DIGITAL LEARNING NOW!

DATA BACKPACKS:
Portable Records & Learner Profiles

DLN SMART SERIES

IMPLEMENTATION STRATEGIES AT THE INTERSECTION OF DIGITAL LEARNING AND THE COMMON CORE STATE STANDARDS

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This is the second paper in a series of interactive papers that provide specific guidance regarding adoption of Common Core State Standards and the shift to personal digital learning.

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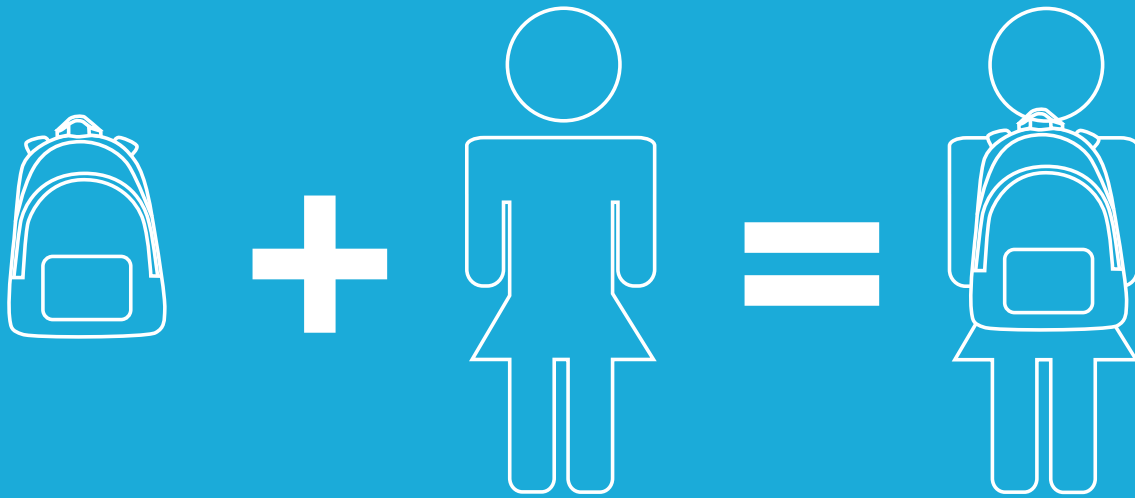For access to this and other papers
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DIGITAL LEARNING NOW!

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

The current way student records and transcripts are managed is insufficient to meet the evolving needs of teachers, students, and parents. Only the most basic of information follows students into the classrooms they enter each year. Teachers have little visibility into the past performance of their students, what other teachers noted, or each learner's strengths, weaknesses, and individual needs. New personalization technologies and the demand for differentiated instruction as a Common Core strategy will only further place further strains the ecosystem of data systems and paper based records that form the patchwork of our current student records.

What if students instead came to each course or classroom with a digital backpack of data about their learning levels, preferences, motivations, and personal accomplishments? How would this improve each teacher's ability to tailor learning to meet the needs of individual students? What if parents and students could easily access their child's records to share the information with afterschool providers? How would all of the

personalization this affords add up to deeper learning and improved college and career readiness?

Data Backpacks: Portable Records & Learner Profiles asks these questions and reveals some key problems with the current system:

1 The current official transcript does not provide enough information for teachers to personalize learning from the first day of school.

2 Customized learning requires an enhanced and expanded Learner Profile.

3 Parents and teachers should have the ability to protect privacy and empower multiple providers to use and contribute to a Learner Profile.

This paper provides two recommendations for addressing the inadequacies of today's student records in order to power personalization from day one, at every step, for every student.

The Data Backpack

The Data Backpack is an expanded common electronic student record: an official transcript that follows students through every transition—grade to grade and school to school.

The Backpack includes traditional transcript data such as demographic information, state testing data, and supplementary student supports. However, it would also include additional information in order to represent a more holistic picture of student achievement—such as a gradebook of standards-based performance data and a portfolio of personal bests—and better capture the student's progression at any moment in time. This enhanced data would provide a context for attendance and behavior patterns, supplementary support services, grades, and other performance information such as proficiency scores and learning gains.

Since this data would follow students to each new learning experience, learning could be tailored to meet their individual needs from the first lesson rather than the extra time teachers must spend diagnosing student needs and abilities.

The Learner Profile

The Learner Profile builds on the "official transcript" of the Data Backpack to provide additional clues to unlock learner needs, preferences, and potential. While each student's Data Backpack would be populated by a set of common elements for all students at a new minimum level, the components of each student's Learner Profile could be customized based on student needs, platform data requirements, and family decisions.

Amazon, iTunes, and Netflix have demonstrated the potential of predictive algorithms. Adaptive software is powering high performance blended schools. Learner profiles—powered by achievement and keystroke data— will unlock secrets about the kinds of experiences that inspire persistence and performance for each student.

In addition to standard achievement data, Learner Profiles should contain expanded achievement information, student goal statements, badges and other recognitions, and a college/career readiness tracker. Students would contribute a full portfolio of work, complemented by teacher narratives on student assets and challenges. The Profile could also include non-cognitive variables that impact achievements, as well as an "early warning system," self-management skills, behavior/character education, and a record of community service.

When learning is personalized to meet the needs of individual learners, everyone wins. Taken together, the Data Backpack and the Learner Profile can power personalization and protect privacy. **The Data Backpack ensures that personalized learning begins on Day One. The Learner Profile powers a personalized pathway toward college and career readiness.** Customized learning, informed by enhanced and expanded student data, will boost motivation and achievement—keeping more students on track for college and career readiness.

The Opportunity

We are at a critical moment in time. With the introduction of the Common Core State Standards (CCSS), online assessments in 2014-15, and the shift to digital learning, districts are on the brink of receiving a flood of unprecedented amounts and variations of student data. Although no one has yet realized a full-scale solution to unlock the potential of personal digital learning that Digital Learning Now! described in the 10 Elements of High Quality Digital Learning, the authors describe a rich field of toolsets and "point solutions" that address singular aspects of the overall needs. While much good work is underway, the paper concludes with a call to action and an assertion that the leaders of various efforts need to come together to create a common, integrated, and comprehensive system that is universally endorsed and widely implemented. Tackling the range of challenges— from privacy compliance to technical issues—will require collaborative involvement from everyone, ranging from state leaders and policymakers to developers and industry leaders, in addition to representatives from education agencies, advocacy organizations, and funders.

55million

students walked into the classrooms

7million

teachers in American pK-12 classrooms

INTRODUCTION

What information should follow the student?

We turned to practicing teachers, educational and industry leaders, and other leading experts to gather information from the field for this paper.

On 9/7/12 we hosted a Twitter chat that explored useful student data, what information should (and should not) follow students, privacy concerns, and student data challenges. Read the transcript of our chat by visiting http://sfy.co/b8De or scanning this QR Code.

This fall, approximately 55 million students walked into the classrooms of more than 7 million teachers in America's Pre-K through 12 classrooms.[1] In most cases, the students showed up on day one knowing little more about their teachers than the name on the classroom door. Unfortunately, teachers also have little access to much useful information about their incoming students.

Sometimes more information flows within a school as students move grade to grade, but often data and information is trapped within silos in a patchwork of paper and electronic systems. For districts with high student mobility rates and at transition points for all students in the system, this results in inaccurate instructional decisions and duplicative instruction—and contributes to students falling further behind. It can take weeks, if not months, for teachers to ascertain the individual strengths and weaknesses of each student in order to offer of the appropriate instruction to meet the unique needs of each learner.

What if students instead came to each course or classroom with a backpack of information—loaded with data about their learning preferences, motivations, personal accomplishments, and an expanded record of their achievement over time? How would this "Data Backpack" and "Learner Profile" improve each teacher's ability to tailor learning to meet the needs of individual students? What if parents and students could access and customize this record to serve their own needs? How would all of the personalization this affords add up to deeper learning and improved college and career readiness?

Coupled with more widely affordable devices and a plethora of educational tools and apps, the shift to Common Core State Standards and the new online assessments further necessitate a robust plan for organizing, analyzing, presenting, and comparing student data in a way that is most useful to students, teachers, and families. Without a robust plan for expanding our notions of transcripts, student records, and Learner Profiles, we won't be able to make the most of the opportunities for truly personalized learning that these shifts present.

