

Recommendations for Education and the Advancement of Learning (REAL) Agenda Commission

**Taking Steps to Invest in the Promise of
Their Future and Ours**

April 2012



TechAmerica
FOUNDATION



Dear Readers,

As the REAL Agenda Commission comes to a close, the TechAmerica Foundation would like to thank former Chief Technology Officer Aneesh Chopra for being instrumental in the early stages of the Commission. The future of K–12 learning will depend largely on the successful use of technology in the classroom. CTO Chopra had the foresight to ask that TechAmerica Foundation bring together experts in education technology, educators, and business representatives alike, to recommend how best to improve learning through the use of technology in K–12 schools.

Improved education technology is more important than ever simply because of the number of students and professionals who use it. Technology has transformed other sectors including finance, communications, and transportation, but the education industry is still behind on leveraging technology to transform itself. The REAL Agenda Commission believes that improved technology integration in the educational space has a critical ability to improve the educational outcomes and experience of our nation's children.

Stepping up to the call to serve, Dave Belanger, Dr. Arden Bement, and Dr. Tracey Wilen-Daugenti co-chaired the Commission. The Foundation also thanks the chairs/co-chairs of our four working groups: Mitch Benson, Jeff Bohling, Pete Cevenini, Breck DeWitt, Diana Richie, Patti Sullivan, and Jane Swift. Their long hours, leadership, and commitment to vetting ideas kept us on schedule and each provided valuable insight to the direction of their working group's portion of the report.

We also recognize the contributions and efforts of all of the Members of the Commission who spent countless hours researching, meeting, discussing, drafting, and reviewing their working group's recommendations as well as the final draft of the report. We thank them for their participation and the valuable knowledge and innumerable years of experience they shared to inform the recommendations of this report.

We appreciate the contributions from Karen Cator, Director of the Office of Educational Technology at the Department of Education, and to Julie Evans, CEO of Project Tomorrow. Both provided expert direction, education technology knowledge, and key guidance throughout the working months.

Special thanks to Adam Frankel and Digital Promise for working in tandem with the REAL Commission to provide us with a framework for how best the report can be used to guide their efforts; and Tom Kalil, Deputy Director for Policy for the White House Office of Science and Technology Policy, for his insight and support.

We hope this report will have a dramatic impact on K–12 education technology, serving as a valuable resource to students, parents, educators, administrators, employers, public officials, and the community at large. The Commissioners realize that their recommendations are just a tip of the iceberg of what needs to be addressed in the education technology continuum for K–12 schools. We encourage all those interested to check back with the TechAmerica Foundation as we plan to address many more education technology issues in the coming year.

Sincerely,



Jennifer Kerber

President
TechAmerica Foundation

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Education is the key to America's economic growth and prosperity and to our ability to compete in the global economy. It is the path to good jobs and higher earning power for Americans. It is necessary for our democracy to work.

National Education Technology Plan
U.S. Department of Education, 2010

Members of the REAL Agenda Commission

Co-Chairs

Dave Belanger

Chief Scientist
AT&T

Dr. Arden Bement

Director, Global Policy
Research Institute
Purdue University

Dr. Tracey Wilen-Daugenti

Vice President and General Manager
Apollo Research Institute

Commissioners

Mitch Benson

Senior Vice President
Pearson

Jeff Bergeron

Chief Technology Officer, U.S. Public Sector
Hewlett-Packard

Jeffrey Bohling

Vice President and General Manager
General Dynamics

Pete Cevenini

Education and Workforce Lead
Cisco Systems Inc.

Mary Cullinane

Senior Vice President, Corporate
Social Responsibility
Houghton Mifflin Harcourt

Weili Dai

Co-Founder
Marvell Technology Group

Breck DeWitt

Director, K-12 and Higher Education
EMC Corporation

Julie Evans

CEO
Project Tomorrow

Dr. Elizabeth Grossman

Technology Policy Strategist
Microsoft Corp.

Paige Johnson

Education, State and Local
Government Strategist
Intel

Peggy Johnson

Executive Vice President and President,
Global Market Development
Qualcomm, Inc.

Michael D. King

Vice President, Global Education Industry
IBM Corporation

Maribeth Luftglass

CIO, Assistant Superintendent for
Information Technology
Fairfax County Public Schools

Frank Menchaca

Executive Vice President, Gale Learning
and Research Solutions
Gale-Cengage Learning

Michael Patterson

President and CEO
Avant Assessment

Dr. Linda M. Pittenger

Associate Dean, Graduate Programs &
Distinguished Professor
Stevens Institute of Technology

Darryl Ramsey

Business Development Manager,
Technical Strategist
Juniper Networks

Diana Richie

Executive Director, K-12 Education
Industry Solutions
Oracle

Dr. Kari Stubbs

Vice President, 21st Century Learning
BrainPOP

Matthew Swayhoover

Director of Learning and Development
SRA International

Jane Swift

CEO
Middlebury Interactive Languages

Daniel Wakeman

Vice President and Chief
Information Officer
ETS

Cheryl Williams

Executive Director
Learning First Alliance

Jessie Woolley-Wilson

President and CEO
Dreambox Learning, Inc.

Key Personnel

Julie Evans, CEO, Project Tomorrow

Managing Director for the REAL
Agenda Commission

Kristy Khachigian, TechAmerica Foundation

Staff Director for the REAL
Agenda Commission

Members of the REAL Agenda Commission *continued*

Deputies

Sara Akbar

Director
Oracle

Alan Balutis

US Lead
Cisco Systems Inc.

Tim Cannon

Executive Vice President, Alliances
Houghton Mifflin Harcourt

Amy Falcone

STEM Program Manager
Project Tomorrow

Tom Houston

Chief Technologist, U.S. Public Sector Innovation
Hewlett-Packard

Bill Kamela

Senior Policy Counsel
Microsoft Corp.

Jack Kang

Director, Application Processor Business Unit
Marvell Technology Group

Sandy Kretzer

Coordinator, Technology Architecture and Assessment
Fairfax County Public Schools

Caroline Molina-Ray PhD

Executive Director of Research and Publications
Apollo Research Institute

Jamie Northrup

Senior Director of Strategic Initiatives
Middlebury Interactive Languages

Anne O'Brien

Deputy Director
Learning First Alliance

Kimberly O'Malley

Senior Vice President, Research
Pearson

Lakshmi Pakala

Business Development Manager, Public Sector
Juniper Networks

Peter Scott

Publisher, Classroom and Library Solutions
Gale-Cengage Learning

Nancy Segal

Director, Government Relations
ETS

Patti Smith

Vice President of Marketing and Product Management
Dreambox Learning, Inc.

Jim Snyder

Director of Market Research
Avant Assessment

Patricia Sullivan

Solution Executive, Global Education Industry
IBM Corporation

John Tanner

Executive Director, Educational Assessments
General Dynamics

Alice Tornquist

Vice President, Government Affairs
Qualcomm, Inc.

