

# TECHNOLOGY-ENABLED *Personalized* LEARNING

## SUMMIT

### Findings & Recommendations to Accelerate Implementation

Based upon the National Summit  
Hosted by the Friday Institute for Educational Innovation at NC State University  
February 2014 / Raleigh, NC



**Technology-Enabled Personalized Learning**  
***Findings & Recommendations to Accelerate Implementation***

Based upon the National Summit  
Hosted by the Friday Institute for Educational Innovation at NC State University  
2014 / Raleigh, NC  
<http://www.fi.ncsu.edu/tepl/>

In collaboration with  
Digital Promise, League of Innovative Schools  
Michigan Association of Intermediate School Administrators (MAISA)  
Software & Information Industry Association (SIIA)

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## Background

On February 11-13, 2014, the Friday Institute hosted more than one hundred education leaders for a National Summit on **Technology-Enabled Personalized Learning (TEPL)**. This working meeting brought together innovative leaders in the field – educators, service providers, nonprofit leaders, researchers, and other stakeholders – and built upon some of the partnerships, findings, and outcomes from a related 2010 National Summit.\*<sup>1</sup>

The Summit was informed by and sought to identify and accelerate the many important initiatives underway to deliver the new learning paradigms needed to accomplish personalized learning. Leaders in the field compared experiences, discussed common challenges and barriers, and identified potential solutions and models that all must be addressed collectively to scale the implementation of personalized learning through technology. Outcomes included development of action plans, tangible recommendations, partnerships, and furthering of participants' knowledge. The [TEPL site](#) provides information about the Summit and videos of presentations and panels.

More specifically, Summit organizers identified the following Summit goals:

- ✓ Bridge currently dispersed interdisciplinary networks of UDL (Universal Design for Learning) and Learning Analytics (LA).
- ✓ Address technical (e.g., metadata and integration), business model (e.g., content packaging and license models), regulatory (e.g., data privacy) and other issues best solved collectively.
- ✓ Provide an experience that advances the collective and individual knowledge of participants to share expertise and develop partnerships.
- ✓ Identify gaps, needed deliverables, and action steps for follow-up work.

[Summit participants](#) were driven by their shared vision of systemically redesigning the traditional school model to one that is more student-centered. Participants believe educational equity and student success require that each student's educational path, curriculum, instruction, and schedule be personalized to meet each unique learner's needs. Participants believe that the effective use of technology is necessary, though not sufficient, to provide personalized learning at scale.



## Definition of Personalized Learning

Although many different ideas about personalized learning exist, the Summit participants focused on the definition included in the 2010 National Education Technology Plan:

"Personalization refers to instruction that is paced to learning needs, tailored to learning preferences, and tailored to the specific interests of different learners. In an environment that is fully personalized, the learning objectives and content as well as the method and pace may all vary (so personalization encompasses differentiation and individualization)."

Personalized learning is not simply about differentiating the method or approach of instruction or about individualizing the pace of learning. Personalized learning further seeks to empower the learner to shape what, how, and when they learn, thus engaging them through their explicit and implicit choices. Authentic implementation of personalized learning requires fundamental redesign of the school structure and of the role of teachers.

1 See Innovate to Educate: System [Re]Design for Personalized Learning / A Report From The 2010 Symposium hosted by SIIA, CCSO and ASCD <http://www.siia.net/Portals/0/pdf/Education/PerLearnPaper.pdf>

The 2014 Summit utilized this definition of personalized learning and worked off the 2010 Symposium's conclusion that equality does not necessarily equal equity:

"Personalization is necessary for educational equity. Educational equity is not simply about equal access and inputs, but ensuring that a student's educational path, curriculum, instruction, and schedule be designed to meet her unique needs, inside and outside of school. Achieving educational equity requires meeting each child where she is and helping her achieve her potential through a wide range of resources and strategies appropriate for her learning style, abilities, and interests, as well as social, emotional, and physical situation."

Many components of the education system vary considerably when moving from a traditional system to a personalized learning system, as illustrated in Figure 2.<sup>2</sup> This comparison list outlines key components of a personalized learning system, while recognizing that each characteristic should be seen on a continuum as its implementation evolves from traditional to personalized.

TRADITIONAL SYSTEM	REDESIGNED PERSONALIZED LEARNING SYSTEM
Mass Production	Mass Customization
Time Constant/Achievement Variable; Seat Time	Time Variable/Achievement Constant; Mastery/Competency Based
Industrial Age, Assembly-Line, Common-Pace Instructional Model	Knowledge Age, Individualized, Variable-Pace Learning Model
End of Year/Course Assessment of Knowledge	Ongoing, Embedded, and Dynamic Assessments of Knowledge/Skills, Learning Styles and Interests
Institution/Teacher Centered Student-Centered	Fixed Place; School-Based Anywhere and Everywhere; Mobile
Fixed Time; September-June; 6 hours/day, 180 days/year	Flexible Schedule; Anytime; 24/7/365; Extra as Needed
One-Size Fits All Instruction/Resources	Differentiated Instruction
Teach the Content; Sage on the Stage	Teach the Student; Guide at the Side; Collaborative Learning Communities
Geographically Limited Instructional Sources (Teacher/Textbook)	Virtually Unlimited, Multiple Instructional Sources (Online Resources and Experts)
Limited & Locked Student Report Card	Portable Electronic Student Portfolio Record
Printed, Static Text Dominant	Digital, Interactive Resources Dominant
Physical/Face-to-Face Learning	Online Platform Enables Blended Learning
Informal Learning Disconnected	Informal Learning Integrated

"We have a traditional, factory-assembly line broadcast paradigm. Time is the constant, achievement is the variable. In contrast we have students that are increasingly diverse where expectations are ever higher. Where teaching to the mean doesn't align with our learners. So our students are disengaged, not because they don't have technology, but really because they're not being met where they are as a learner at any given point in time."