Current Benchmarks

Student records are currently guided by a complex patchwork of state and federal laws and regulations that specify what must be collected and reported—and under what conditions the data can be shared. More data is generally available about students at the classroom and school level; only a small portion is reported to the district. Even smaller portions of these records are reported to the state and federal departments of education. Often,

DQC supports state policymakers and other key leaders in promoting the development and effective use of statewide longitudinal data systems. As part of this effort, DQC has identified 10 Essential Elements of Statewide Longitudinal Data Systems and 10 State Actions to Support Effective Data Use, which serve as roadmaps for states that are building enhanced data systems. A core component of this work is enhancing state collection of basic transcript data such as enrollment, demographic, programmatic, test score, and grade information (see exhibit). Taken together, these recommendations represent a minimum level of information that could travel with each student.

While these efforts have helped improve state systems, more has to be done to help districts enhance their systems to better inform instruction, target limited resources and interventions, and improve state and federal data collection.

Most district-based systems contain basic demographic information and possibly some academic performance indicators. While this type of standard data might tell the teacher something about the student, it reveals very little about the learner.

The growth in the use of new technology-based platforms has highlighted the fragility of these student data systems, the lack of interoperability among them, and the lost opportunities for deeper personalized learning experiences.

RECOMMENDATION FOR STATE-LEVEL STUDENT DATA

- Grade Level
- Attendance Information
- Special Program Status (Special education, Title I, Gifted/Talented, ESL, etc.)
- Academic Growth from Year to Year ("Value-Added" Data)
- Course Completions
- End-of-Course Grades
- Test Performance Data

different data is needed for different uses or reasons. While some data is needed to inform daily instructional decisions, a state may require other data, such as student enrollment, to calculate funding payments or for accountability purposes.

The Data Quality Campaign (DQC) is a national advocacy group launched in 2005 to improve the availability and use of high-quality education data.[2]

What do teachers wish they knew about new students?

In what environment do they learn best?

Are they meeting the standards in key areas like math, reading and writing?

What goals have they identified for themselves?

What level of support do they have at home? Do they participate in any community programs or organizations?

Do they do best when working alone or with peers?

What are their outside interests that I can use to motivate learning?

Is there anything in their learning history that I should flag for follow-up or special attention?

What did other teachers note about their strengths and challenges?

Student Data Problems

This paper addresses three related problems with the current state of student data collection and dissemination:

1 **The current official transcripts do not provide enough information to allow teachers to personalize learning from the first day of school.** Students arrive into each new grade or school with little or no information, requiring every teacher to essentially start from scratch to build an understanding of each student's needs and capabilities. Most information is summative in nature and gives teachers little insight into the learner's individual strengths and weaknesses over time.

2 **Customized learning requires an enhanced and expanded Learner Profile.** Learner Profiles are needed for differentiated instruction at the most basic level, particularly for systematic methods such as Response to Intervention (RTI). However, next-generation adaptive platforms enhance instructional practice with smart recommendation engines that are based on a comprehensive profile of each student. This expanded Learner Profile must represent a holistic view of the student's unique learning preferences, such as his or her best learning modality (such as, "does the student learn best through visual representations in some cases and with hands-on learning in others?") and learning environment (such as, "does the student perform better in small-group or whole-class settings?").

3 **The system must balance the need for access to student data with privacy management tools that empower families.** Parents who wish to access their children's student records are often met with complicated systems of forms, fees, and long waits. The current system is not set up to accommodate easy access to student data, and parents have little or no control over the information that is collected or shared about their students. There is no mechanism for parents to grant access to (and accept contributions from) multiple providers. Empowering parents with control over these records is an important consideration.

Big Data in Education

The flood of data is coming. There's more of it, and it's coming from lots of new and different sources.

Using data to guide decisions is certainly nothing new. We are moving from a time of data poverty, in which data-driven decision making relied primarily on a single high-stakes assessment score, to a time of data abundance, in which it is collected frequently throughout the day. What's more, today's education system is data rich but information poor. There is already a tremendous amount of data produced through homework, essays, quizzes, assessments, projects, grades, teacher observations, tutoring sessions, and student portfolios. However, much of this resides in a paper format; even if it is captured electronically, it is usually trapped within different applications and does not contribute to an overall

individual record. Next-generation digital tools, services, platforms, and systems now give us the opportunity to collect and classify information down to the individual keystrokes of comparable students in parallel situations. We are just beginning to understand how these data can inform our understanding of the learners in our care.

The tools within this new technology-rich, personalized world of learning will both produce and consume data that can be analyzed to tailor each student's experience. The personal educational experience of each student will be further enhanced by ongoing and authentic assessments that are integrated seamlessly into the lesson, customized task lists that are driven by smart recommendation engines, social learning on a global scale, progress based on demonstrated mastery, and achievement recognition systems that certify attainment—all of which are made possible by advances in educational technology and learning sciences.

What can education learn from healthcare?

The U.S. healthcare and education systems are remarkably similar in some key ways. Both sectors deal with sensitive personal information and have laws to govern privacy protections regarding data—The Health Insurance Portability and Accountability Act of 1996 (HIPAA) Privacy Rule and the Family Educational Rights and Privacy Act (FERPA). As education leaders consider big data strategies, it may be helpful to explore how the healthcare sector has struggled with the same questions, particularly the move to electronic health records (EHR).

However, the healthcare sector is further ahead in both conceptualizing and implementing portable, personal EHRs than education. EHRs enjoy strong bipartisan support due to their ability to drive savings in healthcare while also reducing medical errors and improving healthcare quality. Fueling the rapid adoption of EHRs is $20 billion in America Recovery and Reinvestment Act funds that established a "Meaningful Use" adoption initiative. Under the program, physicians are eligible to receive a Medicare or Medicaid bonus payment if they not only adopt EHRs that meet certain technical and privacy standards but also demonstrate that they are "meaningfully using" these technologies based on adopted use and reporting standards. These financial "carrots" end in 2015, at which point a "stick" of financial penalties kicks in for physicians who do not meaningfully use EHRs.

The education sector could benefit from a similar approach that focuses on creating a more robust portable electronic student education record. Educators would have instant access to the student's entire education history, including the interactions and experiences with outside specialists - be it a tutor, a speech therapist, or a student's online AP teacher. And just as EHRs help facilitate better coordination of care among physicians and specialists, so too could an electronic student record facilitate better coordination of instruction among all of the adults and professionals that a student comes across in their academic careers.
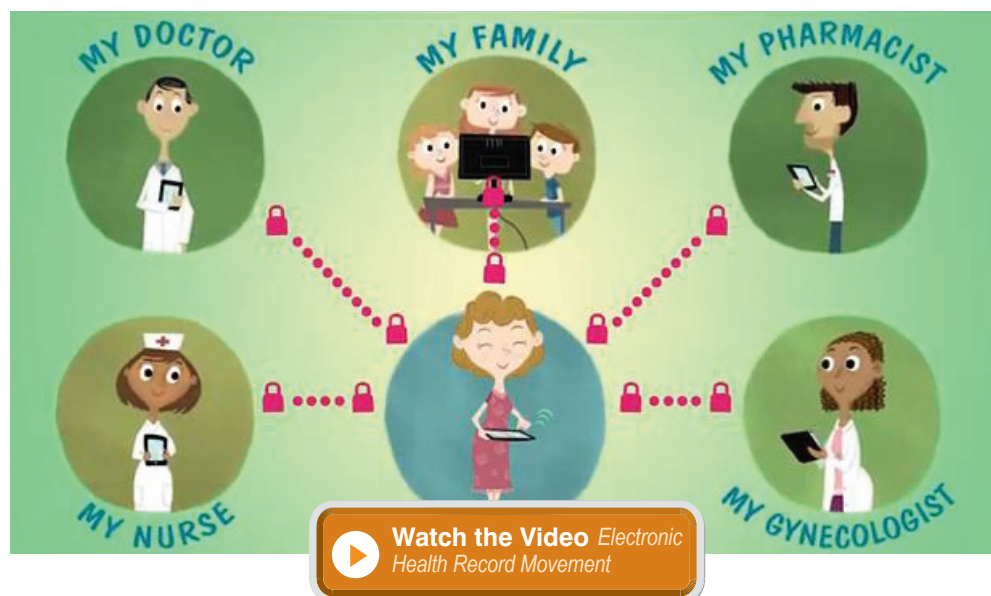
Note: Video available publicly on YouTube, courtesy of Health.Gov.