Mike Wade

Senior State and Education Manager
EMC Corporation

New Questions. Next Steps.

Expanding the Role of Information and Digital Technologies to Improve Teaching and Learning.

Today, in U.S. K–12 schools, technology use is growing in every aspect of teaching, learning, school operations and management, and community outreach. But even as technology use in schools expands, education is under siege. Politicians, pundits, teachers, parents, and students alike are clamoring for major improvements and significant transformation in the way education and instruction are designed, developed, delivered, and assessed.

The TechAmerica Foundation, a leading voice for the U.S. technology industry worldwide, was asked by former White House CTO Aneesh Chopra to provide direction and guidance for future research projects and activities that will help America's schools harness a wide range of emerging technologies to improve educational outcomes and the productivity of learners and teachers. In response to this request, TechAmerica established the REAL Commission (Recommendations for Education and Advancement of Learning (REAL) Agenda Commission), a panel of 27 technology industry and education leaders. The commission's initial charge was to organize its work through the creation of four interdisciplinary working groups, each tasked with the identification and development of 3–5 research topics deemed to be critical in the ongoing work of Digital Promise.

DIGITAL PROMISE: A PROFILE

Digital Promise is an independent nonprofit corporation, formally titled as the National Center for Research in Advanced Information and Digital Technologies (Digital Promise). Digital Promise's statutory purpose is to support a comprehensive research and development program to harness the increasing capacity of advanced information and digital technologies to improve all levels of learning and education, formal and informal, in order to provide Americans with the knowledge and skills needed to compete in the global economy.

This report summarizes the research and recommendations from each of the REAL Agenda Commission's working groups. After in-depth conversation and collaboration, the groups organized around four central themes, each selected because it is individually important in K–12 education and because taken together, these themes illuminate a pathway to substantive change and transformation in K–12 education:

- Content/Curriculum Systems
- Delivery Systems
- Data Systems
- Synergies Among Content/Curriculum, Delivery, and Data Systems

Why are the REAL Agenda Commission's research and activity recommendations and priorities valuable for Digital Promise? The Commissioners, collectively, represent many of our nation's leading technology, telecommunications, employment, and educational companies and institutions. These are the organizations at innovation's leading edges and the ones that are responsible for developing and deploying many of the technology products, tools, and services that are transforming industry, healthcare, government, and the lives of consumers here and around the world. The Commissioners have the advantage of seeing how emerging technologies can apply to K–12 education in ways that will speed its transformation. While many members of the commission are not directly involved in K–12 education, their own corporate and growth agendas and vision require the contributions of a highly trained, highly capable workforce. As major employers, they are stakeholders in our country's education system and strengths. As corporate citizens, they are interested in and committed to supporting education and its role in strengthening our economy and our nation's ability to compete in the global marketplace.

The Commissioners acknowledge that a great deal of research has been and continues to be conducted on the use and impact of technology in education. The Commission's intent is not to repeat those research efforts but rather to look at educational technology's potential value through a different lens, as reflected in the suggested research programs and activities here.

Technology in the K–12 Learning Environment. A Picture of Change and Challenge.

Speak Up, a national initiative of Project Tomorrow, an education nonprofit organization working to raise the profile of stakeholders' voices and ideas in education, annually surveys over 400,000 K–12 students, teachers, administrators, and parents to better understand both the aspirations for more

effectively leveraging technology within learning as well as the real challenges facing schools and districts in that pursuit.

As first described by Project Tomorrow in their annual reports on the Speak Up National Data Findings, today's students have their own vision for how technology should be used more effectively within learning. But don't be fooled into thinking that our students are waiting for the rest of us to catch up to their vision! According to Project Tomorrow, students are already very effectively implementing their own vision of enabled and empowered digital learning on their own, in and out of school, with or without the assistance and support of their teachers or schools. The students' concept of 21st century learning focuses on education experiences that are socially-based to stimulate greater peer interactions and global awareness, un-tethered to traditional education institutions with the upside of leveraging a wide range of Internet resources, and rich in digital content to provide relevancy and context to the learning process. This unique student vision strongly complements the U.S. Department of Education's National Education Technology Plan but also can provide valuable insights into new paradigms for teaching and learning. The examination, therefore, of how students are adopting and adapting a host of different technologies to meet their learning needs is, in fact, a very good representation of how they want to approach learning in general and a solid foundation for the exploration of new research avenues for Digital Promise.

As an example, the rapid consumer adoption of personal tablet devices, smartphones, apps, and eBooks is also finding its way quickly into U.S. schools. Educational technology journals are filled with coverage of the expanding "Bring Your Own Device" movement growing rapidly in schools and school

districts across the country. Educators are making innovative steps to incorporate digital resources throughout instruction, and the critical role of technology in helping students prepare for college and careers is an essential part of the Common Core State Standards, now adopted by 45 states and two U.S. territories.

And while this innovation and momentum are growing, schools and districts continue to face challenges in designing and deploying effective, scalable, integrated technology systems that will support the real and sustained improvement America's schools and students need and deserve. This brings us squarely to the focus of the REAL Agenda Commission and the recommendations of its four working groups.

Smart. Scalable. Sustainable.

The REAL Agenda Commission's working groups began with the overarching question, "How can emerging technology drive greater innovation in K-12 education?" As the groups worked together, a vision of this innovation began to take shape in the form of a vignette included in this report. In this vignette, readers will see what is possible when technology-based innovation is smart, scalable, and sustainable so it benefits students, educators, parents, administrators, and the community at large.

The vignette that follows was created by the Commissioners to put forth a vision of what technology's promise and power can be when deployed strategically and successfully to help all students engage in personalized learning that is digitally rich, delivered effectively, and data-driven.

THE PROMISE OF CONNECTIONS: A VISION OF HOW DIGITAL TECHNOLOGIES COULD ASSIST LEARNING

Ronald and Amelia Escovedo are a hardworking couple of modest means who recently moved to Tulsa seeking opportunity from the service jobs available near the new convention center and renovated downtown. Facing understandable concerns about Darlene, their 7th Grade daughter, having to change schools, the Escovedos happily discovered that “next-generation” education had arrived. Darlene enrolled at TechAmerica Middle School. TechAmerica features innovative student engagement that is immersive, dynamic, and highly personalized. Technology at TechAmerica, although ubiquitous and always accessible, is not designed to sit between the teacher and the student, but rather it informs and connects, creating more personalized teacher-student interactions, keeping parents engaged, and motivating students to own their own learning and improve every day.

The Escovedos discovered how “connected” TechAmerica was on their first visit when with the click of a button, they provided TechAmerica with permission to access Darlene’s Lifelong Learning Locker and access her student profile. Course history, grades, and even detailed assessments from specialists related to Darlene’s preferred learning style were immediately loaded into TechAmerica’s system. Within 5 minutes the Escovedos completed the transfer process and spent the remainder of their 30 minutes learning about the school, being introduced to specialists, and sharing additional information about Darlene to optimize her class selection, tutorial plans, and establish her long-term college-ready goals.