—Mark Schneiderman, senior director of policy, SIIA

<sup>2</sup> See Innovate to Educate: System [Re]Design for Personalized Learning / A Report From The 2010 Symposium hosted by SIIA, CCSSO and ASCD <http://www.sii.net/Portals/0/pdf/Education/PerLearnPaper.pdf>

In order for personalized learning to yield the desired results, certain conditions must be met. Summit leaders reiterated the following Essential Elements and Policy Enablers of personalized learning:

Essential Elements:	Policy Enablers:
1. Flexible, Anytime, Everywhere Learning	1. Redefine Use of Time (Carnegie Unit/Calendar)
2. Redefine Teacher Role and Expand “Teacher”	2. Performance-Based, Time-Flexible Assessment
3. Project-Based, Authentic Learning	3. Equity in Access to Technology Infrastructure
4. Student-Driven Learning Path	4. Funding Models that Incentivize Completion
5. Mastery/Competency-Based Progression/Pace	5. P-20 Continuum & Non-Age/Grade Band System

While the 2014 TEPL Summit focused on technology, the findings and definitions above provide the context that personalized learning is about much more than technology. Personalized learning is a comprehensive educational model that puts students at the center and engages students when, where, and how to meet their unique needs and interests. Summit participants recognize the central human element of teaching and learning, and view technology as critical to gather input from, share actionable data with, and enable targeted instructional support from a broad array of individuals in a student’s learning network.



## Definition of Technology-Enabled Personalized Learning

***The redesign of education and the personalization of learning can take place without technology and digital learning, but not at scale. Technology is a teaching force multiplier and a learning accelerator that can enable more efficient and effective use of learning time.*** “Smart enterprise technology systems enable personalized learning and dynamically identify, manage, and address the unique learning needs of all students. These systems should provide a platform to access myriad engaging learning content, resources, and learning opportunities needed to meet each student’s needs everywhere at any time” (2010 Symposium). This doesn’t mean computers replace teachers, or that all learning takes place online.

Rather, technology-enabled personalized learning means that technology is used to:

- ✓ Collect and analyze extensive student learning data to a degree not otherwise possible;
- ✓ Provide a differentiation of interactive, multimedia teaching and learning resources as well as student creativity and collaboration tools not otherwise possible from one teacher, book, or classroom; and
- ✓ Free teacher time from rote and administrative activities to more value-added instruction.



**Elisabeth Engum** @PGelisa • Feb 12  
**The teacher needs to change from the sage on the stage to be a learning engineer. #Tep14**



“The model of learning described in this plan calls for engaging and empowering personalized learning experiences for all learners. The model stipulates that we focus what and how we teach to match what people need to know and how they learn. It calls for using state-of-the-art technology and Universal Design for Learning (UDL) concepts to enable, motivate, and inspire all students to achieve, regardless of background, languages, or disabilities. It calls for ensuring that our professional educators are well connected to the content and resources, data and information, and peers and experts they need to be highly effective. And it calls for leveraging the power of technology to support continuous and lifelong learning.”

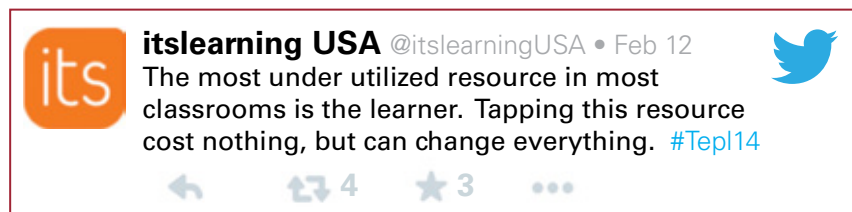
—National Educational Technology Plan (2010)

#### Technology-enabled personalized learning includes teacher and machine use of the following tools:

- Multiple, ongoing assessments and other data to dynamically identify each student’s needs and strengths relative to learning goals, including around the universal design for learning (UDL) spectrum;
- Dynamic matching of students with a customized playlist of content and interventions (digital and analog) from multiple sources based on relevant connections to prior learning, interest, experience, etc.; and
- Ongoing evaluation of what works best (#2) with which types of students (#1) to inform the development of ever smarter educational systems.

#### Participants identified the primary challenges they seek to address through personalized learning:

- Improve achievement for all students;
- Implement competency/mastery-based education (vs. seat-time);
- Implement a more student-centered learning model where the student voice is empowered to help determine his own learning path; and
- Increase student engagement.



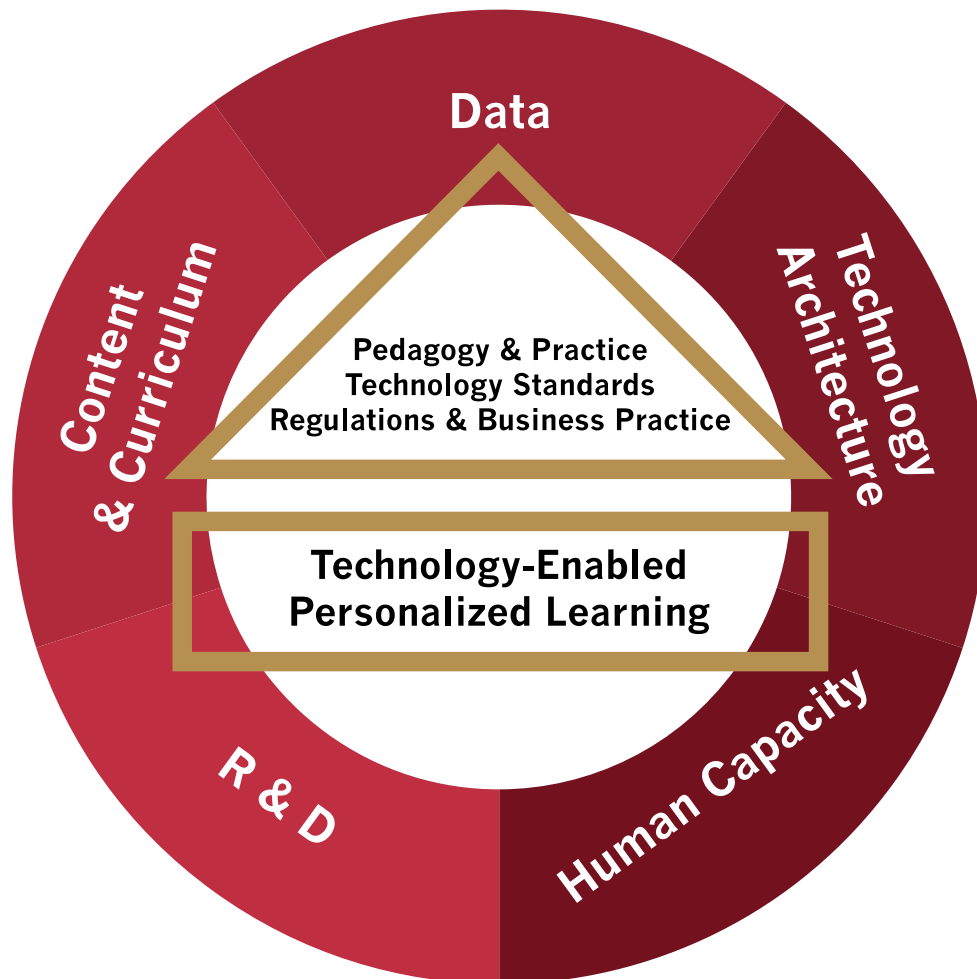
“Are we not just training teachers on the ‘101: Here’s How You Turn the Device On,’ but are we training them how to transform the experience that the student has in the classroom using that technology?”