▶ **Watch the Video** *Electronic Health Record Movement*

THE POTENTIAL OF CUSTOMIZED LEARNING

Personalized learning has long been an aspiration of education technology.[3] National education technology plans, going back to the Clinton Administration and following through to the U.S. Department of Education's 2010 plan entitled "Transforming American Learning: Powered by Technology," all highlight the potential for technology to improve student learning, accelerate and expand effective practices, and boost data as a teaching guide.[4] This current Ed Tech Plan issues a call to action for American schools to leverage learning sciences and modern technology to "create engaging, relevant, and personalized learning experiences for all learners that mirror students' daily lives and the reality of their futures." Further:

The model of learning described in [the nation's EdTech plan] calls for engaging and empowering learning experiences for all learners. The model asks that we focus what and how we teach to match what people need to know, how they learn, where and when they will learn, and who needs to learn. It brings state-of-the art technology into learning to enable, motivate, and inspire all students, regardless of background, languages, or disabilities, to achieve. It leverages the power of technology to provide personalized learning and to enable continuous and lifelong learning.[5]

Achieving this vision has proven to be elusive. In early iterations, the technology overpromised results and often failed to deliver. New platforms with the algorithms and digital content necessary to deliver customized learning have only recently emerged. Schools struggled with adjusting their classroom models and instructional practices to take advantage of new technologies. And the majority of funding streams at the state and federal levels reinforced old models of learning. Only recently has the U.S. Department of Education restructured funding streams to support new models through programs such as Race to the Top District and the Investing in Innovation Fund.

Digital Learning

We know that every student should have equal access to personalized learning, and we believe this will not be possible without access to personal digital learning opportunities.

Digital Learning Now's 10 Elements of High Quality Digital Learning is a state policy framework for the future of education based on the premise that all students have a right to a high-quality education, which in the 21st century must include digital learning.[6] The framework stems from the belief that all students are digital learners and should have access to quality learning experiences that are unbounded by geography or artificial policy constraints.

Developed in 2010 with input from more than 100 experts, the framework was extended in 2011 to include a Roadmap for Reform that provides tangible steps toward systemic change.[7] Specific recommendations for state policymakers include:

- States should ensure local and state data systems (and related applications) are updated and robust enough to inform longitudinal management decisions, accountability, and instruction;
- States should ensure a digital formative assessment system;
- States must hold school and individual providers accountable for achievement and growth;
- States should evaluate the quality of content and courses predominantly on student learning data; and
- States must require students to demonstrate competency on a standardized assessment in order to advance.

▶ Watch the Video
Personalized Learning

Video available publicly on YouTube, courtesy of Digital Learning Now!

Personalized Learning

When learning is customized to the needs of individual learners, everyone wins. Much of the guesswork is removed from teaching, and limited resources like time and money can be funneled to more efficient and proven strategies. Teachers can focus on helping students take the next step down their individual learning paths, rather than wasting time trying to figure out where they are each beginning. Rather than being forced to "teach to the middle" on a predetermined path, teachers will have the tools to differentiate learning seamlessly, without adding more to an already overflowing plate.

New types of data can inform instruction and educational choices. Teachers can use metadata such as keystroke information, how much time students spend on each question, and what types of activities generate the most success to inform their understanding of each student's motivation and to form a comprehensive Learner Profile that will drive sophisticated recommendation engines and produce customized task lists of learning opportunities for each of their students across both content and context. Perhaps most importantly, this type of non-standard data can provide clues that indicate which types of learning experiences are most likely to encourage the most student persistence and so drive student success.

PERSONALIZED LEARNING · TYLER'S STORY

Tyler has always struggled in math. His parents have run out of ways to help him at home and his teachers have grown frustrated by his behavior problems during class. When Tyler's family moved to a new town after his mom found a new job, he was placed in Mrs. Putter's classroom. On Tyler's first day, Mrs. Putter spent some one-on-one time introducing Tyler to his tablet computer and helping him create his profile. Tyler answered some simple questions and then chose from a list of pre-installed apps for the afternoon's independent work time. While he was working, Mrs. Putter used her laptop's screenshare feature to watch Tyler work through his chosen online activities. As she switched windows to view another student working, Mrs. Putter's sidebar alerted her that Tyler had incorrectly answered 4 of the 5 questions on comparing fractions, so she dragged and dropped his name into the small-group instruction block from 3:00-3:30 for the students struggling with similar concepts. Tyler received a meeting invitation in his classroom inbox and an instant message from his teacher. The meeting would take place in the school cafeteria, where Mrs. Putter planned to use items from the kitchen to demonstrate comparing fractions, since she had learned from Tyler's earlier online survey

that he wanted to be a chef when he grew up. That evening when Tyler got home, his parents invited him to help prepare dinner using a recipe that required measuring and comparing fractions that was sent to them automatically as a follow-up activity based on his work in class. As the year went on, Mrs. Putter learned more and more about Tyler, thanks to the technology that powered his digital learning experiences. She learned what types of problems he was most likely to skip, and that he preferred fiction to illustrate difficult concepts. She learned he was motivated by competitive games and would persist longer at tasks if there was a clear path to recognizing his completion. Although Tyler's math scores began to improve almost immediately, the program was set up to notify Tyler's parents and teachers if he triggered any of the "early warning indicators" in the system, such as missed questions. When this happened, Mrs. Putter was able to add descriptions to his Learner Profile based on what she had learned about through her personal interactions with him, and observations with his peers, to augment the computer-generated data to help focus the interventions on the methods most likely to tap into Tyler's motivations and interests.

CURRENT EFFORTS

Although no one has yet realized a full-scale solution that can truly unlock the potential of personal digital learning that Digital Learning Now! first described, a number of current efforts are tackling some key components of the problem as we see it. These various efforts address different parts of the overall education data problem—some are looking for ways to expand the information that is collected, some are seeking to integrate information that is currently available, while others are providing new solutions for data analysis and presentation. In order to realize big data's true potential to impact learning, however, these efforts must come together in a unified way to address what might be called both the "what" and the "how" of personalized learning.

Learning Analytics

Traditionally, school systems and state departments of education have focused on building and enhancing data warehouses and student information systems. These technologies allowed for data to be collected, stored, and reported in rudimentary ways. Implementation challenges included identifying data owners who were responsible for updating elements, reducing duplicative reporting requirements, and producing data runs for compliance purposes.

As these systems improved and it became easier to collect data, a new field emerged around learning analytics, which focused more on analyzing data for trends, forecasting possible outcomes, and producing more actionable reports.

New personalized learning recommendation engines are now emerging that use the same science that drives Amazon's shopping recommendations or Netflix's suggested movies. Pandora and Spotify can create customized music playlists based on previous selections, but the magic in the user experience is in discovering whole new worlds of music that we never knew existed—now revealed to us by hidden analytics tied to the previous experiences of millions of other users. It only stands to reason that student learning could also be a personally tailored experience based upon a shared understanding of how similarly situated students learned a new skill or concept most effectively. At their best, these kinds of recommendations would be matched to student-level archives of information collected over years of building digital student profiles based on the individual successes and failures of each student.

Pioneers such as Scholastic's Read180 intervention, Wireless Generation, New Classrooms, and Education Elements already provide blended learning solutions that harness technology's potential to create a new degree of customized learning within a school setting. Tools from Knewton and Alleyoop also deploy smart engines and real-time analytics to guide what material students are presented in various situations. Stanford's H-STAR Institute is developing a 5-year plan for learner analytics, with the goal to bootstrap a national data ecosystem. Over time, tools will capture a growing set of student records that will become a new map of optimal learning paths to better inform instruction.

Current Solutions

For an overview of leading student data efforts, including Achievement Standards Network (ASN), Common Education Data Standards (CEDS), National Education Data Model (NEDM), Ed-Fi, Learning Resource Metadata Initiative, Postsecondary Electronic Standards Council (PESC), School Interoperability Framework (SIF), Shared Learning Collaborative (SLC) and how they fit together, please see Appendix A.

Learn more about Learning Analytics

Interested in learning more about how learning analytics can inform instruction and improve student achievement? Check out these infographics on Learning Analytics and Student Data and How Big Data is Changing the College Experience.

The Rise of the Algorithm

Adaptive assessments quickly identify a students learning level by adjusting the difficulty of questions based on his or her responses. Adaptive assessment and personalized instruction are being combined in powerful new ways.