The Escovedos are committed to Darlene’s educational success. As parents they are knowledgeable about their daughter’s educational progress and performance, and assist Darlene as she begins to take responsibility for learning. TechAmerica supports a web-based Learning Exchange that enables the Escovedos and parents to engage consistently across the education community, including interactions with Darlene’s teachers, fellow parents, and an ever-expanding support network. The Escovedos commitment is matched only by Darlene’s own motivation. Last week she earned the Pheidippides award for completing her 26th extra-credit Math question, and now her avatar is one of only 3 in the seventh grade to sport the coveted golden winged shoes.

After dropping Darlene off at school, Amelia arrives at her office at about 8:15 a.m. While she plans her day, she enjoys scanning the daily email summarizing Darlene’s current status which is almost always “green.” When time allows, one click brings Amelia into the Parent Learning Portal where she can view Darlene’s homework history, assignment trends, and results of all classroom and standardized tests. Ronald sometimes accesses the Parent Learning Portal from an app on his mobile device, but he mostly concentrates on the text message alerts that let him know Darlene may need to be picked up due to sickness, there is a school emergency, or Darlene is suspected of skipping class, which he is happy to say he has yet to receive.

Later that evening, following a family dinner, Darlene comes downstairs from her bedroom and proudly announces she has completed her homework as well as an extra credit assignment in English — in pursuit of the Hillary Badge earned for reading a mountain of short stories (really 29). In a nightly ritual repeated in homes across the United States, Darlene hands her mother, Amelia, her school-issued KnowledgePad and races off to the playroom. With a flick of the finger Amelia transfers the image on the knowledge pad to the large-screen family television and reviews Darlene’s homework with Ronald. Now directly connected to the Parent Learning Portal, Amelia has access to the full curriculum of learning materials selected by Darlene’s school and teacher, and a list of current news stories and other relevant material that they can watch to link Darlene’s classroom activities to the “real world.” Amelia appreciates the many teaching aids and suggested on-demand resources that are designed to help parents coach their children, stimulate conversation, and facilitate additional learning at home.

More than a few times, Ronald and Amelia have had to access these resources to help Darlene complete her more challenging homework assignments. For those days when Darlene finishes her homework quickly, her parents can identify supplemental resources and extra credit activities to be completed. The Escovedos chose to link Darlene’s home profile with her Lifelong Learning profile so the family controls on their computers, cable boxes, and game consoles will interrupt Darlene and require that she successfully complete at least one extra-credit activity for every hour spent surfing social media, watching television, or gaming. Tonight Amelia is pleased to see the results of Darlene’s recent quiz scores and makes note of a few of the new vocabulary words so that she can use them in conversation with her daughter over the next few days.

Unpacking the Recommendations of the Working Groups

Addressing the Needs of Education's Stakeholders: The Working Group Focus

In their collaborative discussions and writing sessions, the REAL Agenda Commission's working groups sought to develop recommended research and activities that addressed the needs of education's key stakeholders, namely K–12 students, their parents, teachers and educators, school administrators and leaders, the community at large, and employers. This shared focus can be seen in each of the working group's recommendations and it reflects education's central role in our nation's family, cultural, and economic futures.

In the four sections that follow, this report summarizes the specific recommendations of the REAL Agenda Commission's four working groups. Each group addressed their focus area differently but all four arrived at specific and substantive recommendations for Digital Promise to consider.

Section One: Content and Curriculum

CHALLENGES & PRIORITIES

- With the proliferation of digital content, how can education's leaders and practitioners ensure consistent quality and rigor, in keeping with the intent of the Common Core State Standards?
- How can digital content's potential for innovation and personalization flourish within a more rigid standards-based learning environment?
- How can computer-based formative and summative assessment be implemented on a large scale to measure important competencies, to model good instructional and learning practices, and to make assessment fairer for all students, including ELLs and students with disabilities?
- How can we use technology more effectively to provide valid and reliable measures of student achievement while also using technology to personalize instruction and maximize learning?
- How can technology and digital resources help librarians address student motivation, research skills, college readiness, teacher effectiveness, and school productivity, while helping students and teachers grapple with information overload?

The Content and Curriculum working group organized their report in three related sections: examining how states making the transition to Common Core State Standards can leverage technology, the evolution of technology-supported assessment, and the role of the school librarian as a content curator who helps students and teachers leverage digital library resources to support college and career readiness.

Leveraging Technology for Content and Assessment

Background

Digital technologies are now essential in every aspect of curriculum and the opportunities provided by leveraging them could be a turning point in the history of education for our country, fueling additional research, development, and innovation.

Common Core State Standards. The movement to a clear and consistent framework to prepare children for college and the workforce is likely to have a profound impact on instruction

and assessment. The goal is to provide teachers and parents with a common understanding of what students are expected to learn. These standards define the knowledge and skills students should have within their K–12 education careers so that they will graduate high school able to succeed in entry-level, credit-bearing academic college courses and in workforce training programs.

Content developers and providers are beginning to change the way that they plan, create, and deliver curriculum not only due to the transition to the new Common Core standards, but also changes in increased availability and access to content. Digital resources are easily accessible, dynamic, continually-updating, cost-effective, and adaptable to the needs of learners. Because of these advantages, there has been a sharp increase in the demand for digital content and increased emphasis on integrating digital technologies and digital literacy into the curriculum.

No Child Left Behind. Backlash to the current iteration of the Elementary and Secondary Education Act (ESEA) has led to a reexamination of the role and time spent on assessments. Many parents, teachers, district administrators, and state and federal policy makers are calling for assessments not just *of* learning, but also *for* and *as* learning.¹ They want to use assessments to understand and promote individual student learning, progress, and growth over time. Many are also pushing for comprehensive assessment systems that include formative, interim, and summative assessments that are closely aligned to these priorities. There have also been calls for quicker results, broadening the focus beyond English language arts and mathematics, and the development of innovative ways to measure critical thinking, problem solving, creativity, communication, innovation, and collaboration, as well as information technology and digital literacy.²

The vision for assessment includes the use of digital technologies, specifically computer-based testing to align with and address the new standards. This is reflected in the work of both the SMARTER Balanced Assessment Consortium (SBAC), comprised of 28 states, and the Partnership for the Assessment of College and Career Readiness (PARCC), comprised of 23 states and the District of Columbia, which are funded by the federal Race to the Top Assessment Program. These state consortia will produce online accountability tests by the 2014–2015 school year that will include selected response, constructive response, innovative technology-enhanced items, and performance tasks for use in grades 3–8 and high school.

The migration to computer-based testing may open opportunities for increasingly valid measures of intellectual and psychosocial performance and more complex forms of learning.^{3,4} The migration may also provide opportunities for speed efficiencies, as well as more valid tools for measuring how individuals perform in highly technological learning and work environments.⁵ In addition, with increased use of

technology-delivered curriculum and assessment, we may see convergence between these two activities as assessment becomes embedded into readings and lessons.

