally important is a range of approaches or venues for learning, including online courses, blended or hybrid learning, or digital content or resources. Additionally, digital learning and technology can be used for professional learning opportunities for teachers and to provide personalized learning experiences for students.

In its 2009 report *Leveraging Title I & Title IID Partnerships: Maximizing the Impact of Technology in Education*, the State Educational Technology Directors Association provided a useful overview of many of these facets.<sup>32</sup> While online courses may be the most obvious application of technology, digital learning encompasses a much broader application of various technologies to improve student outcomes and assist teachers. Schools and districts are showing more and more growth in using the range of tools referenced below for blended learning experiences for students.

## INCREASED EQUITY AND ACCESS TO THE BEST TEACHING

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Teaching matters. For years, policymakers have been pondering how to address the dilemma faced by many schools in high-poverty, urban, rural, and other underserved areas: students are less likely to have access to an effective teacher. Many factors play a role in this predicament, including the length of teachers' experience, teacher turnover rates, course offerings, and student support at home. Students in these regions are also less likely to have access to advanced course work, particularly in math and science, and are more likely to have less experienced teachers. As noted above, the average length of teaching experience has dropped from around fifteen years to just one to two years.<sup>33</sup>

Because technology and digital learning often transcend geographic location or personal situation (such as income status, special learning needs, or language barriers), students and teachers can participate in learning experiences and have resources available that were barely possible ten or fifteen years ago. Technology offers and already has proven in many schools and districts to provide greater opportunities for equity and access by helping reduce the dropout rate, address the achievement gap, and ensure that students are prepared for college and a career. Research on why students drop out of school frequently points to a lack of interest and relevance,<sup>34</sup> and technology accelerates opportunities to engage students through a wider variety of courses, instructional strategies and delivery, and curriculum and content pertinent to their lives. For students in diverse settings, especially those attending schools in underserved areas, the dropout rate and achievement cap can be addressed by technology and digital learning, through increased access to

- **a wider variety of course offerings**, including Advanced Placement (AP) and International Baccalaureate programs, higher-level math and science, foreign languages, and remediation classes taught in different ways;
- **a more personalized learning experience** that builds on learning styles, interests, and abilities and allows students to work at their own pace;
- **credit recovery options** to assist the struggling student or one who needs an additional course to graduate;
- **experts** from around the world to increase knowledge and understanding of careers, access to simulations, and virtual field trips; and
- **digital content, adaptive software, and learning platforms** to provide multiple options for content and curriculum, including simulations and interactive opportunities to increase the understanding and knowledge of standards and real-world applications of what is learned in school.

Whether through the availability of timely data or the ability to connect students with the content and activities that meet their individual learning styles and needs, technology and digital learning provide opportunities for teachers to personalize learning for more students at any given time and to ensure that all students are reaching their full learning potential. Students often have more flexibility with timing and pacing, can take courses that are not offered at their school or do not fit into their schedule, and experience different instructional approaches in their learning. In many cases, these represent blended learning models in which part of the instruction occurs in an actual school building and part occurs online, as described earlier. Technology provides opportunities for students to have access to courses, content, and/or experts that often extend their learning. For example, in rural, urban, or historically underserved schools, students may not typically have the opportunity to take AP classes or high-level STEM courses. The Learning Power program in South Dakota offers online AP courses to rural students, but offers support and training for the onsite teachers to allow them to develop as well.<sup>35</sup>

To a struggling student, a course like Algebra I, which is required for high school graduation, may seem like a barrier to a degree. Although a traditional course may approach the material in one way at one pace, digital content provided through adaptive software that addresses different learning styles or specific standards or an online course may provide the support and personalized approach that a student needs to succeed. This can be particularly true when a course is needed for credit recovery. Additionally, a student may not need to repeat an entire course, if he simply requires support understanding one or two key concepts or modules. In countless learning situations, technology and digital learning often provide more tailored options for the individual needs of students and their teachers.

### **Technology + Teaching = Student Success in Missouri**

The eMINTS (enhancing Missouri’s Instructional Networked Teaching Strategies) program is an example of how technology can be used to improve student performance, with significant focus on professional development support provided to teachers as well as the technology itself. External evaluations verify how significant changes in student performance can result from intensive professional development and the use of high levels of technology in the classroom. The combination of high-quality instruction and technology creates conditions that allow students to outperform peers who are not in classrooms equipped with the technology and whose teachers have not participated in the eMINTS professional development program. Students enrolled in eMINTS classrooms significantly outperformed third- and fourth-grade students not enrolled in eMINTS classrooms on the Missouri Assessment Program (MAP). Studies beginning in 2006 demonstrate a direct link between eMINTS professional development and technology use and improved student performance in grades five and six. In addition, students with disabilities and students designated as English language learners in eMINTS schools performed better than their non-eMINTS peers by approximately 1 standard deviation in each of the four subjects.<sup>36</sup> The eMINTS model has been replicated in multiple states and Australia, and has received an Investing in Innovation grant from the U.S. Department of Education.