—Stephen Bowen, Council of Chief State School Officers (panel)

## Organizing Themes

Summit attendees were drawn together by a common vision, but as importantly by common challenges slowing their efforts to deliver redesigned learning environments needed to personalize learning. They identified potential solutions that must be addressed collectively to scale the implementation of personalized learning through technology.

Summit organizers identified five interdependent strands critical for realizing the role of technology to personalize learning. The Summit agenda was focused on breakout working groups around these five strands:



**Data** — a robust, timely picture of student performance, preferences and needs

**Content & Curriculum** — recommendation engines to help dynamically match content/tasks with student needs

**Technology Architecture** — enterprise systems to access and manage data, content and communications

**R&D** — research process to identify what works with which students in which cases across silos

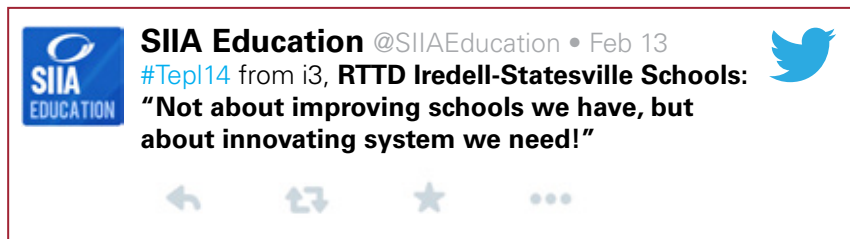
**Human capacity** — instructional model, and next generation professional learning

"We're really thinking about how we can empower students to self-direct and own their own learning. What does a model look like in which students have control over making those decisions and can actually drive what they are doing in their learning?"

—Jon Deane, chief information officer, Summit Public Schools

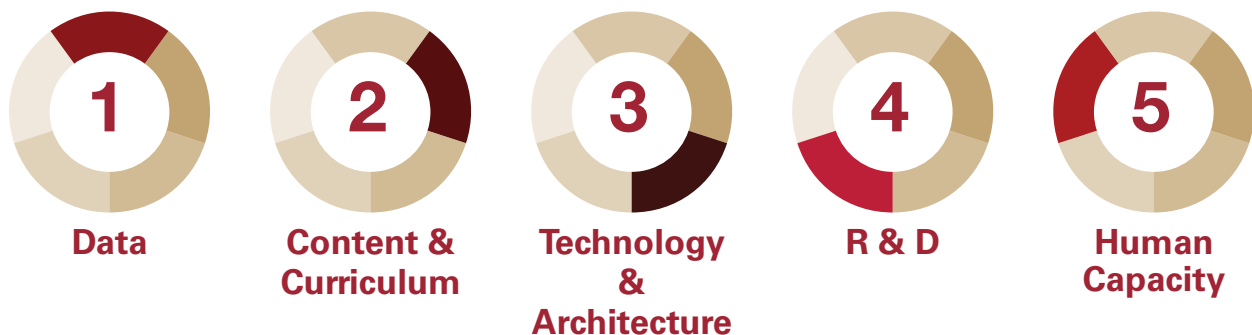
#### Organizers also identified the following cross-cutting issues:

- **Technical Standards** – resource tagging, data definitions, and systems interoperability that allow for systems to talk to and interact with one another for more seamless and easy to use integration of disparate content, student information, and technology applications.
- **Regulations & Business Models** – legislation, policies, and practices, such as privacy, procurement, subscription services, and licensing.
- **Pedagogy & Practice** – the interplay of instruction and content, including sequence, scope, and standards alignment; role of teachers and technology; and instructional strategies.



## Opportunities and Challenges to Technology-Enabled Personalized Learning

Following is a description of the opportunities and challenges for each strand addressed at the Summit, including some assumptions, guiding questions, definitions, and possible solutions or connections. Each also includes input from the pre-event attendee survey and planning groups.







## **Data — a robust, timely and dynamic picture of student performance, preferences and needs**

Personalized learning requires real-time access to meaningful data. This enables educators, students, families, and computers to translate the data into actionable information to better facilitate each student's learning experience.

Traditionally, this data is largely summative, academic test data, but there is an opportunity to further include ongoing and embedded performance data, information on student learning strategies, preferences and interests, and other non-academic information for the whole child's needs. Having this depth of actionable information available for appropriate uses and authorized users on a regular basis requires a robust, sophisticated platform and data system.

### **Survey Respondents' Top 5 Skills Teachers Need to Implement Personalized Learning:**

Rank	Issue	Total Repondents
1	Apply instructional strategies that help place students in the locus of control of their own learning	27
T-2	Use a wide range of data to inform curriculum and instruction	26
T-2	Effectively utilize technology throughout the curriculum	26
4	Embed appropriate formative assessment into the curriculum to inform instruction and enable "assessment as learning"	25
5	Apply appropriate instructional strategies depending on the students' needs	23

### **Guiding Questions:**

- ✓ What data do most educators have now? What data do they still need? What tools and interoperability standards may be needed for recording and integrating this information?
- ✓ How can educators transform the data into actionable information to properly deliver it where, when and how it is needed?
- ✓ What data is appropriate to be proprietary internal data? What data should the user — school and student — expect to access?
- ✓ How will the current discussion around student privacy impact the actual use of data? What are appropriate models and protocols for data analytics that safeguard student privacy and information security?