Rocketship Elementary uses engaging and adaptive math products Dreambox Learning and ST Math to personalize math instruction. Knewton's adaptive engine delivers the right MyMathLab content to math students at Arizona State University reducing the amount of time they spend in developmental courses.

Blended learning platforms from Education Elements and Agilix help teachers personalize instruction using multiple content libraries.

Learner Profiles— For Teachers

Bloomboard allows teachers and leaders to create personal learning plans for professional development based on a Learner Profile and individual learning needs. Bloomboard includes tools to allow teachers to set their own goals, manage the observation process, and connect to a set of online resources that are specific to their own professional learning objectives.

All of this is very good, but none of it is nearly enough.

The flood of new data that is coming—potentially pouring in every moment of the day from billions of continually connected devices—first requires a strategy with the power, flexibility, and comprehensive internal architecture of the data system to make a whole array of personalized learning variables interoperable. If our future technologies are to identify and recommend singular learning paths based on a continuously expanding matrix of content characteristics (to include at least factors of learning preferences, learning environment, and student motivation), then we need to work today to define that data taxonomy that will promote sound engineering to the same degree it invites continuous innovation.

Point Solutions for Student Data

Enabling the next generation of personalized learning will require us to collect more robust and significantly enhanced student records. Taken together, these records should form the foundation of new district data systems. Nowhere near the rich variety of data envisioned here is currently captured and tied to a unique student record, since a uniformly categorized and shared set of student information does not yet exist. While some progress is being made in this area of "shared data standards," current efforts to date are more like "point solutions" that solve a single legacy issue. What is needed is a comprehensive student record of the kind described below and a safe, secure, flexible, and transparent technical infrastructure that adapts to the rich variety of digital data that is now pouring in from multiple instructional settings and across various aspects of the teaching and learning process.

One way to quickly see the limitations of our current environment is to imagine a whole universe of rich instructional content tied to smart assessment tools that could be seamlessly processed in four ways for every individual student, regardless of setting: (1) analyzed into unique component parts, (2) synthesized into multiple potential learning objects, (3) orchestrated across multiple learning paths, and (4) curated into singular personalized learning portfolios. Systems that are sufficiently flexible to adapt to these demands, while catering both to the unique needs of individual users and to the internal integrity of very specific content objects, are absolutely essential to the future of personalized learning.

Realizing this vision, however, requires both a more comprehensive student record and a more robust technical infrastructure than exists today. There has never been more momentum towards building the infrastructure to support this vision, thanks to the Common Core State Standards, Race to the Top, and the requirement to digitize statewide summative assessments by 2014. Yet this same momentum is creating a rush to implementation that today looks more likely to support the status quo of industrial age learning than to enable truly transformative innovation. If each state continues to duplicate the efforts of others, embed industrial era assumptions in their technology implementations, or create incompatible systems that at their core cause friction against the adoption of innovations in personalized learning at scale, we will never achieve the future envisioned here.

Therefore, just as with the current state of learning analytics, we applaud much of what is being done, yet remain singularly dissatisfied with the industry's failure to agree to a shared strategy.

RECOMMENDATIONS

There is a two-part solution to push the field one step closer to realizing this goal: creating a "Data Backpack" that follows each student along every transition throughout their education and developing an expanded "Learner Profile" that will power personalization and protect privacy. Inherent in these two new components is the recognition of questions regarding the "what" and the "how" of educational data; both are needed to synthesize the student records necessary to personalize learning.

The Student "Data Backpack"

The official transcript information that a teacher receives about a new student, either on the first day of school or in the middle of the school year, often reveals little more about the learner than his/her name, gender, race, age, and standardized test score history. Teachers are faced with the overwhelming task of spending weeks evaluating what works best for each individual student, often through inefficient trial and error methods that frustrate both teachers and students—and all of this information is lost the moment the student transitions to another teacher or grade level.

State and school district leaders should explore establishing a new minimum—a student "Data Backpack" that forms a new official transcript that can unlock the potential to personalize learning by giving students, parents, and teachers access to a greater quality and quantity of information. When coupled with conventional transcript records regarding demographics, special program status, and attendance history, the Data Backpack would form the foundation for personal digital learning across traditional, online, and blended

Recommendations to Power Personalization

**Personalized
Learning
*From Day One***

**Personalized
Learning
*To College and
Career Readiness***

Student Data Backpack

- Demographic data
- Standards-based gradebook (computer and teacher entered items)
- Grades and transcript data (for secondary students)
- Portfolio of personal bests (e.g., current writing sample)
- State testing data
- Attendance and behavior data
- Supplementary student supports

Expanded Learner Profile

- Expanded achievement data
- Motivational profile that predicts persistence and performance
- A narrative description of student assets and challenges
- Recognitions and badges
- Full portfolio of student work
- Student goal statements
- College and career readiness tracker

Optional Additions to Profile:
- Non-cognitive variables
- Self-management skills
- Behavior and character education
- Record of community service

learning settings. This would differ from a traditional data warehouse in key ways. While a data warehouse houses student information, the Data Backpack is our description of the new minimum standard for official student transcripts.

Each student's Data Backpack would move seamlessly from course to course, classroom to classroom, grade to grade, school to school, and across learning experiences of every kind, including afterschool and enrichment programs. This universally transferable set of information would function as a "super gradebook" for teachers and house standards-based achievement information (tagged in correlation with CCSS subskills for example). While current transcripts do not reveal a student's ranking along a continuum of learning objectives, the "super gradebook" would not only contain summative data from standardized achievement tests, but thousands of formative observations (gathered both from teachers and computer-based learning experiences). As a lifelong archive of achievements, the Data Backpack would also allow for collections of demonstrated competency, such as a portfolio of personal bests and proudly stored artifacts of learning such as essays or projects.

Each student's Data Backpack would be formed from both teacher-entered and computer-generated entries. Data from participation in digital learning experiences such as games, apps, and programs could be set to automatically enter student data into a pre-determined template to house information that would be most useful to teachers, parents, and students. Overall, the Data Backpack would function as the "read-only" portion

of the student record, as it would only contain artifacts from pre-approved and certified sources.

A student portfolio of this kind would be used in many contexts and across many layers of the technology architecture. Properly used, it could seamlessly inform parents, students, and educators of student progress; provide insight for curriculum, content, and application development; inform scholars regarding the effectiveness of individual interventions; and advance the state of education science.

An Expanded Learner Profile

Each student's Data Backpack would be complemented by an expanded "Learner Profile" that could be easily accessed and managed by the various teachers, tutors, and education providers that come in contact with a student. It would simultaneously function as a way to track student progress and preferences and to gather data to evaluate content, courses, interventions, and teachers. The expanded Learner Profile would move beyond the limitations of today's paper transcript to track and measure factors that affect learning which have, until recently, been nearly impossible to efficiently gauge. With recent advances in technology inside and outside the field of education, we can now gather and evaluate student data related to learning patterns, preferences, and the types of learning experiences that produce the most effective outcomes for each student.

In contrast to the Backpack, which would function as the "read-only" portion of the student record, the broader Learner Profile would be more open to contributions from multiple providers and sources.

Profiles and Platforms

See Appendix B: Toward Comprehensive Learner Profiles for an overview of current tools that highlight the potential breadth of the Learner Profile.

See Appendix C: Next Generation Learning Platforms for a scan of personalized learning tools and platforms.

The expanded Learner Profile will also need to remain flexible to allow for integration with new achievement recognition systems such as learning badges and data visualization strategies. As these systems become more widely recognized and adopted, they will increasingly become the new standard for communicating demonstrated achievement and will move to the standard Data Backpack. There are a number of technological tools to facilitate the development of an online portfolio that will form an archive of student work over time. Part of that record could be constantly updating "personal bests," for example of a piece of writing or a project. One option would be to include the "personal best" artifact as one element of every student's new minimum Data Backpack and to archive personal bests and other work samples in the deeper Learner Profile. Students, teachers, and parents could all be a part of the decision to choose work samples. In order to prevent the Learner Profile from becoming a disorganized assembly of artifacts, we propose a common system of predetermined categories that will help facilitate improved comparability across classrooms and schools.

AN EXPANDED LEARNER PROFILE · MADELINE'S STORY

Madeline was a third grader assigned to Mrs. Moore's class when she moved into Forest Lane School District in 2009. The week before school started, Mrs. Moore reviewed the cumulative files of her 25 incoming students. She was especially eager to review the files of Madeline and the three other students new to the district this year. As she thumbed through Madeline's file, she discovered that Madeline was a Caucasian female student with a March birthday. She missed four days of school last year, and her parents' names were Jill and Steven. A review of Madeline's grades from elementary school to date revealed "Satisfactory" in all subjects, and her standardized test scores showed she was performing on grade level.