The achievement gap is often tied to the different levels of preparation and support that students have outside of school, the challenges of English language learners, and the fact that one-size-fits-all instructional strategies do not meet the needs of many students. The enhancing Missouri's Instructional Networked Teaching Strategies (eMINTS) program includes extensive professional development for teachers to integrate technology into teaching and learning. The strategies used by eMINTS include a specific emphasis on more personalized learning, including project-based learning.

Students at the Independence High School in the Charlotte-Mecklenburg Schools in North Carolina now have the opportunity to participate in online courses in a blended learning setting to better meet their needs.

### **Blended Learning Opportunities Keep Students on Track**

Charlotte-Mecklenburg Schools in North Carolina includes 178 schools and more than 133,000 students. Independence High School (IHS), an urban school with over 2,000 students, implemented online learning and blended learning opportunities to increase college and career readiness, access to courses, and on-time graduation. The blended learning experiences included students taking online classes with a highly qualified, certified teacher in the classroom to allow students to earn college credit, increase access to classes for enrichment and remediation, and increase on-time graduation. IHS also implemented summer school blended learning for remediation and credit recovery, especially in courses such as Algebra I and English I, for which failure to complete indicates high-risk factors for dropping out of high school. During the summer, sixty-three students took English I and fourteen took Algebra I with highly qualified subject-area teachers through the North Carolina Virtual Public School (NCVPS). In an impressive display, 100 percent of students passed the courses. All of the Algebra I students met the gateway standards, including portfolio, and 96 percent of students met the English I gateway standards, allowing them to begin School Year (SY) 2010-11 on track for graduation with their class. During SY 2010-11, IHS enrolled more than 200 students in online courses through the NCVPS. Through blended learning, IHS emphasizes the important role of teachers to help recognize the individual needs of students and to support students as they take online courses. IHS is also growing its dual-enrollment program through online opportunities to allow students to take courses for college credit while still in high school. The demand for high school and college courses continues to increase at IHS and Charlotte-Mecklenburg Schools overall, with district enrollments quadrupling from SY 2009-10 to 2010-11.

## TODAY'S BUDGETS: ABILITY TO CREATIVELY AND EFFECTIVELY UTILIZE HUMAN AND FISCAL RESOURCES

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Times are tough. As described previously, states, districts, and schools are facing budget uncertainty while simultaneously having to respond to increasing demands for greater educational outcomes. Districts and schools wrestling with meeting the needs of students in these tough budget times must rethink how they use their fiscal and human resources. While technology implementation can require an outlay of up-front and ongoing costs, digital learning and technology can also provide more efficient use of human and fiscal resources, increase the productivity of teachers and administrators, and, most importantly, create conditions that raise student academic outcomes. While strategies vary for how technology and digital learning affect academic results, educator productivity, and budgets, general categories include

- **using data and assessment** more effectively to identify student and school needs and potential interventions to help students achieve, especially those at risk for dropping out of school;
- **participating in online and blended programs of sustained professional training for educators**, including courses, professional learning communities, and digital resources and content;
- **utilizing digital content** to personalize learning for students, to develop learning communities among students, to embed assessments within lessons, and to help students create and publish knowledge and content;
- **communicating more effectively with parents and students** by using online communication tools to post homework, tests, and projects; by addressing issues immediately and directly with parents; and by sharing opportunities for students to expand learning beyond the school day; and
- **collaborating with other districts and schools** to build on economies of scale for course offerings, professional development, infrastructure, and expanded learning opportunities.

### Blended Learning Provides Rural Students with More Summer School Options

At Rawlins High School, in the rural town of Rawlins, Wyoming, students had access to many summer school options through a blended learning program in which they spent some time in the school and some participating in the courses online. Because of the reduced costs to the district when a course for twenty-five or thirty students was not needed in the school itself, Rawlins was able to provide access to many more courses for the same total price.