**Shaun Kellogg** @sbkellogg • Feb 12  
**"The real problem with ed data is not a technical one, it's an actionable one" #Tepl14**



The Summit working groups recognized that these data issues appear across most of the other four strands as well. Complex technical, regulatory and business issues exist in the safe and effective use of data for implementation of personalized learning. Some of the challenges include:

- **Data Accessibility and Usability**— Educators do not always recognize what data is needed. Many schools do not have the sophisticated data systems, platforms or training to effectively manage,

access, and leverage data into actionable information. Information about student learning strategies, preferences, and interests is often not surveyed or collected, especially for physical and analog experiences that account for most school time.

- **Data Interoperability**— Data is not in one universal format. Much data is electronic, but handwritten data created by teachers makes compilation difficult.
- **Data Analytics** — How can data be collected, analyzed, and acted on in effective ways while taking into account student data privacy restrictions and regulations (e.g., FERPA and COPPA)? Questions exist about the scale and scope of data collection and sharing, including with third-party service providers and for research purposes. Data sharing policy and regulation issues and public perception of data are important to consider.
- **Tagging Content** — Data synthesis is challenging as data comes from different sources and often tells different stories. It's time-consuming to develop individual learning paths for students and for teachers' professional development.



### Data Collection

Data first needs to be collected in order to later be analyzed and used. Data collection systems need to be able to process data and make it available to other systems. New systems or changes to existing systems usually require significant dollars to complete. RFPs to acquire these systems do not always lead to systems that can handle the level of data output and processing needed for personalized learning.

#### Possible Approaches:

- **Create Standards** - What standards should a system have that will aid in interoperability and ease of data collection/information flow?
- **Create More Measurement** - Current systems do contain data, but not enough for the current needs of personalized learning. These include areas like teacher analysis of content offline measurements that need to be online for measurement.
- **Data Analysis** - Measurement and data collection capabilities are increasing the quantity of data, but not always the value added. More sophisticated analytical tools and techniques are needed to translate this data into more actionable intelligence to help predict needs, identify patterns, and support educators in identifying the best strategies and resources.
- **Good Data vs. Bad Data** - Not all data is considered the same. The way data is presented and shared determines whether or not it is digestible and useable. More necessary and usable data needs to be collected and reflected.



### Tagging

What considerations should be made for how to find content when it's needed? Particularly within K-12, there are a number of projects that have been started and a lot more that are awaiting guidance on what standards to use, which content to tag, and what considerations are needed.

#### Possible Approaches:

- **Objects need to be pre-vetted, including assessment objects.**
- **Understand what objects to tag.** Learning Object Resources are actually bundles of pieces (vs. lesson plans) that are all required to properly "tag" resources so their usage is understood as well as the resource itself. This includes pre-requisites, post-requisites, asset, assessment, questions for teachers, introduction for presentation, instructional metadata, additional details on measurement, types, etc.

- **Develop options for tagging** - Open tagging for objects can build itself, but also balance some pre-designed tag options. With the sheer volume of resources that need tagging, finding qualified and motivated teachers to tag can be difficult.
- **Create a higher level signoff** - Looking for ways where curriculum specialists can add to the conversation rather than having to tag all content. Content that is “vetted by the district” could have separate designations and ways of marking, but that information also needs to be stored with the rest of the metadata.
- **Develop meaning for tags** - When information is stored about pieces of content and learning objects and a search is executed, how can tags be explained to students and teachers? Interpreting the tags will be important to use materials effectively.



Schools and universities need help in understanding what data might be useful to collect and what available data should not be used in decision-making. This is particularly important in adaptive learning contexts. Companies recognize the need for their customers to better define the data useful in the analysis for personalized learning so the companies can adapt their solutions accordingly.



### SUMMIT PUBLIC SCHOOLS

Summit Public Schools, founded in 2003, is a Bay Area charter organization that includes six schools with a diverse population of 1600 students. While 96% of Summit graduates are accepted to four year colleges, only 55% are on track to complete college in six years. The students who were not on track to graduate were found to be struggling with two key issues: they had gaps in their content knowledge coming into Summit schools that never quite got filled and they didn’t know how to succeed on their own when they got to college. Realizing that students need the “habits of success,” as well as content knowledge to be successful, Summit Public Schools ceased the model they had been using for the past ten years and rebuilt it, keeping those two key ideas in the forefront.

Summit’s Next Generation School Model is now in place. Students are empowered to drive their own learning, ensuring they are prepared for success in college, career, and life. The use of timely, meaningful data utilized to inform instruction is critical to this approach. Summit Schools have moved beyond college acceptance to true college readiness. College readiness is broken down into four key elements: cognitive skills, content knowledge, experience, and habits of success. Students follow the self-directed learning cycle where they set goals, plan, learn, show, and reflect. Students have access to materials through the Personalized Learning Plan. Using data is essential to how they determine student work and supports. This plan links to all other systems and includes everything a student does and needs to do, telling them where they stand and where they need to go. Because Summit Public Schools wanted to change the total system of learning, they adopted this model across the entire school. Because they have a common technology platform that conforms to their educational model, they are able to generate a wealth of valuable data, authentically collaborate, develop a sharable body of work, raise standards for competency, and select or build appropriate tools.



## **Content & Curriculum — recommendation engines to help dynamically match content/tasks with student needs**

“Technology is not the innovation, and that’s the problem we keep getting into when we look at these big initiatives where technology is seen as the innovation. The innovation is deeper content. It’s more active forms of learning and teaching. It’s more authentic forms of assessment. It’s linking school to life. It’s taking the passions that kids have in their informal learning and using technology to bring those into formal learning.”

—Chris Dede, morning panel video

The Content & Curriculum Strand planning team identified “Recommendation Engines” as the strand priority for the Summit. Such an engine makes recommendations informed by data, students, teachers, and computers and allows for choices by teachers and students. It works across various content sources, data systems, and technology platforms. It therefore requires a coordinated ecosystem of tools and standards to index, align, store and compare contextualized data – including metadata and paradata – about learning content, learners, educators, learning environments, and learning objectives that are necessary to dynamically match learners with the appropriate learning resource. It makes recommendations based on relevant connections to prior learning, personalized by reading levels, interaction, and other preferences. These systems allow for the optimal matching of learning opportunities with student needs and preferences to create the most efficient and effective learning. These systems must also enable the ongoing improvement of recommendation algorithms to support personalized learning.