A New Kind of Library. As teaching and learning evolve at an unprecedented pace, the role of the librarian is changing as well. Librarians have become content curators, helping students and teachers discover, exchange, analyze, and apply information using the spectrum of 21st century tools and resources. As schools move from passive learning environments to collaborative and creative ones, the school librarian’s knowledge of information resources, technology, and research — especially when fully integrated into student learning — makes a significant contribution to the research skills and digital literacy of students. The call for increased student skills in gathering information, thinking critically, synthesizing information, and creating new knowledge has spurred a change in the role of librarians and resource centers that will continue to evolve.⁶

Challenges

With all new opportunities, there are challenges in adopting these new sets of standards. Forty-five of the fifty U.S. states have pledged to adopt the Common Core Standards; however, there is great variability with regards to readiness and implementation plans among these states. We must ensure both the efficacy of content and the ability for market efficiencies to thrive. We must keep the focus squarely on quality instruction aligned to trusted content with ubiquitous access. This will require support for our local education authorities, enabling them to provide secure infrastructures, managed environments, and reliable networks. It will require continued investments in research-based aligned content, which truly leverages the power of adaptive technologies. There is also a need to identify means for and acceptability of third party evaluations for digital content – both that which is aligned to the Common Core Standards as well as that which is not. It will also require strong policies that support adaptive learning environments based on competencies rather than simply Carnegie Units.

A number of challenges exist to fully implementing computer-based formative and summative testing on a large scale. First, our technology infrastructure is not developed enough yet to test all students in an efficient and secure manner. Second, innovative technology-based assessments are very expensive to create. Third, the competencies of students with limited computer skills could be underestimated. Fourth, graphics and dynamic stimuli could pose accessibility problems for some students with disabilities. Finally, it is not immediately clear how to interpret and effectively utilize the additional data that could potentially be collected through highly interactive performance tasks.⁷

Recommendations

Research into the “flipped” classroom model. In this model, students use digital resources outside the classroom for topic introductions and explorations and use classroom time for direct collaboration and support with teachers and peers. While there has been some research regarding the needs for training and support for teachers, several critical issues remain and demand additional research. These include defining the role and value of adult supervision and learning coaches in this model and identifying how these supports can be delivered outside the school day for all learners. The group also recommends further research into supporting students with learning differences. The goal of this research is to explore whether independent content learning is possible and optimal for students with learning differences. Further, there should be research to investigate what types of supports and accommodations are available and necessary when critical learning happens outside of the school day.

Research new funding options and approaches for digital content. While some high quality content is available for free, it is often supported by significant infusions of grant or philanthropic dollars. This research should focus on funding options for digital content accessed outside the school day. The group also recommends a closer investigation of how the textbook funding model would work for high quality digital content and the development of strategies to guide schools through a whole new set of evaluation criteria (i.e. hosted versus owned, subscription versus perpetual licenses, Learning Management Systems, cloud storage) for this content.

Support the development of next-generation assessments through research. By researching innovative tasks for technology-based assessments, approaches for improving the validity of automated scoring engines for constructed response tasks, and on interpreting highly interactive performance tasks, we can ensure comprehensive and accurate assessments. There should also be further research into ways to use technology to measure standards validly and reliably, while also utilizing its capacity to truly personalize instruction and assessment to maximize learning. The working group also suggests that the research be framed using these recommendations:

- Use technology to give students more substantively meaningful assessment tasks;
- Use technology to measure important competencies that cannot be easily measured in conventional form;
- Use technology to model good instructional and learning practices;
- Take advantage of the opportunities that technology provides to measure student performance in smaller

and more frequent increments that can be aggregated over time. This will provide teachers, students, and their parents with results that are more timely and instructionally actionable than traditional accountability assessments;

- Utilize the potential of adaptive testing to better assess the full range of important competencies;
- Use technology to make assessment fairer for all students, including those with disabilities, English Language Learners, and limited computer skills and access;
- Assess technology skills which are increasingly required for success in college and career;
- Invest in research on innovative assessment tasks for technology-based assessments, on improving the validity of automated scoring engines for constructed response tasks, and on interpreting highly interactive performance tasks.⁷

Section Two: Delivery Systems

CHALLENGES & PRIORITIES

- How can we assure equity and access to resources and tools for students who are most needy in our communities?
- How can U.S. schools accommodate new technologies rapidly within a constrained physical and network infrastructure?
- How can we validate that technologies add real value to education?
- How can we ensure students’ privacy and security while opening access to more resources and tools?
- How do we ensure technology, pedagogy, and associated professional development evolve simultaneously so that teachers can use and integrate new technologies effectively?

The Delivery Systems working group began their work by developing an overview of the characteristics and emerging requirements for a learning environment that would be enhanced and enriched by digital resources and tools. This list then served as the catalyst for this group’s recommendations to Digital Promise.

Rising Expectations. Significant Challenges. Creating a Delivery System that Delivers...

Background

Delivery systems for learning in the future are expected to be more than just networking infrastructures to deliver educational content. Instead they are envisioned as interactive, technology-based solutions that are integrated with a wide range of educational resources, tools, services, and environments. For electronic delivery systems to be effective, they must efficiently connect participants in a learning community to the right resources at the right time. The proliferation of digital resources presents a tremendous opportunity for enhanced choice and options for a diverse set of learners to engage more actively and successfully with educational experiences. That same proliferation of capabilities also poses tremendous challenges for schools, districts and states in accomplishing their mission of providing equitable access and quality education to all students affordably.

Digital technology is rapidly evolving, driven by a marketplace where businesses are rewarded for producing the latest-and-greatest device, app, or service. Mobile devices and broadband networking allow consumers to access their favorite apps conveniently, wherever they are and at any time of day. Web experiences are more engaging thanks to more sophisticated

interactivity. And behind the scenes, business intelligence systems and advanced search algorithms are directing content and services that are tailored to consumers' stated or predicted preferences so the experiences are more personal.

The ever-improving, ever-broadening consumer technology experience has raised the expectations of students, parents, and teachers. They are asking for more engaging educational experiences, higher fidelity and quality of learning resources, greater personalization, more mobility, and timely, informed recommendations for instructive content. They are perplexed and often frustrated when amazing capabilities are missing in the education environment.

The challenges presented by this rapid evolution of technology for schools are numerous. As schools and school districts seek to adapt and adopt these new technology resources, they must assure equity and access for those who are most needy in our communities. They have to accommodate new technologies rapidly within a constrained physical and network infrastructure. Further, to assure accountability, they need to validate that the technologies are adding real value and opening access to more resources and tools — all while ensuring students' privacy and security.

In developing the recommendations for delivery systems, this working group began with a list of some of the emerging requirements for a digitally-rich learning environment, as shown in the chart here.