Madeline was a seventh grader assigned to Mr. Miner's class when she moved again in 2013. Over the summer, Mr. Miner reviewed the online records of the students coming into his new class on his tablet. Mr. Miner was in his tenth year of teaching, and particularly loved teaching seventh graders since they began each year with a fresh start in a new building in his district. He also knew it could be a challenging time for students who were experiencing big social and emotional changes, and he understood the importance of finding ways to connect with each of them individually. As Mr. Miner reviewed the learning profiles of the students in his class, he used data visualization tools to get a quick overview of the students' abilities and found out right away that all but two students had already mastered the standards in the first math unit. He noticed that a new student, Madeline, had already mastered the majority of the standards for the seventh grade curriculum, and he flagged her advanced level work and sent her profile to the guidance counselor for a gifted evaluation. As he flipped through each student's Learner Profile, he was able to start building a picture of each of them. Combined with the narrative descriptions from past teachers and examples of personal best work, the expanded achievement data gave Mr. Miner an advanced understanding of the strengths and weaknesses of his class as a whole and of each individual student in his class—all before Mr. Miner or any of his students stepped a foot into the classroom. Madeline was eager to meet Mr. Miner, who had already emailed her over the summer to introduce himself and ask her about her passion for horses that was revealed in her profile. School was always a pretty boring place for Madeline, but she was amazed to find that her work was engaging and interesting—and almost immediately. Each morning Madeline eagerly opened her "playlist" to find options for the day's activities. She knew that as she mastered something, she could move onto what was next, rather than having to sit and wait for something that challenged her. And she couldn't wait to get started.

The Learner Profile would evolve to meet students' needs over the course of their educational careers. For instance, as the student approaches later grades, the profile could grow to include a college and career readiness tracker with data visualization tools to support the achievement of key milestones along the way.

An additional option for expanding the Learner Profile would be to include non-cognitive variables that impact learning. Monitoring factors like persistence, psychological health, and resilience could create an "early warning system" that could trigger further evaluation and intervention. A recent report from the Brookings Institution reveals that schools in 16 states are using data mining techniques to identify at-risk students.[8] America's Promise and Johns Hopkins University have also highlighted how readily accessible data can serve as an early warning indicator for student dropouts.[9]

Tools—such as those employed by Charlotte-Mecklenburg County, North Carolina and Arizona State's eAdvisor System—use prediction models based on factors such as truancy, disciplinary problems, changes in course performance, overall grades, and more to signal when students fall "off track" or exhibit "at-risk" behavior. This data could be further combined with information gleaned from other informal learning settings, club activities, athletics, and the arts—or merged with descriptions of various skills and behaviors that teachers observe based on more closely working with students, such as their study habits, personal character traits, and interactions that unlock their deepest individual interests. In the end, it is neither utopian nor Orwellian to suggest that any information collected from participation in any activity at all (e.g., Boys & Girls Clubs, mentorship programs, outside tutoring) could only further bolster the Learner Profile's ability to present a holistic picture of the student across every stage in a lifetime of learning. But to work well, the Learner Profile has to be properly designed.

What questions does a parent have about his/her child's education?

Is he/she on track to graduate high school? Is he/she on track to attend college?

Are there areas where my child is really thriving or showing advanced aptitude that I can use to further motivate him/her?

How is my child achieving compared to his/her peers?

Are there any areas where my child is struggling? What resources exist for me to help him/her at home in the exact areas where she is weak?

What type of learning environment seems to work best for my student?

How can I become more involved in helping my child to succeed to his/her fullest potential in school?

Video available publicly on YouTube, courtesy of Office of Educational Technology

Watch the Video *MyData Button's Personal Learning Profile*

What does it take for a parent to access his/her child's records?

While it differs from state to state, there are often many hurdles that parents have to overcome to access their child's school records. Often, access requires the completion of an application, payment of a processing fee and waiting for several weeks. In New York City Public Schools for example, principals have 45 days to fulfill parent requests. Even if parents jump through these hoops, the information they do get is often limited and difficult for a non-educator to decode.

Privacy Management Tools

When it comes to student records, control and transparency are equally important considerations and raise important questions regarding privacy and information sharing. Privacy management tools must be an element of the shift to expanded student records and profiles, in order to protect students and empower families and help better meet the goals of the Family Educational Rights and Privacy Act (FERPA) and state privacy laws. Key questions include:

• What limits are placed on a school's ability to disclose data in education records to third parties without parents' consent?

• How can parents and students more easily access all education records directly related to them?

• What is the process for challenging, correcting, or appealing inaccurate or misleading data?

Many states have student record privacy or confidentiality laws that affirm or extend FERPA. While no state may have a law more lenient than FERPA, some states may impose greater restrictions on the types of data that can be collected, how it is stored, and under what conditions it can be released.

This is about more than just complying with federal and state regulations; it is about protecting sensitive student information and privacy rights as a core design principle in developing enhanced student records.

Empowered Choices

While the contents of each student's Data Backpack would be populated by a set of common elements for all students at a new minimum level, the components of each student's Learner Profile could be customized based on family decisions.

The MyData initiative is a joint project between the U.S. Department of Education and the White House Office of Science and Technology Policy (OSTP) to encourage schools and digital learning providers that host student data to allow students and parents to easily download their own data in order to create a personal learning profile that they can keep with them throughout their learning career.

This approach offers a first step to parents and students to easily export their data and potentially share it with other services and providers. Supporting the exporting of data will require different providers to use uniform protocols for granting access to and authorizing any transmission of the official record in a way that is safe, secure, and respects the privacy of all concerned. From a technical standpoint, the SIF Association is a nonprofit organization with 3,200 members that have come together to create a set of rules and definitions that enable software programs from different companies to share information. In addition to ensuring that programs within a school or district are able to share data without requiring each vendor

to learn and support the intricacies of other vendors' applications, it is critically important to anticipate the needs of individual students and parents so that a single student record like the Student Data Backpack could be accessed and used by individual students and their families as they choose. This is simply not possible today.

When it comes to educational data, awareness is important, but it is possible to go one step further by creating processes within the system that engage and empower families. This type of engagement could include options for parents and students to get involved with collaborative goal setting throughout the school year and systems that alert parents when students are exhibiting declining effort or achievement.[10] In order to facilitate meaningful family involvement in student record management, the data must be displayed in a user-friendly format and be matched with specific tools and actions. Careful attention must be paid to presenting users with data that serves their individual needs in a format that is customizable and adaptive. While parents might want to have access to comprehensive profiles, they will most likely be interested in real-time information that they can use to guide involvement right now.

Privacy management is a critical aspect of making these records more easily available to students and parents. In addition to standard privacy controls such as encryption for sensitive information and user authentication, the new records will include a Facebook-like set of privacy management tools that let parents determine what data gets shared, and with whom. Parents could determine, for instance, if they were comfortable with sharing information about their child's profile with outside community organizations, institutions of higher education, or tutors. The key design principle must be to give users the tools to control what is shared with whom in a way that is easy to understand and allows the parent and student to know when information is disclosed and to whom.

Proper training of students and parents will be essential to guide them to make the best decisions regarding data and information sharing. Teachers and administrators will also need thorough professional development to learn more about interpreting these new and varied data sources—and to become well versed in the legal issues surrounding student privacy and data management. Training will also help lessen the potential for tracking students based on a set of differentiated expectations, rather than properly using data to differentiate and personalize instruction in a way that sets high expectations for all learners.

IMPLEMENTATION CONSIDERATIONS & CHALLENGES

The transition from the current official student record to a more comprehensive and holistic Data Backpack and Learner Profile will not be without its challenges. After addressing basic questions around FERPA, state and local regulations, and other legal issues such as varied definitions of what constitutes a student record, there are a number of agenda-setting "big questions" that will need the focused attention of leaders across all aspects of the system. Tackling these challenges will also require collaborative involvement from all parties, ranging from state leaders and policymakers to developers and industry leaders, in addition to representatives from education agencies, advocacy organizations, and funders.