### **Survey Respondents’ Top 5 Most Challenging Resource Issues in the Implementation of Personalized Learning in their School/District:**

Rank	Issue	Total Repondents
1	Alignment at a granular enough level between learning standards, performance standards, curriculum, assessments and content & Sequenced curriculum and lesson plans aligned to standards at a sufficiently granular level	24
2	Teacher professional development/support	21
3	Accessible and actionable data about student performance and needs	18
4	School or district administrator understanding of what personalized learning means	15
5	Adaptive, interactive digital content & Digital content and curriculum	15

### **Guiding Questions:**

- What are the educational building blocks (e.g., learner profile, learning object, learning progression, learning plan, etc.) necessary as inputs to a recommendation engine designed to personalize learning for individual students?
- What is the nature of the system(s) and learning analytics required to effectively enable the recommendation engine?
- In the context of the data and technology enablers (e.g., metadata, paradata, interoperability), how are the educational components, systems and learning analytics required to make the recommendation engine operational?

Though the strand team had a specific focus coming into the meeting, there were still many areas to address. The team collapsed the findings into the following key challenges:

**Challenges (associated with design, development and deployment):**

- Availability and interoperability of content across a variety of sources
- Clarification of learning progressions for use within recommendations
- Proof points for recommendation engines
- Lack of maturity, consensus and usage of metadata
- Content pricing and business model conflicts
- Effective vetting and curating of learning resources
- Lack of maturity within paradata frameworks
- Learning/pedagogical/education model conflicts
- Lack of clearly defined learner profile characteristics
- Limitations with modularity and adaptability of content
- Lack of depth and availability of student data
- Lack of models for recommendations supporting intelligent student grouping

The Content & Curriculum Strand participants prioritized and summarized these key challenges, highlighting possible solutions and pointing out the interdependencies within the education market for each challenge.

**Effective Vetting and curating of Learning Resources**

Effective vetting and curating of learning resources has the potential to increase the scale and effectiveness of matching digital learning resources to personalized learning needs. Yet, within the K-12 market, there are few examples of effective processes for promoting quality while increasing scale.

**Possible Approaches:**

- **Emphasize Standards** - Because of the increased emphasis on standards-based education in K-12, vetting and curating learning resources based on state and common core standards is an essential, foundational element.
- **Leverage Common Vocabularies and Taxonomies** - To promote effective sharing of the vetted content, a basic level of common vocabularies and taxonomies is needed across the various groups who are vetting and curating the learning resources.
- **Build Consensus Through State Coalition** - The recommendation was made to create a state coalition who would formally adopt a standard set of metadata elements, recommended vocabularies, and taxonomies (e.g., LRMI and CEDS). This process would start by synthesizing the current disparate documentation on these topics into a story format that illustrates the opportunity to deliver and scale personalized learning with properly vetted and curated learning resources. These information summaries would then be shared with state level decision makers, emphasizing why the vetting/curating process is essential. Ultimately, the state coalition will need help with district-level and vendor-level dissemination. The district-level dissemination is important to ensure a shared mission and need for effective vetting and curating processes, and the vendor-level dissemination is important to ensure that demand is effectively generated in the marketplace – aligned with the future opportunities for technology-enabled personalized learning.



Some of this work has already been started, even at the state coalition level. There needs to be more transparency of these efforts to ensure greater dissemination and wider support. Some groups are already working together on similar efforts; some are more isolated. Broader cooperation is needed around a shared sense of mission related to this effort throughout the marketplace. The following are some, but not all, of the current initiatives or groups that need to cooperate to create effective vetting and curating processes: Learning Registry; LRMI; CELT CIO Network; IMS Advisory Group; State-level RttT Initiatives; Publishers; EdTech Solutions; CEDS.

**Availability and Interoperability of Content across Variety of Sources**

Interoperability, particularly in the past year, has gained noticeable momentum, especially around IMS Global's Learning Tools Interoperability (LTI) Standard. Districts have begun to generate market demand, placing specific requirements for interoperability within RFPs and

formal communications shared with existing and potential education solution and content vendors. Even with the more noticeable momentum this past year, significant confusion still exists in the marketplace about how these interoperability standards work in isolation and in concert. For example, few district leaders and vendors fully understand how different standards can work in concert to support interoperability (seamless access across systems) and portability (move from one system to another) of content.

### Possible Approaches:

- **Create greater Awareness within District and State Leadership.** While some districts have begun to implement interoperability demands on the education solution and content vendors, there is still a large need for greater dissemination of the potential benefits of content interoperability. There needs to be a set of interoperability and portability definitions written in a use case or scenario format (samples that portray “day in the life” stories not “technical” explanations) for district leaders to learn from so they can increase their appreciation for content interoperability and portability. Ideally, the dissemination tools would include video portrayals of content interoperability and portability to support personalized learning (screen shots or video in day of life of student).
- **Sample RFP Language for Districts** - Districts that are looking to meaningfully advance their enterprise systems integration need help with standard language to include in their RFP and communications with vendors regarding interoperability requirements. This is not a standard RFP template; instead, it is language about interoperability requirements that can be inserted into district RFP’s – standard language for districts around use and implementation of interoperability standards (e.g., LTI, CCK12, SCORM, etc.). The standard language would be in a format that would ensure the vendor solutions meet a basic level of content interoperability and portability.
- **Adopt Metrics to Measure** - Ideally, there would be some basic metrics that would illustrate market movement on both the district and vendor side.



Connections  
to be Made

First, a clear understanding of interoperability and portability standards within schools is needed to create stronger demand for content publishers and education solution providers.

Second, for content publishers and education solution providers to participate, there must be clearer ROI in interoperability and portability, promoting seamless content discoverability across systems. Publishers who sell content must have effective Digital Rights Management (DRM) to motivate them to promote wider adoption.

The ability of the interoperability and portability standards to effectively manage initial and ongoing evaluations of quality of the content is another key element to promoting wider adoption. Thus, there is a distinct interdependence between this standards-focused challenge and the Effective Vetting and Curating of Learning Resources challenge listed above. Similarly, ensuring a clear understanding and use of metadata will be increasingly important to permit unified search/discovery across disparate systems. This need is magnified when the goal of personalized learning recommendations are applied across a diverse set of learning resource repositories. This is directly interdependent with the Lack of Maturity, Consensus and Usage of Metadata challenge listed below.