Requirements for a Digitally-Rich Learning Environment

STUDENTS	TEACHERS	PARENTS	EMPLOYERS
Personalized learning	Insights to student progress	Real time access to child's progress and curriculum	Graduates with skills needed for workforce
Motivation for learning	Rapid feedback on learning	Availability of tools to augment learning	Relevant curriculum to employer needs
Relevant and engaging learning	Integrated and non-disruptive tools	Ability to customize learning	Early identification of future employees
On-demand learning resources	Recommendation systems for effective content	Recommendations to help child succeed	Removal of barriers to student success
Affordable access	Feedback on teacher performance in a way that allows teachers to develop	Multilingual capabilities	Desire to provide feedback of emerging needs and see it reflected in the curriculum

The characteristics of the delivery systems that can address these requirements are:

- Easy, yet secure, access to a broad set of reliable learning resources, a learning community, and tools and services from a wide variety of providers
- Ubiquitous, high-speed network access to ensure equitable access to resources from traditional computer and mobile devices in schools, homes and communities
- Infrastructures that can integrate tools and technologies to create and support learning environments that are engaging, interactive, relevant, and motivating
- “Two way” delivery systems that provide feedback to teachers, parents, and students using analytics for assessment, progress, teacher performance, and recommendations

Recommendations

Government and industry should jointly support the development and implementation of a national education industry standards framework for digital learning. The Delivery Systems working group recommends that the multiple existing standards-setting organizations focused on student data, learning content, assessment, and curriculum converge and collaborate with stakeholder associations to create a national education industry standards framework. The new standards framework should be evaluated by identifying and addressing gaps in relevant U.S. best practices and existing standards related to student data, learning content, lifelong portfolios, and achievement with respect to digital learning. As much as possible, existing standards should be leveraged and expanded to simplify the introduction of ever-changing delivery capabilities.



Government and industry should support and participate in an analysis of current funding mechanisms and develop incentives and models for best practices of broadening the access to and reach of high-speed networks to communities and homes using public as well as public-private ventures. Ubiquitous broadband access to enable digital learning cannot be assumed. Many areas of the country and segments of the population have limited or no access to the Internet. Successful digital learning requires access from homes and communities for learning beyond the classroom and the school day. Participants in the education community must have high performance access beyond traditional school hours for the true potential of delivery technologies to make a real difference.

Develop policies, investments, and programs that will improve school infrastructure. Rising expectations for engaging learning experiences in school will require that teachers and students alike have access to new technologies and resources as they become available. Current strategies for acquisition of student and teacher devices by schools only provide a temporary stop-gap to keeping pace with consumer technology advancements. Schools need to shift their expenditures toward a robust and standards-based infrastructure that creates a secure, reliable and inclusive approach to providing student and teacher devices. Students and teachers should be allowed to utilize their personally owned devices for their learning and teaching experiences. Investments by schools should be for teachers and needy families to create an equitable educational environment for all students. Cloud-based services should be considered to allow a “pay-as-you-go” model for learning resources and tools that can evolve without impacting the school’s physical infrastructure.

Government and industry should support and participate in the development and implementation of standards for data collection, best practices, and exchange associated with the usage of learning content to create intelligent delivery systems. Delivery systems for the future digital learning environment cannot be exclusively uni-directional. Delivery of content and tools to students must also allow for data and information to flow to teachers and parents so they can monitor students’ progress, needs, and gaps and then make recommendations and take appropriate action throughout students’ academic careers.

Update and expand professional development and pedagogy. Introducing advanced technologies into the learning environment without appropriate changes in pedagogy and associated professional development will have little real or sustained impact. New models for learning are evolving that make greater use of social networks, multimedia, and video content that dramatically changes traditional classroom models of instruction. The delivery device will continue to evolve and so must the pedagogy and associated professional development, to make sure teachers can use and integrate new technologies effectively.

Section Three: Data Systems

CHALLENGES & PRIORITIES

- How can we provide the right data at the right time to students, teachers, parents, and administrators to inform and enhance teaching and learning?
- How can we have a consistent, holistic view of student and teacher data that would be available anywhere, anytime, on any system, that leverages standards and shows a more complete picture of student strengths, abilities, needs, and interests?
- How can we leverage this data to facilitate equitable access and enhanced learning potential across the country?
- In a world of personalized learning, how do we ensure access to standard aggregate data to assess overall school performance?

The Data Systems working group focused on unlocking the potential of data to deliver critical impact on the day-to-day learning environment for students and teachers, with an emphasis on using data to help improve teaching and learning outcomes. The group made a specific effort to align with the overarching goals of the National Education Technology Plan from the U.S. Department of Education and the Data Quality Campaign.

Making Data Actionable, Effective, and Focused on Learners and Teachers

Background

“I believe that [new technology] is destined to revolutionize our educational system and that in a few years, it will supplant largely, if not entirely, the use of textbooks. We get about 2% efficiency out of schoolbooks today... with [new technology] it should be possible to obtain 100% efficiency.”

Anyone who thinks we must update our education system to compete effectively in a global economy might guess this quote is from a recent speech on U.S. education, but in fact, these are the words of Thomas Edison, in 1922. The new technology he was referring to — the motion picture — is now regarded as old technology, but the statement lends perspective to our efforts to improve education today. We must use the technology of our day to build the best education system possible to better prepare students for their new world.

The theme for the Education Data Systems working group was to unlock the potential of modern society’s most powerful assets: digital information and data. Today, most systems — commerce, communications, media, finance, etc. — run on digital information and data. Data movement is the very lifeblood that allows us to engage, anytime and anywhere, and be productive in our modern world.

The data collected in education today tends to be mostly for administrative use or deferred, big picture analytics rather than real-time data for day-to-day teaching and learning. Very little data is used where it could have the most impact — the actual learning environment. The Data Systems working group believes that the highest and best use of education data is to improve teaching and learning outcomes. We need to build richer and more robust individualized learning environments that genuinely prepare students for the world they will live and compete in. In addition, the more nuanced and detailed data that arises from deployment of such student and teacher-centric Educational Data Systems (EDS) will help educational administrators, policy-makers, technology and curricula developers, and researchers get the information they need better and sooner.

This flipped EDS model hinges upon both **access to** and **application of** an expanded education data infrastructure. If knowledge, as the saying goes, is indeed power, it’s most powerful when it arrives in time for appropriate and meaningful action. With real or near real-time access to education data, educators can improve the decision-making that suffuses and shapes a student’s education experience, and likely success.

Providing better **access** depends on developing:

- Broadened data standards and interoperability across systems
- Federated data infrastructure and security methods to facilitate data movement
- Tools and connections for receiving, interpreting, and exchanging education data

Application of education data to improve teaching and learning requires:

- Training teachers and administrators on the tools to access and leverage data
- Designing methods for handling, interpreting, and applying data in instruction
- Developing communications and feedback loops to drive continuous improvement

The background details and specifics of our recommendations dovetail into the overall goals of the National Education Technology Plan (NETP) from the Department of Education and the Data Quality Campaign (DQC). We also recommend building

on, and integrating with, existing systems and standards such as the Common Education Data Standards (CEDS) from the National Center for Education Statistics (NCES) and the Common Core Requirements (CCR) from the National Governors Association (NGA) and Council of Chief State School Officers (CCSSO), which can be leveraged to build an expanded and interoperable national education data system that is more student and teacher-centric. Key NETP Focus Areas (from a Data Systems Perspective) that helped guide this working group's recommendations are learning, assessment, teaching, infrastructure, and productivity.