Our research has generated a list of implementation challenges in these categories:[11]

Borders and Boundaries

The Data Backpack and Learner Profile must be operational for a wide range of stakeholders—from students and parents to teachers and administrators, as well as course providers and service providers. State and local leaders, in collaboration with the private sector and federal government, need to determine to what extent information from external providers and informal learning opportunities will become a part of each student's record, in addition to the overall question of "ownership" of the components of the official transcript. While issues of quality are of course important, being too strict about allowing information about students generated from learning experiences that fall outside the standard school day could be detrimental. Many kids are blending their own learning down to the course level, and the new transcript must allow for information to be accumulated from multiple sources, platforms, and providers.

Technical and Translational Issues

Systems such as predictive algorithms and smart engines already exist at scale in fields outside of education. As technology evolves, existing privacy and information-sharing policies have also evolved to accommodate new opportunities offered by technology while still protecting sensitive information. The biggest challenge to education is to "translate" the relevant functionality from various systems in fields like health, supply chain management, library science, and ecommerce into the field of education. Once translated, additional issues that fall under this category include system design and maintenance and determining protocols for coding, organizing, and sharing information.

Collaboration Concerns

Researchers from the Brookings Institution note that the most significant obstacle to overcome is building a common data-sharing network and explaining how current systems are disconnected from one another, with separate systems for academics, discipline, attendance, etc.[12]

This problem is further complicated by the fact that data is collected outside the traditional school system, by external providers and online applications, that could provide useful information for the schools to expand and inform student records. Without system integration and shared data formatting, comparability is lost and important learning trends go unrevealed. The lack of a common system can also force providers with innovative solutions to go straight to students outside traditional school hours, because it's too difficult to work within school districts with diverse systems.

For example, a common system for tagging the Common Core State Standards into microstandards will be necessary to build a common comprehensive Learner Profile with improved comparability from grade to grade and state to state. This raises questions about proprietary information and incentives to share what many industry leaders consider intellectual property. Standards databases, like the Achievement Standards Network, will allow translation between Common Core states and other states.

These are issues that will need further investigation as solutions are generated, since there will be some data points (testing, for example) that are common enough to cross systems, while others may be unique to the needs of individual users and providers and would only clutter and muddy the student backpack and profile elements that are intended to guide instruction.
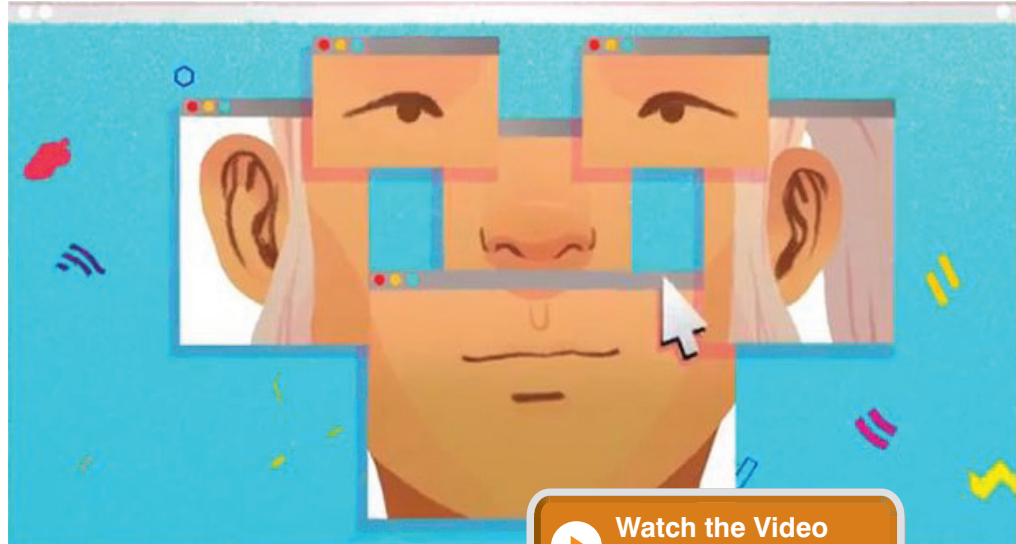
Watch the Video
Voice of the Active Learner

Video available publicly on YouTube, courtesy of BlackboardTV

Unintended Consequences

The move to an expanded system of student record keeping is not without its risks. If the data collected are not valid, rich, and properly used, the expanded profile could have the opposite effect of narrowing the educational experience, rather than enhancing it. There's certainly an important difference between differentiated instruction and differential expectations. In addition to maintaining a keen awareness of the potential for lowered expectations, the system must also guard against potential threats like privacy exploitation, cheating, and misrepresentation. As we move beyond measures of basic skills to formulate a more comprehensive overall profile of student learning, we must be careful not to generate unintended consequences.

CONCLUSION

The potential for achievement and participation data to personalize learning and improve educational outcomes in the United States is vast. In this paper we have described how the rich concept of a Student Data Backpack, paired with a more comprehensive Learner Profile, could greatly improve educational decisions, increase access to more focused and relevant instruction, motivate students to learn in new ways, and boost achievement.

Strong leadership, broad collaboration, and a commitment to innovation that does not sacrifice privacy are essential to getting this right. But it is also true that a new era is already upon us; too much time has already been wasted, and too many resources squandered. Digital natives are in our classrooms today, and we must build new systems that can work together to support the smarter evolution of our educational system into one that better personalizes instruction and expands the total opportunity for all of us to learn.

In summary, we believe there is a threefold challenge before us: a definitional challenge, a legal challenge, and a technical challenge. Together we need to answer the following questions: (1) What kind of data are we talking about? (2) What legal guidance is required for custodians and users of the data? And (3) How do we safely and securely move the data in ways that both maintain its integrity and make it maximally useful?

The majority of this paper has concentrated on the definitional challenge. We have described the power and potential of the Student Data Backpack and Learner Profile not just to inform the imagination, but to invite a

more rigorous and systematic definition of what exactly constitutes each of these and what exactly must be built to bring them into being. We do not believe that we have completed that assignment here—there is still much work left to be done. To take but one example from these pages to demonstrate how our recommendations are not yet actionable, consider how a gradebook full of achievement data would follow a child. Today almost all assessment data is course/content, platform, district, or state specific. For this information to meet our minimum requirement that it be analyzed into component parts and then curated into singular personalized learning portfolios, would require at least (1) a universally recognized micro-tagging strategy and 2) a common record format that makes it easy to export/import this kind of data. Getting this done is an absolutely necessary first step that has yet to be successfully executed by a cross-industry working group with the expertise to make it happen.

Privacy is a real issue that must be protected as these systems evolve. However, much of what is described in this paper can be done within the bounds of FERPA and other privacy laws already on the books.

Finally, it is important to note that the primary barrier to the widespread use of these enhanced records is organizational, not technical. These records build on the important work is underway by efforts such as the NEDM, SLC, DQC, and other state transcript efforts. Analytic and personalization tools have advanced in other areas, particularly in consumer services. There are also important lessons to learn from how the healthcare sector is deploying safe, secure electronic

medical records to every American within the next five years. The main challenge for implementing the Student Data Back and Learner Profile is pulling these piecemeal initiatives into a comprehensive effort driven by state and district leaders.

More than anything else, it is absolutely essential that we work together across all 50 states and all 15,000 school districts to outline the specifications of a new universal standard for the Student Data Backpack and Learner Profile. An adoption campaign, not less substantial than the DQC of the last decade, will be required to gain widespread agreement on the specifications of a new universal standard for the Student Data Backpack and Learner Profile. Working together we can craft an approach that will allow for the safe, secure, and nearly instant communication of student data in a myriad of settings across a myriad of users to support deeper, richer, and more informed learning experiences to improve educational outcomes for all. This is what we are calling for.

To be successful, each constituency in the "digital learning landscape" not only has to be engaged, but also has to work hard to arrive at a solution that addresses the needs of all the other parties in question. Federal and state governments together with vendors and school districts need to take action in tandem to work towards a single solution that meets everyone's needs at once.

In order to get there as quickly as possible, the following next steps are recommended as immediate action items that we can put in place now:

1 States should use state transcripts to advance the Student Data Backpack recommendations, incorporate the expanded records into their longitudinal data systems, facilitate in state transfer of grade book data, and accelerate the adoption of important standards such as Ed-Fi, SIF, and the work underway by the SLC.

2 State and federal funding streams should encourage the adoption of robust, enhanced student records. State and federal policies related to the adoption of electronic medical records provides a useful model. IEPs may also offer a starting point given the need to coordinate education services among multiple providers, support parental decisions, and enable better state and federal reporting.