As mobile devices become more prevalent in K-12 education, there will be new use cases for stretching the capabilities of interoperability and portability standards.



Key  
Challenge

### Lack of Maturity, Consensus and Usage of Metadata

There have been meaningful metadata standards for well over a decade, yet the potential for using the metadata information to support personalized learning recommendations is still very nascent. Dublin Core and IMS’s Learning Object Metadata (LOM) are two standards that have been around for several years. More recently, the Learning Resource Metadata Initiative (LRMI) created a metadata standard focused on meeting the needs of search and discovery of learning resources. However, especially among district-level administrators and classroom teachers, there is little knowledge of or appreciation for how metadata can be used to support personalized learning recommendations. So, within the K-12 space, there is the issue of general awareness of what metadata can do for personalized learning and there is a lack of clarity on what metadata standard to use when vetting and curating learning resources.



### Possible Approaches:

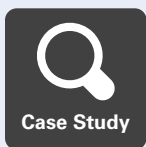
- **Create a General Awareness within District and State Leadership** - There are resources (documents, videos, etc.) available that highlight the definition and potential for metadata, especially in relation to promoting the potential for personalized learning. Similar to the state coalition and district dissemination efforts listed above in the Effective Vetting and Curating of Learning Resources challenge, informing the educator community about metadata should be an intentional focus. These dissemination efforts should point to key, existing resources to raise the level of discovery and awareness of metadata schema and current meta-tagging efforts. As part of the dissemination/awareness efforts, a user-friendly web presence should exist. Similar to the *Availability and Interoperability of Content across Variety of Sources* challenge, metadata definitions written in a use case or scenario format need to be shared, portraying samples that illustrate “day in the life” stories not “technical” explanations.
- **Enhance Metadata Standard Crosswalks** - Some metadata standards crosswalks exist that compare Dublin Core, LOM and LRMI. These should be enhanced and converted into a form that enables both the educator and vendor communities to appreciate the nuanced similarities and differences within and among the standards.



Similar to the Effective Vetting and Curating of Learning Resources challenge, there are a variety interdependent organizations and initiatives involved in the definition or sharing of metadata: Learning Registry; Dublin Core; IMS LOM; LRMI Proof of Concept & Governance for LRMI; CEDS; CELT CIO Network; IMS Advisory Group; State-level RtT Initiatives; Publishers; EdTech Solutions.

As mentioned, there is the interdependence of complementary/competing metadata standards – e.g., LOM, Dublin Core, and LRMI. In fact, the TEPL pre-summit survey results demonstrate that there is a lack of consensus on which are the most important technical standards for content tagging and exchange. While some 50 respondents were each asked to identify the three most important standards (e.g., n = 150), no standard was so identified by more than 12 people.

There is also a distinct interdependence between past, current, and future learning resource purchase behavior of states/districts/schools and the content publishers’ appetite for and compliance with metadata usage.



### GWINETT COUNTY SCHOOLS

Gwinett County Schools, a large, diverse district outside of Atlanta, has realized success in increasing student achievement as well as in overcoming the achievement gap. For twenty years, they have been working toward personalized learning based on the guiding beliefs that all students can learn and that a pathway can be found for each student to follow in order to learn. Gwinett launched a Digital Conversion Initiative in 2011. This initiative uses instruction as the infrastructure and technology as the overlay. They are developing a learning management system, a teacher evaluation system with professional development tools, and online communities of best practice across schools and districts. All the applications coming to teachers, students and parents come through one portal and an enhanced assessment system is being developed that will allow schools to capture critical data as well as to deliver assessment in different ways.

Gwinett is searching for the best breed of applications as well as the best ways to cross integrate the systems. They are trying to move beyond predictive analytics to responsive analytics, looking at what students’ data points are and how to intervene. They are also creating next generation assessments. They have not completed their work, but they are working toward predicting points where students are at risk by looking at attendance records, behavior records, and course performance trends and analysis that now go back to third grade. An interactive chart has been developed where teachers can see students who are at risk, students who are on the bubble, etc. Gwinett is also looking at how to line up content with identified learner needs.



## Technology Architecture — enterprise systems to access and manage data, content and communications

By definition, technology is fundamental to technology-enabled personalized learning and underpins the effective use of data and content/curriculum. Technology is necessary to bring personalized learning to scale.

Ever more sophisticated tools and integrated systems are required to meet this bold approach to learning.

**Ronnie Bell** R Belle • 4 months ago

Today'sMeet

**Schools make plans for utilizing technology but do not develop plans for integrating technology to support teaching and learning.**

When considered systemically, an enterprise approach to technology architecture allows for a shift from the current fragmented approach to curriculum, instruction, data, and communications to a much more integrated approach that allows access anytime, from anywhere. Schools need technology-based platforms in order to gather and analyze assessment and other data, deliver multi-modal and universally designed resources, and to dynamically match the two based on ongoing assessment of student performance and needs. Summit organizers identified the architecture of the enterprise approach for technology as a priority issue for the Summit, including the functional elements and the interconnections. Pre-Summit survey respondents identified “enterprise approach to technology architecture, e.g., SSO, security, identity and access management (IDAM), privacy, and data integration,” as a top technical issue to be addressed at the Summit.

### Challenges:

- Enterprise platform for managing and accessing content, data, communications, etc. from any time and everywhere
- Technology application integration (e.g., single sign-on)
- Resource access on multiple platforms (e.g., devices, browsers, LMSs, etc.) and device independence.
- Balance between proprietary platforms and open standards



### Diagram Personalized Learning Technology Architecture

Technology is important to personalized learning; however, it's not always clear how to structure an environment that can help enable its construction. It is not about a specific technology but rather how all the technology can be architected to bring it together more effectively for the classroom.

### Possible Approaches:

**Create Base Reference Architecture** — Having a reference point for schools to compare and work with is a first step to review solid architectural design for personalized learning. An initial version is necessary to begin work with school districts on creating variations and best options. There is no “one way” to architect an environment, but sharing best practices in meaningful ways can pave the way for schools to configure and reconfigure their environments for more effective learning.

These challenges cross over into the Data strand discussions, but they are mainly focused on the technology needs of personalized learning.