Recommendations

Facilitate Standards for Enhanced Education Data System Structure and Integration. A modern education system allows for data-driven decisions and the use of adaptive learning tools to enhance the teaching and learning experience. Having interoperable data systems and the ability to access or move that data anywhere, at the moment of need, is critical to modernizing the education ecosystem. This also will make equitable, individualized learning not only more possible, but more effective.

Digital Promise should coordinate with existing education groups such as the Department of Education's Common Core of Data (CCD), Data Quality Campaign (DQC), National Governors Association and CCSSO's Common Core State Standards, state and local leaders as well as student information systems and learning management system leaders, technology companies, and others to define a unified base-level superset, or tiers, of standard education data. This would facilitate a common unified view of a student or teachers' key information, allowing this data to be both accessible and usable in real time across any approved system that is interoperable with the baseline education data standard.

The overarching goal is to relatively quickly facilitate minimal interoperability that allows flexibility and provides a base to build out additional standards on over time. Such additional standards would allow for expanded traditional data sets, and new elements such as Core Curriculum Assessment data, the ability to store unstructured data (to include, for example, student body of work examples), location data, interests data, and key health and demographic data.

Looking forward, Digital Promise could also support and enable research to establish a foundation for the development of data access, exchange, and security standards. Findings from this research activity would inform necessary federated data exchange rules and systems integration protocols and processes to foster an education data cloud infrastructure that would allow for the access and use, or as needed, movement of standards-based education data anytime, anywhere. Work could build on broader investments and advances that are

being made in data management generally, including in identity management, security, privacy, cloud services, and the integration of structured and unstructured data.

Enable data-enhanced teaching and learning environments through the creation of data collection, access, and interpretation tools and systems that connect and foster virtual teaching and learning communities. One of the best ways to positively impact teaching and learning environments lies in providing educators, students, and parents equitable access to deep, real-time education data in clear and concise ways. This data enables tools to support insightful decisions, such as the ability to review an individual student's work and progress, regardless of where they are in school in America; the creation and use of smart teaching and learning tools, from adaptive curriculum to smarter digital textbooks, supporting individualized learning and real time assessment; and providing the feedback loops necessary for rapid assessment of understanding, curriculum, methods, and other factors to drive constant improvement.

One specific example of how better integrated data systems could be used is through smart analysis and leveraging of data across institutions and sources to connect the right individuals or groups together across schools, subjects, student ages, and geographies to form interactive teaching and learning communities. Digital Promise and related entities could look to the digital social media world (Facebook, YouTube, Twitter, LinkedIn, etc.) for development of similar dedicated systems and access tools targeted at education communities.

The above are just a few examples. As data standards are put in place and more broadly adopted, many opportunities will be enabled, with the challenge being how to sift and present teachers, students, parents, administrators, policy-makers, and others with the right information at the right time. Digital Promise and related entities like the DOE, DQC, and Challenge.gov could sponsor a national competition to develop example web/app tools for teachers, students and parents to access, view, and interpret education data. The competition could leverage a district-sized, anonymous set of data, with the best data access and visualization tools receiving additional development support and widespread recognition.

Create Professional Development Resources and Programs Focused on Leveraging Data for Teaching and Learning. To fully realize the benefits of the expanded data standards and associated analytic and reporting tools described above, educators must be comfortable with and trained to leverage these new capabilities. Digital Promise and related development entities should reach out to professional development teams, instructional technologists, NCES, DQC, CCD, teachers' unions, school administrators, university education programs, and teachers to develop and make available a wide range of teacher training resources focused on the effective and expanded use of new education data and data tools. As part of this recommended development

activity, the Data Systems working group suggests that the entities involved in creating these resources also work programmatically to elevate the level of importance for professional development in the use of data systems, working to make it a top priority activity for all teachers and administrators.

Research Ways to Derive Additional Value from Education Data.

Expanding, creating baseline standards for, and making accessible education data for traditional classroom and administrative use will truly enhance the teaching and learning environment, but this is only the beginning. Once a common pool of education data is available that has common meaning and interpretation, the additional value and impact on education which can be derived from this “big data” could significantly impact the content, curriculum, delivery, research, and engagement aspects of education.

One example of a benefit that could come from more nuanced and integrated data about individual students is improved opportunities for colleges and businesses to provide targeted outreach and resources and for students to discover and prepare for appropriate career pathways. Leveraging information on interests, aptitudes, and curriculum strengths and weakness would allow colleges and public/private sector businesses to discover and conduct outreach to students whose interests and abilities align with these organizations’ strengths and priorities. The colleges and businesses could then help by providing additional resources (people or programs), internships, or other services that K–12 education could use to further prepare students for college or career readiness. To realize this opportunity, research and proof-of-concept work would be needed to identify the technological or policy barriers to sharing of information and facilitating connections.

This is just one example of the potential of big data in education, and other sorts of opportunities are discussed elsewhere in the report. In any case, certain groundwork needs to be laid to realize these opportunities. For one, research is needed to build models that help extract richer and more nuanced understanding of cause/effect outcomes from the future pool of available standardized education data that will be deeper and more statistically significant. For another, work should be done to define and create standard data access methods and application programming interfaces to the skills, elemental progress, and interests subset of the standards data that would allow for the development of smart tools, adaptive curriculum, digital textbooks, and other resources that could be leveraged by any student, any teacher or parent/guardian anytime, anywhere, to facilitate and enhance individualized learning. Education curriculum experts, data and cognitive scientists, and education technology developers, and others have a role to play in these efforts.

Section Four: Synergies Among Systems

CHALLENGES & PRIORITIES

- How can we harness the power and promise of technology-enhanced curriculum and content and delivery and data systems to support personalized learning for every child?
- How can we deliver personalized learning at scale?
- How can we consistently help students use technology to learn, communicate, collaborate, and create the new ideas and products that will sustain and grow their individual opportunities and our nation’s collective opportunities to compete successfully?

The Synergies Among Systems working group focused on the state of education in America relative to other countries as well as how to leverage technology in order to make students active participants in and owners of their own learning. They emphasized the importance of personalized learning and how technology can assist with providing it at scale.