3 Districts should build these same data interoperability and industry standards into new RFPs for instructional resources, online services, and data systems and create pilot projects around expanded learner profiles.

4 Private sector solution providers should embrace emerging standards such as Ed-Fi, SIF, as well as the MyData specifications from the U.S. Department of Education.

Working together, we can execute an action plan to design and develop the cross-industry adoption of a safe, secure, flexible, and transparent universal standard. How this data is stored, who is the official steward of it, and the actual data structure itself will all be defined so that participants in the teaching and learning process can all benefit from the power of the Student Data Backpack and Learner Profile to usher in a new era of personalized learning.

ENDNOTES

1. U.S. National Center for Education Statistics, as cited in the Statistical Abstract of the United States: 2011 (Tables 215 and 615). http://www.census.gov/compendia/statab/
2. Data Quality Campaign, 10 Essential Elements of a State Longitudinal Data System Website, http://www.dataqualitycampaign.org/build/elements/
3. For example, the USDOE 2004 EdTech plan also referenced data, personalized learning, and competency-based learning. See Toward A New Golden Age In American Education. http://www2.ed.gov/about/offices/list/os/technology/plan/2004/plan.pdf
4. U.S. Department of Education Office of Educational Technology. Transforming American Learning: Powered by Technology, 2010. http://www.ed.gov/sites/default/files/netp2010.pdf
5. Ibid.
6. Digital Learning Now! website. http://digitallearningnow.com/
7. Digital Learning Now! Roadmap to Reform website http://digitallearningnow.com/roadmap-to-reform/
8. West, 2012.
9. For example, See Heppen, J and Susan Bowles Therriault, S. Developing Early Warning Systems to Identify Potential High School Dropouts. National High School Center, 2008. http://www.betterhighschools.org/pubs/ews_guide.asp
10. For example, Pearson's PowerSchool has an "easy goal" tool: http://www.pearsonschoolsystems.com/pdf/throwsheets/pearson-partner-samegoal.pdf
11. This list was generated from numerous interviewers and conversations. Please see the Acknowledgements section for a list of participants.
12. West, 2012.

## APPENDIX A:
THE CURRENT DATA SOLUTIONS LANDSCAPE

The figure below, used with the permission of the team at Ed-Fi Alliance, is an attempt to clarify how many of the current efforts fit together. Information for this section was gathered from public resources and describes summary-level objectives and interrelationships of these key initiatives.

The greatest level of generality is at the bottom of the figure; the NCES handbooks provide guidance on consistency in data definitions so that all such data can be accurately identified when either aggregated or analyzed. As you move upwards through the figure, the data becomes increasingly more specific—requiring more detail and definition in the data protocol and more flexibility across the technical infrastructure if systems citing or transferring these data are to be interoperable.

What is missing from the illustration, perched at the very top, is the single record of a universally accessible Student Data Backpack and comprehensive Learner Profile, which have the power to benefit from (and make sense of) all these efforts through the coordinated handling of supremely comprehensive individual student records.

Unless—and until—all of these efforts come together to enable the swift and secure transfer of individual student records that can be used to drive individual student achievement in the most innovative and imaginative ways possible, we will only be working at the margins.

How do they fit together?

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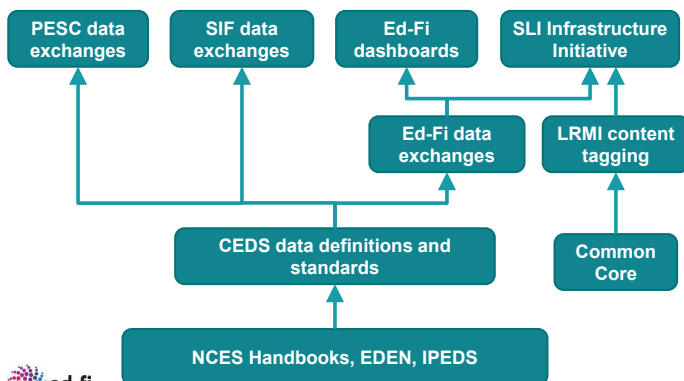
Achievement Standards Network (ASN) is the largest open-access repository of learning objective data on the web. It provides access to machine-readable representations of learning objectives published by education agencies and organizations, including the Common Core State Standards.

Common Education Data Standards (CEDS) is an NCES-led group that created a set of commonly used P-20 education data elements to support the effective exchange of data within and across states, through student transitions, for federal reporting.

Ed-Fi tools include a universal educational data standard and tool suite that align with CEDS and is supported by the Michael & Susan Dell Foundation. Ed-Fi tools are designed to integrate information from a broad range of existing education data sources to facilitate data comparisons and interoperability. The tool suite also allows vendors to develop reusable products across multiple states. The Ed-Fi 1.1 version, out in November, includes improved dashboards, content tagging, and student assessment tracking. Ed-Fi has been incorporated into SLC.

Learning Resource Metadata Initiative is an initiative for tagging diverse educational content to match it with learning objectives.

The U.S. Department of Education and the Council of Chief State School Officers also developed the National Education Data Model (NEDM), which is a conceptual but detailed representation of educational data focused at the student, instructor, and course/class levels.

Postsecondary Electronic Standards Council (PESC) is collection of organizations that provides standards for the flow of student data between the K-12, Postsecondary, and federal data collections.

School Interoperability Framework (SIF) is a specification of rules, definitions, and data formats that enables programs and systems from different systems to share information.

Shared Learning Collaborative (SLC) aims to help teachers more efficiently enable effective, personalized instruction. Sponsored by the Bill & Melinda Gates Foundation with support from Carnegie Corporation, SLC is a data-sharing alliance of five states (and four more in 2013) working together on data-sharing standards and supporting middleware systems. Shared Learning Infrastructure (SLI) is a platform for teachers to find the resources and tools to address individual student learning needs.

Student Information Systems

PowerSchool is a student information system that supports 10 million students. In states like Idaho, students can move from one school or district to another and their "Digital Backpack" follows them. When a student moves from any PowerSchool district to another, the student record is transferred to the new school. In districts with PowerSchool and Schoolnet, an integrated backpack combines the gradebook data with summative and formative assessment data. Any special documentation (RTI, IEPs, etc.) is also attached.

Infinite Campus manages more than 5 million students. Scheduling tools help match students with teachers based on learning plans. Other widely used systems include Illuminate Education SIS , Genius SIS, and Maestro SIS.

Standards-based Gradebooks

PowerTeacher is the most widely used standards-based gradebook. With similar functionality, Engrade combines gradebook, attendance, and calendar in one toolset. Echo powers project-based learning across the New Tech Network. Project Foundry supports project-based learning and competency tracking in Edvisions schools.

Dozens of schools are sponsoring the development of next-generation tools. For example, Federal Way Public Schools worked with Global Scholar on a standards-based gradebook and E.L. Haynes Public Charter School sponsored the development of SchoolForce gradebooks.

Portfolio of Student Work

Digication and Pathbrite are comprehensive e-Portfolio providers for K-12 and higher education. OpenSchool ePortfolio is an open resource. Three Ring manages student artifacts.

Non-cognitive Variables

Renzulli Learning's Personal Success Plan helps students identify their interests, develop talents, associate with role models, and create goals and plans. Goalbook helps educators, students, and parents collaborate on personal learning plans for students with special needs based on individual learning goals and needs.