### Integration Pain Points

Technology applications that support personalization bring together data and content from myriad sources – including student information systems, assessment systems, HR management systems, content management systems, instructional learning systems, and so forth. Some of these systems are premise hosted within a school district, but increasingly, virtually all contemporary systems are only offered as remote hosted “cloud” services.



## Integration can be broken down and falls into these three overarching areas:

1

### Data

Historically, data integration has been a custom exercise district by district – solved via a combination of software scripts and proprietary interfaces. Each new application that needs access to data becomes a new professional services opportunity for the vendor of the source system – and that is repeated in every district. Standards like the Schools Interoperability Framework (SIF) emerged to help solve this challenge. In addition, there are standard Internet-based mechanisms for securely sharing data between systems – via file transfers, messaging protocols, and employing operational data stores. Finally, master data management is imperative here – identifying what systems are authoritative for what source data and process for authorizing the transfer of the data to consuming systems.

2

### Identity and Access Management (IDAM)

Students, teachers, and parents are interacting with many applications in a role-based manner – parents see their kids' data, teachers see their students' data, and students see their course-related materials. Content filters are role-based (e.g., different for a third grader than for a high school senior,) as are the core wireless systems. Furthermore, as more applications migrate to the cloud, more distinct logins emerge. IDAM is about having mechanisms to uniquely identify users and their roles – allowing for single ID and password to be used across all systems. This should not be confused with single sign-on, which implies you only have to login once.

3

### Content

As the content on the Internet expands, the role of Open Education Resources becomes more significant and proprietary content is purchased, the portability of content between the various systems grows exponentially. Using a manual process to rebuild content integrations proves prohibitive. In addition, without a seamless solution for the integration of the various content, the discoverability of the content proves challenging and students will not have access to the rich resources provided by the school and teacher. The content integration and interoperability challenge are discussed further below.

## Possible Approaches:

- *Data Management Model.* Greater work needs to be done in providing an understanding of data management. While each situation is different, full sample models can be provided to develop an understanding around the processes, governance, policies, standards, and tools to manage data for a district. Along with this, a data architecture reference model can be created for a district in understanding the enterprise nature of data and the integration points.
- *Local Capacity for Learning Analytics.* As technology-enabled personalized learning becomes the norm in schools, creating local capacity for learning analytics, including aligning the architecture, plays a more important role. Provide resources for schools to better understand learning analytics and the data about students and the environment to inform instruction, curriculum and overall services for students.
- *Standard, Non-Proprietary Transfer.* In any integration or interoperable solution necessary to enterprise approach to architecture, supporting and developing a standard for transfer that can be utilized anywhere and with any applications is significant to the success of overall integration. Work with standards organizations (which include schools, vendors and policy makers) to raise awareness of the importance as well as create a standard model for transfer.



## FORSYTH COUNTY SCHOOLS

Forsyth County Schools, located about 45 minutes north of Atlanta, serve over 45,000 students. They are a BYOT (Bring Your Own Technology) district. The district had traditionally been siloed, and teachers had used many different platforms, including different tools for grades, assessments, attendance, etc. Nothing had been available to aggregate all the information. The district began asking questions about personalized learning, about preferences, pace, place, and platform. They knew they needed to transform their system and they wanted to make sure the learning was personalized. They wanted to identify different learning pieces and to also give the students content. Content has moved away from textbook, decreasing textbook costs, and toward digital, creating a smaller increase in digital costs.

Forsyth County realized they needed to meet the needs of all learners and they knew they wanted to identify different learning styles, tag the content, and direct the students to it. The schools wanted to assess the content, reflect on it, and recommend it. Because they wanted to break learning down into specific standards, identify areas of struggle, and recommend content based on those areas, in conjunction with learning styles and using formative assessments along the way, they developed a system of ratings, similar to iTunes and Amazon, where the popular content rises up and the unpopular content falls down. They are focused on the need for both content and platform interoperability.

Along this journey toward personalized learning, Forsyth County has realized that public/private partnerships are crucial. The schools have gained a tremendous amount from the successful partnership they've created with it'sLearning and after two previous unsuccessful partnerships, they acknowledge the power of successful collaboration. Forsyth County piloted this as a 6-12 math and Language Arts program, and while the math teachers were more receptive initially, all teachers have embraced the changes as they have seen the different models work in the classroom.



## **R&D – research process to identify what works with which students in which cases across silos**

“In the classroom, you really try to differentiate, but the truth is, you always end up teaching to the middle... so how do we truly personalize and really realize the promises of our children?”

—Christine Johns Haines, Superintendent, Utica Community Schools, MI (panel)

The scale and scope of needed research and development is significant to translate the vision of personalized learning to effective implementation. Opportunities include cognitive and brain science research, adaptive tutorial software development, and change management and professional development best practices needed for school redesign to a student-centered model.

Summit organizers have identified as top R&D priority a research agenda/process to help the identification of what works best with which students in which conditions. Technology-enabled personalized learning includes at its core the dynamic matching of students with appropriate learning resources based upon a timely and robust profile about their prior learning, performance, interests, and other needs. If a student profile can be created and the impact of various interventions with that profile can be identified, that understanding can be used to match students of similar profiles with interventions demonstrated to have impact in such cases.

### **Guiding Questions:**

- How does personalization change educational research and development? What research and development is needed?
- How might personalization change the conversation/practices around how we measure success in our research studies? (Considerations: causation vs. correlation, randomized control, design-based research, evidence-based practices)
- How do we approach and/or design solutions to overcome the issues associated with privacy for research and development? (Considerations: logistics, public understanding, policy)
- How do we grow big data mindset and skills in education and social science research?
- How do we gather and share data across silos?
- How do we develop interactions across educators, researchers, and developers? What intersections are needed?

### **Challenges:**

- Learning analytics and algorithms, and “big data.”
- Translating big data across silos (e.g., districts, data systems, vendors, etc.) to understand what works with which students in which conditions. This is viewed as being interwoven across technical, regulatory, research culture, and business issues to implementation of personalized learning.
- Policies and terms for using personal student information, including sharing with third party service providers and for research purposes. A challenge may be to identify and implement appropriate models and protocols, within and by impacting regulations, for data analytics that safeguard student information privacy and security.



### Defining “what works” within modern learning environments.

Developing and using learning analytics, associated algorithms, and generally big data to support “what works” across and within what conditions for the various types of learner variability.