Similarly, the ability to use many forms of digital content, through both subscriptions and Open Education Resources (available free on the internet), will provide more enriched learning experiences to meet the needs of individual students. As is currently the case with printed materials, digital content may also have costs associated with it. However, schools and districts have the opportunity to select content and curricula that is directly focused on the needs of the school, the district, and the students. For example, schools may opt to purchase content that applies a Universal Design of Learning approach to support students with special needs. However, this approach, which provides curriculum in a flexible and customizable way, will typically increase options and meet the individual needs of all students.

### **Digital Conversion Increases Graduation Rates Without Increasing Spending**

The Mooresville Graded School District in North Carolina implemented a digital conversion initiative beginning in 2007. While involving a significant shift from print to digital content material and the deployment of an internet-accessible device for every student and teacher, the district's focus centered on changes in teaching and learning. Teachers and administrators participate in extensive, ongoing, and job-embedded professional development using a distributed leadership model. They learn how to maximize the potential of the technology to personalize learning. This includes utilizing digital content and resources in which students can become creators of knowledge and products, as well as implementing digital assessments that provide timely feedback to ensure the availability of data for planning and decisionmaking. During the district's one-to-one (1:1)<sup>37</sup> conference in the summer of 2011, teachers described challenges associated with the changes in instruction and the need to reinvent their lessons both to make them more student-centric and to take advantage of technology. Many described new roles as facilitators of learning and reported that they would not return to how they taught before the conversion. Not only is the shift in instructional strategies and learning evident in the schools and classrooms in Mooresville, but the district has made tremendous strides in student achievement. Mooresville is now third out of 115 school districts in North Carolina in student achievement based on state test scores, representing a dramatic jump from the bottom quarter of all districts just several years ago. The graduation rate has increased 25 percent in five years and is now the third-highest cohort rate in North Carolina. Mooresville has accomplished this with one of the lowest per-pupil expenditures in the state, ranking ninety-ninth out of the 115 districts.

Digital learning can positively affect school budgets and teaching practices by shifting the makeup of classes and the approach to learning. As many are finding, a "flipped" classroom model in which students watch or listen to the lecture on video or podcast at home provides teachers with the ability to take on a different role in the classroom with students. Since students can be working on problems or projects or engaging in discussions in the classroom, the teacher becomes more of a facilitator of learning who can guide individuals. This, as well as the opportunity for students to engage in other digital learning opportunities in the classroom in a blended environment, may provide an opportunity to rethink the use of teachers and their time. Rather than taking the place of the teacher, these digital learning models take much greater advantage of the abilities of teachers as professionals.

## COMPETITIVENESS FOR TOMORROW: IMPROVING ACHIEVEMENT AND LEARNING OUTCOMES FOR EACH STUDENT

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Technology and digital learning provide the critical educational support that U.S. students need in order to respond to the increased pressure for greater academic performance and global competitiveness. As noted above, the Organisation for Economic Co-operation and Development's PISA, or Programme for International Student Assessment, results and high school and postsecondary dropout rates show that the United States is struggling to keep up with other countries around the world, especially in math and science. Digital learning provides many approaches to teaching and learning to meet the needs of all students. Specifically, digital learning and technology opportunities provide access to the most recent information, tools, and resources for students to

- **participate in higher-level courses**, such as AP science, math, and foreign languages, or begin earning college credits while in high school;
- **have access to digital content** that is dynamic and allows for more in-depth research and understanding, such as simulations in science;
- **interact with subject-matter experts** to learn more about a career in a STEM subject and other areas of innovation to foster interest in college majors and a career;
- **develop firsthand experience with technology** that can be applied to future experiences and innovation;
- **create their own products and build knowledge** through collaboration and online tools and resources or by producing apps, software, and other innovative solutions to real-world issues; and
- **personalize individualized learning experience** by taking courses, publishing writing, researching areas of interests, and collaborating with students and teachers across the world.

Findings from a randomized control trial conducted in Maine and Vermont show that offering an online Algebra I course to students in eighth grade who were ready for the class but whose schools did not offer it positively affected those students' algebra achievement at the end of the year and increased their likelihood of participating in an advanced course-taking sequence in high school.<sup>38</sup> Also, programs, such as ThinkQuest<sup>39</sup> and Quest to Learn<sup>40</sup> have an explicit focus on developing the problem-solving and collaborative skills that researchers indicate will be critical in the twenty-first century.<sup>41</sup>

Transitioning the teacher from a passive, teacher-centric role of largely disseminating content knowledge to being actively involved in the student's discovery and application of information creates a powerful learning experience that positions students to see themselves as innovators and creators. For example, Winterboro High School in Winterboro, Alabama, employs project-based learning and access to technology to ensure that students graduate prepared for college and the workplace.