TurnAround for Children helps New York City schools measure and address the predictable effects of poverty on cognitive, social, and emotional skills. The Strive Network dashboard combines academic and non-academic student support data from sources inside and outside the classroom to form a comprehensive student profile and evaluate programs and investments.
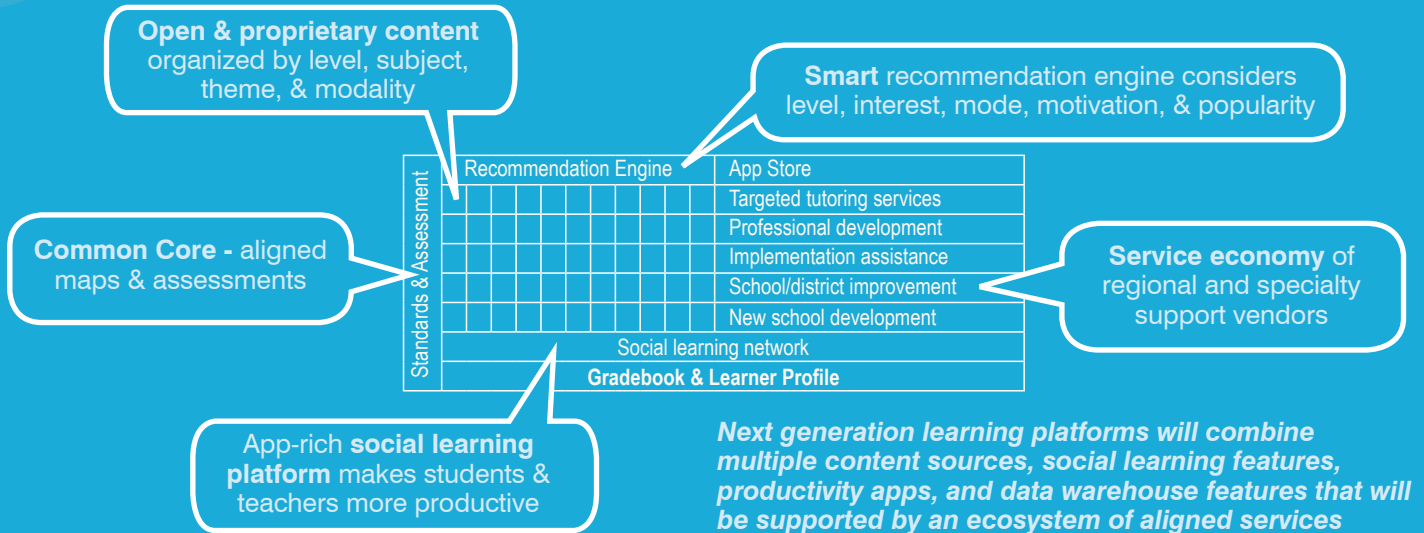
Naviance helps high school students and teachers navigate college and career readiness with tools to monitor student performance and provide early warning indicators for falling off-track.

APPENDIX B: TOWARD COMPREHENSIVE LEARNER PROFILES

To illustrate some of the breadth of a comprehensive Learner Profile, this exhibit includes examples of the rich and rapidly developing landscape of tools. Profiles will include student information systems, gradebooks, portfolios, and non-cognitive variables. Data will be shared within networks or across state lines using facilities like The National Transcript Center. The list of profile elements is illustrative and not comprehensive.

Open & proprietary content organized by level, subject, theme, & modality

Smart recommendation engine considers level, interest, mode, motivation, & popularity

Common Core - aligned maps & assessments

Service economy of regional and specialty support vendors

Standards & Assessment	Recommendation Engine	App Store
		Targeted tutoring services
		Professional development
		Implementation assistance
		School/district improvement
		New school development
	Social learning network	
	Gradebook & Learner Profile	

App-rich **social learning platform** makes students & teachers more productive

Next generation learning platforms will combine multiple content sources, social learning features, productivity apps, and data warehouse features that will be supported by an ecosystem of aligned services

APPENDIX C: NEXT GENERATION LEARNING PLATFORMS

Over the next few years, the ability to capture several orders of magnitude more data about each student will develop. Next-generation tools and platforms will make it easier to create, manage, and use Learner Profiles to personalize learning.

Adaptive Engines that Modify Instruction Based on Student Responses

Dreambox Learning provides an adaptive game-based K-5 math product.

i-Ready, from Curriculum Associates, is an adaptive K-8 reading and math diagnostic with aligned instruction.

NWEA has an adaptive K-12 math and reading assessment linked to Compass Learning content.

Wireless Generation provides formative assessment, learning analytics, and adaptive curriculum to improve student achievement.

READ180 is a blended reading intervention program for grades 4-12 that leverages adaptive technology to individualize instruction for students and provide data for differentiation to teachers.

Alleyoop uses a game-based approach to engage students who need additional support in math and science outside the classroom.

Knewton queues MyMath Lab content based on student success in Arizona State developmental math courses.

Blended Learning Platforms

EdElements powers classroom rotation-blended learning models at KIPP LA, Alliance for College Ready Public Schools, and IDEA Public Schools.

Learning management systems like Brainhoney, Desire2Learn, and Vschoolz continue to add personalization tools for blended learning environments.

Blended Math Platforms with Customized Playlists

Teach to One: Math from New Classrooms (the inventors of School of One) combines diagnostic academic assessments and non-academic surveys to develop an initial Learner Profile and use daily feedback to recommend a possible instructional experience for each learner each day.

Summit Public Schools is working with Illuminate and Khan Academy to build customized math playlists for every student.

Curated Content Playlists

Social learning platform Edmodo provides its more than 11 million teachers and student users a secure place to connect, collaborate, and share content—including tools that allow students to share their feelings about assignments with their teachers.

PowerMyLearning has grade-level learning experiences that teachers, parents, and students can use to build customized playlists.

eSpark Learning recommends iPad apps for elementary students based on identified needs and interests.

Gooru Learning is a search engine for learning with open grade level resources.

The Floe Project and The Gateway are big open education resource libraries with tools that aim to match learner needs with suitable content.

APPENDIX D:
EDUCATIONAL DATA RESOURCES

Research and Reports

Brookings Institution
Big Data for Education: Data Mining, Data Analytics, and Web Dashboards

Chronicle of Higher Education Special Report
Big Data's Mass Appeal

Data Quality Campaign
10 Essential Elements of Statewide Longitudinal Data Systems
10 State Actions to Support Effective Data Use

Knowledge Media Institute, The Open University
The State of Learning Analytics in 2012: A Review and Future Challenges

McKinsey Global Institute
Big data: The next frontier for innovation, competition, and productivity

New Media Consortium
2012 Horizon Report, Higher Education

U.S. Department of Education, Office of Educational Technology
Enhancing Teaching and Learning Through Educational Data Mining and Learning Analytics

Resources

Achievement Standards Network (ASN)
Common Education Data Standards (CEDS)
Digital Learning Now! Roadmap to Reform
Ed-Fi
EDUCAUSE Learning Analytics Resource Page
Learning Resource Metadata Initiative
National Education Data Model (NEDM)
Postsecondary Electronic Standards Council (PESC)
School Interoperability Framework (SIF)
Shared Learning Collaborative (SLC)
U.S. Department of Education Office of Technology Research and Reports Website

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Casey is the Chief Executive Officer of Faith in the Future, an independent foundation that manages 17 Catholic high schools and four schools of special education within the Archdiocese of Philadelphia. This foundation also provides support services for all Archdiocesan schools in the five-county Philadelphia region. During his career, Casey has been President of National Heritage Academies, a charter school management company that operates over 75 schools in nine states, President of CfBT USA—the U.S. affiliate of CfBT Education Trust—the Head of Global Corporate Social Responsibility for Houghton Mifflin Harcourt, and the Executive Director of the Houghton Mifflin Harcourt Foundation. Casey is also the author of *On Purpose: How Great School Cultures Form Strong Character*, published by Corwin Press/SAGE International, and *No Excuses: Lessons from 21 High-Performing, High Poverty Schools*. His articles, essays, and columns have appeared in more than 180 newspapers and magazines.

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Director of Policy and Research, Getting Smart
Carri is the Director of Policy and Research at Getting Smart. With a background in both policy and practice, she has taught in classrooms from elementary schools to college campuses. Carri has served as an online educator since 2005 in a fully online Master's program in Educational Leadership and has authored several pieces on the future of education. She co-edited the book *Building a 21st Century U.S. Education System* with Bob Wehling, published by NCTAF. Carri has been actively involved in supporting education policy efforts to advance digital and blended learning opportunities as a consultant to state and national organizations, including KnowledgeWorks. She holds an M.Ed. in Educational Administration and an Ed.D. in Urban Educational Leadership.

Tom Vander Ark
Author and Executive Editor, Getting Smart
Tom is the author of *Getting Smart: How Digital Learning is Changing the World* and the Executive Editor of GettingSmart.com. He is also a Partner in Learn Capital, a venture capital firm that invests in learning content, platforms, and services with the goal of transforming educational engagement, access, and effectiveness. Previously he served as President of the X PRIZE Foundation and was the Executive Director of Education for the Bill & Melinda Gates Foundation. Tom was also the first business executive to serve as a public school superintendent in Washington State. Tom is a Director of the International Association for K-12 Online Learning (iNACOL) and several other nonprofits.

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