People, Processes, and Technology to Enable Personalized Learning

Background

The United States leads the world economically, is the epicenter of most major technological innovations, and is home to the youngest and fastest growing population of any developed nation. Yet we risk forfeiting our position of global leadership to countries that make public education a priority, which includes many of the world’s developing nations. Only 75.5 percent of our high school students graduate on time and among black and Hispanic students the graduation rate drops below 60 percent.⁸ Even when students do graduate, they do so underprepared; researchers estimate that approximately 60 percent of students entering community colleges are referred to one or more developmental courses.⁹ The Condition of Education report estimated that 36 percent of first-year undergraduates in public and private institutions in 2007–2008 and 42 percent in public 2-year institutions reported taking a remedial course.¹⁰ And of those students who matriculate to higher education, only 30 percent earn a Bachelor’s degree and only 10 percent earn a Master’s. Between 1995 and 2008, the United States slipped from ranking second in college graduation rates to 13th among OECD nations. Poor academic performance has led large and small American-based companies — including many of

the companies represented on the REAL Commission — to look outside the U.S. for the talent needed to maintain their competitive edge at different levels in different fields.¹¹

To remain the global leader in innovation, we must make better use of the tools we have at our disposal. Leveraging technology to engage, to assess, to derive needs and meet them, as well as offering personalized learning paths to every child enables us to deliver a personalized learning experience for every child; allows us to engage them in learning using tools they use in their daily life; and make them active participants in, and owners of, their own education. A primary reason cited by students who drop out of secondary and post-secondary schools is that the education they received did not engage them and lacked relevance to their lives.¹²

Starting at a very young age, American students use technology to learn, communicate, collaborate, and create new ideas and things. Only rarely do they do this in school, with the tools they use outside. By leveraging the technologies our nation has led the world in developing, industry and academia can build the long term investment, research, and sustainable solutions necessary to support personalized learning for every child.

The concept of personalized learning has tended to put the student as the center of attention. However, to realize the benefits of innovations and technology that promote personalized learning, the nation's attention must focus on teachers as well as students. The most progressive and effective learning tools will translate to improved student outcomes only when teachers are prepared. Therefore, personalized learning in this document applies to students as they progress to their goals of college and career readiness and to teachers as they progress from new teachers to master teachers, instructional leaders, and administrators. A personalized learning framework, enabled by technology and designed for teachers as well as students, allows our students to master critical skills without the constraints of time or place in an environment that encourages their full engagement and allows for real-time assessment and an immediate opportunity for intervention and acceleration.

Personalized learning, delivered at scale, cannot take place without the use of technology. Students and teachers require stable, accessible platforms and Internet connected devices, along with access to engaging content; new, richer, more accurate and regular assessments; collaboration tools; and access to the data that enables each of these to deliver a more engaging experience tailored to their individual needs. The authors of the 2010 National Education Technology Plan outline five goals for transforming American education using technology. One of those goals states that, “all students and educators will have access to a comprehensive infrastructure for learning when and where they need it.”¹³ They describe the ecosystem needed to support personalized learning and transform public education as one with key components

of people, processes, and technology. This section starts by defining the end goal, which is personalized learning. It then outlines our policy, communication, and research and development recommendations to build, support, and sustain personalized learning for K–12 education. The recommendations serve as a framework for identifying the necessary people, processes, and technologies for promoting continuous learning from pre-kindergarten through higher education and the workplace.

Recommendations

Produce a summary of best practices in bringing digital learning to scale focusing on joint achievement, affordability, and access. Before Digital Promise implements new research and discovery, a critical first step is to understand past research within the lens needed to shape the future of digital learning at scale. A summary of what works in the use of technology for learning framed by the three A's—achievement, affordability, and access — will enable future research to fill gaps and not duplicate research efforts. By summarizing previous studies under these conditions, past knowledge can more accurately inform how we expand the use of technology that works at the smaller level to a national scale. Too many studies comparing digital to traditional approaches focus narrowly on only one consideration, such as achievement. By focusing only on achievement, the study does not inform about how well findings apply to all students, which is needed if innovations are to be delivered at scale. Summarizing past studies by the three A's and encouraging future research and development studies to look ahead to the delivery “at scale” by incorporating the three A's at the start will improve the translation of research to practice.

Given that study findings do not always produce a clear recommendation to implement digital learning wholesale and that many studies were not designed to inform about digital learning at scale, a summary of past studies with explicit focus on the three relevant factors — achievement, affordability, and access — will allow Digital Promise to understand conditions under which digital learning has worked and can work at scale and will form a foundation on which to efficiently build future research.

The **goal** of this first recommendation will be to summarize past studies evaluating digital classrooms in a way that will allow Digital Promise to build on past research in efficient ways. The process will first summarize conditions supporting effective use of digital learning. In other words, this part of the analysis will answer questions such as, “When does it make most sense and when is it less optimal to implement digital learning?” and “How do conditions such as what content is taught, type of student, implementation of technology, teaching technique, and others relate to the effectiveness of digital learning?” As a second step, the process will have experts evaluate past studies and summarize findings on achievement,

affordability, and access. After reviewing past research, the experts will make recommendations about implementing digital classrooms at scale and the need for research to fill missing gaps.

The **product** from this study will be a recommendation paper for taking digital learning to scale based on review of research studies under a framework of achievement, affordability, and access. The paper would clarify what works and what does not under certain conditions.

Conduct a review of content learning maps and learning progressions. To realize the goal of personalized learning for all students, we need to define expected pathways that students must follow to progress through their educational development. To address this goal, many teams are developing learning progressions or learning maps.

An independent study of learning progressions in different content areas by different teams across the nation will enrich our understanding about the pattern of knowledge and skills students must learn as they progress. Multiple learning maps may not support the goals of the common core. Specifically, many different learning progressions may make student mobility across states more challenging and reduce the ability to compare performance nationally and internationally. A review of the different learning maps for use at scale would help move personalized learning forward.

The **goal** of this review is to convene a team of content experts and learning scientists to examine learning maps and progressions that exist or are under development with a recommendation about which characteristics (e.g., open source, theoretical underpinnings, granularity, empirical support, ease of use and understanding, flexibility to include the 15 percent content standards specific to a state, display) are important and which one or two would be best for personalized learning across the nation.

The **product** from this study will be published requirements for learning progressions that can be used at scale and recommendations about which ones meet those requirements. These recommendations will allow districts and states to make efficient research-based decisions about the different learning progressions being developed.

Review research focused on using games in learning and assessment. As a complement to teacher-led instruction, schools should consider using engaging media such as game-based learning, scaffolded learning, peer engagement, behavior motivation, and reward systems to immerse students in their learning experience and provide them with instant feedback on their performance and to help them identify a path to success. Many learning games are available free of charge on the Internet. Yet research has not sufficiently been conducted to compare learning with and without games. Students, parents, and teachers do not have an easy way to

match games to common core standards or to evaluate the appropriateness or usefulness of learning games. Therefore, the opportunity to use games to extend learning beyond the classroom is under realized.

The **goal** for this recommendation is to review research supporting the use of games in learning and assessment, recommend research that needs to be done to evaluate the effectiveness of games on learning and assessment, define criteria and the process for evaluating learning games, recommend ways to use data from learning games, and start a public site that promotes the evaluation of games and alignment of games to common core standards.

The **products** will include a summary of literature on games in learning and education, a list of criteria and a process for evaluating games for specific uses, examples of how the criteria and process are applied to existing games, a recommended method for attributing performance on games/activities to more than one domain (e.g., math, reading, speaking, writing, etc.), and a public site that categorizes games by criteria that can be built over time with continuous scrutiny.