### **Laptop Program Shifts Instructional Strategies and Expands Opportunities in Rural, Low-Income Area**

Floydada ISD is a rural district in western Texas in which more than 86 percent of students are in low socioeconomic circumstances. The nearest community college is over seventy miles away. In 2004, Floydada began to implement the Technology Immersion Pilot, a 1:1 initiative in which the middle school students and teachers received laptops to facilitate learning. In the following years, Floydada expanded the effort to include high school and elementary school students. Job-embedded, ongoing, and sustainable professional learning is at the core of the transformation of teaching and learning. Teachers and administrators report that this is not just about the technology; it is about a true change in instructional strategies, access to digital content and courses, and use of data and assessment to better understand the needs of students. Instruction often includes project-based learning and collaboration, as well as students as producers of knowledge and products. Middle school discipline referrals have been cut in half since the program's implementation, and Floydada's high school and middle school students have achieved double-digit gains in all core subject areas.

While increases in student achievement are important indicators of success, students in Floydada have other experiences that open their minds to new possibilities. Students have the opportunity to communicate digitally with national experts, such as NASA engineers; interact with people and experience places beyond Floydada; and take online college courses for credit while still in high school. Superintendent Gilbert Trevino observed that while previously "students couldn't see beyond the school district of Floydada," now they have an understanding of careers and opportunities outside the area. Floydada has also been able to apply funds to support students in taking online college courses. In SY 2010-11, seniors accumulated 450 college credits—a savings of \$65,000 for the students and their parents—and two seniors will start college as sophomores. Half of the seniors are taking college courses and earning college credit while still in high school. In many cases, taking college courses in high school allows students to see themselves as successful college students—a significant achievement, since more than half of the adults in Floydada do not have a high school degree. Technology has completely changed the teaching and learning experiences for students in Floydada to ensure that they graduate prepared for college and a career.

### **Project-Based Learning, Mentoring, Partnerships, and Technology Result in School Culture Improvements**

Winterboro High School in Winterboro, Alabama, with a free and reduced-price lunch rate of 85 percent, has utilized technology and digital learning to address high dropout rates and discipline issues, poor student achievement, low teacher attendance, and weak morale. Winterboro systemically transformed the culture, infrastructure, and teaching and learning environment by creating a student leadership team and developing the Winterboro Trust Statement and Job Description. Teachers dedicated themselves to intensive project-based learning and technology-based professional development, and the school developed an infrastructure that allows collaborative teaching assignments and a 1:1 student-to-computer ratio. Mentoring programs and community partnerships provide students with assistance on projects and engage the community in the transformation. The model includes blended learning environments. After just two years, Winterboro experienced a 64 percent decrease in dropouts, a 78 percent decrease in alternative school referrals, and a 34 percent decrease in disciplinary infractions. Winterboro has also seen a 40 percent decrease in teacher absences. Simultaneously, math test scores have improved dramatically; the number of eleventh graders scoring at the proficient level rose from 79 to 88 percent and the number of eighth graders rose from 69 to 78 percent. Winterboro educators also observed changes in deeper learning skills, like collaboration, communication, and higher-level thinking. Winterboro is sharing its school redesign plan and experiences, including the successful application of technology, with other schools and districts across the country.

## DIGITAL LEARNING: WHERE NEW CAPACITY CONVERGES WITH GREATER CHALLENGE

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The nation is at a critical juncture. Piecemeal, incremental action is taking place in some states to move toward more digital textbooks, for example, or toward 1:1 laptop/device programs. But without well-thought-out policies that consider quality, the importance of teaching, and the experience of the student, these fragmented efforts will produce no better results than reform efforts of the past decades. States, school districts, and programs focused on improving student learning need to engage in a collaborative, crosscutting process that looks at the needs of the students, the expanded role of teachers, and the most effective ways to get results.

The nation's students cannot wait. All schools—public, private, charter, or virtual—have a responsibility to provide students with enriching and engaging learning experiences, and to prepare them for the rapidly changing job market that awaits them. All schools must find ways to reach all students, especially those most at risk, by providing personalized learning experiences. The technology exists, and many students are already digital natives. At this critical moment, policymakers and education leaders have an obligation to take learning to the next level by maximizing the opportunities that digital learning and technology offer for all students.

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