Reviewing the Working Groups' Recommendations

Each of the REAL Commission's four working groups made recommendations for critical research projects and programs that will support the work of Digital Promise. These recommendations all center on developing smart, scalable, and sustainable systems that harness the capacity of advanced information and digital technologies to improve all levels of learning and education.

The graph here summarizes the recommendations showing which require research on current practices or existing products and services, research to inform the development of new products and services, projects that stimulate the development of new approaches or strategies, and policies needed to support the recommendations.

The REAL Agenda Commission Recommendations to Digital Promise

Research on Current Practices or Existing Products and Services <i>These recommendations focus on the research that is needed around current practices to better understand how to replicate, scale, or sustain innovation.</i>	Research to Inform the Development of New Products and Services <i>These recommendations focus on what new research is needed to jumpstart new innovations in products and services.</i>	Projects that Stimulate the Development of New Approaches or Strategies <i>These recommended projects will provide a foundation for new approaches to speed up adoption, implementation, and further innovation.</i>	Policies Needed to Support the Recommendations <i>These recommendations require policy changes at the federal, state, and/or local levels to support the results of the research findings and/or pilot projects and to create a sustained base for innovation.</i>
<ul style="list-style-type: none"> • Research the impact of the “flipped classroom” model within classroom instruction • Research new funding options and approaches for developing and maintaining high quality digital content for classroom use • Research innovative technology-based assessments to improve validity of automated scoring systems and improve the interpretation of highly interactive performance tasks • Research current funding mechanisms, incentives, and models for best practices in broadening the access to and reach of high-speed networks to communities and homes • Research current content learning maps and learning progressions • Research using games in learning and assessment 	<ul style="list-style-type: none"> • Research ways to derive additional value from education data • Enable data-enhanced teaching and learning environments through the creation of data collection, access, and interpretation tools and systems that connect and foster virtual teaching and learning communities 	<ul style="list-style-type: none"> • Develop and implement a national education industry standards framework for digital learning • Develop and implement sector standards for data collection, best practices and exchange associated with the use of learning content to create intelligent delivery systems • Update and expand professional development and pedagogy for teachers, librarians, and administrators to support innovation in learning and in particular, how to use data to impact achievement and productivity • Develop a network of teaching and learning virtual communities with supporting toolkits for sustained involvement and efficacy • Produce a national report and/or director of best practices in bringing digital learning to scale focusing jointly on achievement, affordability, and access • Facilitate standards for enhanced education data system structure and integration 	<ul style="list-style-type: none"> • Create policies that support government and industry collaborations for a national education industry standards framework for digital learning and the development of an Education Data Standards organization • Develop policies, investments, and programs that will improve school infrastructure

The Call for Knowledge and Insight

Clearly, the majority of the REAL Commission's recommendations center on the need for additional and large-scale research focused on bringing content and curriculum, delivery systems, data systems, and their potential synergies together to improve learning and education. The recommendations, acted upon individually, deliver valuable insight and catalysts for using technology intelligently to help all students progress to college and career readiness. Acted upon together, these recommendations lay a comprehensive foundation for real educational transformation.

This phase of the REAL Commission's work underscores the need to delve further into each working group's recommendations to provide clear "next step" action plans. This logically leads to a Phase II program of work for the Commission so that research plans and project scopes can be detailed and work can be prioritized.

The members of the Commission thank Digital Promise for the opportunity to participate in this initial project and we look forward to continued service. ■

References

1. Bennett, R. E. (2010). Cognitively Based Assessment of, for, and as Learning: A preliminary theory of action for summative and formative assessment. *Measurement: Interdisciplinary Research and Perspectives*, 8(3) 70–91.
2. NWEA in cooperation with Grunwald Associates LLC (2012, February). *For Every Child, Multiple Measures: What Parents and Educators Want from K–12 Assessments*. Available: http://grunwald.com/pdfs/NWEA-GRUNWALD_Assessment_Perceptions_b.pdf and <http://www.nwea.org/every-child-multiple-measures>
3. Clarke-Midura, J. & Dede, C. (2010). Assessment, Technology, and Change. *Journal of Research on Technology in Education*, 42(3) 309–328.
4. Pellegrino, J.W., & Quellmalz, E.S. (2010). Perspectives on the Integration of Technology and Assessment. *Journal of Research on Technology in Education*, 43(2) 119–134.
5. Bennett, R. E. (2011a). *The role of technology in performance assessment*. Paper presented as part of the symposium, Next Generation Performance Assessments and the Assessment of College Readiness (B. Gong, Chair), at the annual meeting of the National Council for Measurement in Education, New Orleans, LA.
6. "Collaboration and Partnerships." *Connecting Libraries with Classrooms: The Curricular Roles of the Media Specialist*. Kay Bishop. 2nd ed. Santa Barbara, CA: Linworth, 2011. 1–11. Gale Virtual Reference Library. Web. 29 Feb. 2012.
7. Bennett, R. E. (2011b). *Innovative assessment systems: The role of new technology*. Invited presentation at the International Computer Assisted Assessment Conference, Southampton, England. Available: <http://caaconference.co.uk/wp-content/uploads/CAA-technology-7–11.pdf>
8. Balfanz, R. Bridgeland, J.M., Bruce, M., Fox, J.H. (2012). *Building a Grad Nation: progress and challenge in ending the high school dropout epidemic*. Report by Civic Enterprises, Everyone Graduates Center at Johns Hopkins University, America's Promise Alliance, Alliance for Excellent Education. Retrieved March 27, 2012 from: <http://www.americaspromise.org/our-work/grad-nation/~media/Files/Our%20Work/Grad%20Nation/Building%20a%20Grad%20Nation/BuildingAGradNation2012.ashx>
9. Bailey, T. (2009). Challenge and opportunity: Rethinking the role and function of developmental education in community college. *New Directions for Community Colleges*, 145, 11–30.
10. Aud, S., Hussar, W., Kena, G., Bianco, K., Frohlich, L., Kemp, J., & Tahan, K. (2011). *The Condition of Education 2011* (NCES 2011–033). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office. Retrieved from: http://nces.ed.gov/programs/coe/pdf/coe_rmc.pdf
11. Brush, B., Sochalski, J. and Berger, A. (2004). Imported Care: Recruiting Foreign Nurses to U.S. Health Care Facilities. *Health Affairs*, 23, No. 3. pp 78–87.
12. Bridgeland, J., Dilulio, J. and Morrison, R. (2006). *The Silent Epidemic: Perspectives of High School Dropouts*. Washington, D. C., Civic Enterprises.
13. *Transforming American Education: Learning Powered by Technology*. U.S. Department of Education Office of Educational Technology. November 2010.



The essential question facing us as we transform the U.S. education system is this: What should learning in the 21st century look like?

National Education Technology Plan
U.S. Department of Education, 2010



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