#### Possible Approaches:

- *Build more collaboration and communication across researchers and developers.* Generally, strand and Summit participants felt there was a divide between educational researchers and technology developers. Providing and supporting more opportunity for these groups to work together would encourage mutually beneficial partnerships for further research in the area of personalization.
- *Develop new models of measurement, data collection, and management.* Traditional models of research for measuring “what works” require large-scale, costly, and time-consuming randomized-control trials. The use of big data supports the need for new models of measurement and data collection. Researchers and developers alike should be studying new ways to support the collection of data and the measurement of learning. As discussed at the Summit, these models should focus on understanding the context of the environment, the learners, and should be seamlessly built into the process of learning, rather than as stand-alone tests. This challenge will require a new culture of academic researchers who understand new forms of data collection and analysis.
- *Help society and stakeholders understand the benefits of data sharing and related research.* Parents, educators, developers, and politicians alike must come to understand the advantages of some data sharing related to learning.



### IREDELL-STATESVILLE SCHOOLS

The Iredell-Statesville school district is comprised of 36 schools and 22,000 students just north of Charlotte, NC. The district encompasses both suburban and rural areas. This district had been awarded an i3 grant, and two years ago was awarded a 20 million dollar Race to the Top grant, becoming one of a very few districts to be awarded both grants. The Race to the Top grant is being used to develop a project called IMPACT – innovative methods for personalizing academics complemented by technology. They believe that in order to achieve bold reform, they must move from the mindset of “improve what we have” to “innovate the system we need.” Innovation is their driving force.

There are four goals inside the grant: 1) to individualize student driven learning, 2) to revolutionize instruction, 3) cultivate quality educators, and 4) make cross-cutting, data-driven decisions. The grant is about changing and reforming instruction, not about technology. They spent a year helping teachers make the shift in instruction. The model used by the district has been their key to success. This model is learning-centered, asking five essential questions: 1) What do students need to know? 2) How will they learn it? (This is the key for blended learning). 3) How will we know they’ve learned it? 4) What will we do if they don’t learn it? and 5) What will we do if they already know it? The district had previously added instructional facilitators, coaches who help teachers with instructional support on a daily basis. To this, they added blended learning coaches to work with the instructional facilitators and teachers. The program is successful, in part, because it builds capacity. Teachers become instructional facilitators who move up to become assistant principals and then principals. The program is about delivering quality instruction for students using quality instructors and leaders who focus on instruction every day.



## Human Capacity — instructional models and next generation professional learning

Personalized learning cannot be easily scaled without technology, but technology-enabled personalized learning will not succeed without human capacity. This includes district and school leaders, educators, parents, students, and policy-makers, who need to have a deep understanding of why this is important and what it takes to maximize the potential of personalized learning for students. Systems must be built with students, educators, and other stakeholders as part of the conversation and those individuals must understand how to inform, be informed by, and effectively use these technologies. Implementing technology-enabled

personalized learning should not be viewed as something separate or on the side, but rather it should be integral to the teaching and learning and be approached in a systemic way.

**Amy Williamson** 4 months ago

**Today'sMeet**

**It's one thing to invest in technology and another to invest in training and preparation.**

### Guiding Questions

- What are the essential conditions and policies for a district or school to build human capacity?
- What are the barriers to building and sustaining human capacity?
- What human capacity do we need - what are the roles that must be considered? Examples may include parents, teachers, principals, district leaders, students, community members, and school board members.
- What types of professional learning do we need?
- What topics do the professional learning opportunities need to address?

### Challenges

While many challenges exist towards identifying, developing, and sustaining the human capacity necessary, three primary challenges or areas emerged:

1. Static and uniform roles of educators and administrators hinder the development of human capacity.
2. Pipeline (pre-service, retention, recruitment) for educators, principals, and other staff does not support the human capacity needed for personalized learning.
3. Professional learning and support systems for teachers, coaches, and administrators do not support development and sustainability of technology-enabled personalized learning.



### Roles, Competencies and Related Policies

States, districts, and schools typically define the roles of those in the education system the same way they have been defined for decades. To develop the human capacity needed to fully realize the potential of technology-enabled personalized learning, the roles (new and old) for administrators and educators must be reconsidered and the competencies and policies must be defined. This impacts and is impacted by evaluation systems, accountability, certification requirements, CEU/seat time limitations, etc.

Educators in personalized learning settings are naturally taking on the roles of curriculum designer and data analyst in a way that is fundamentally different than even ten years ago. Administrators must be prepared to model the use of digital learning and also to understand what personalized learning looks like in and beyond a classroom. Educators may be able to relinquish some of the roles to paraprofessionals to guide students in their work, while educators maximize their pedagogy expertise to meet the needs

of each student. Librarians and media coordinators can support educators and students through professional development opportunities and coaching.

### Possible Approaches:

- *Reimagine and identify the competencies and skills educators and administrators need.*
- *Identify new roles for teachers, paraprofessionals, and others within a school based in part on their skill strengths, including prestigious and funded hybrid roles for educators not wanting to leave the classroom. For example, some teachers may be best at lecturing, others at tutoring or small group instruction.*
- *Enhance collaboration with informal learning providers to bridge and leverage student out-of-school learning experiences. Students learn 24-7-365, but those experiences are too often disconnected, thus limiting the learning personalization.*
- *Consider pathways to certifications, including alternative certifications or classifications that may make candidates and employees more prepared, and align state or district requirements with the new roles and competencies.*
- *Align pre-service training to current education system and personalized learning.*
- *Identify policies that hinder the development of human capacity, including continuing education units' (CEUs) dependency on seat time.*



### Pipeline for Educators and Administrators

The pipeline for educators and administrators may not provide the quantity or quality of professionals needed for personalized learning. The shift to personalized learning often requires even more of educators and administrators, including use of data, skills to model, and an ability to adapt to the pace of change. This includes a shortage of educators, especially in certain geographic or subject areas, and an even more significant discrepancy in the competencies required and those demonstrated by candidates or in-service educators and administrators. Administrators are often selected from a pool of current teachers or educators, and the dramatic shift in responsibilities and competencies are not always considered. Aligning the development, recruitment, and ongoing professional growth of educators and administrators to the roles and competencies referenced above is key to having the right people in the positions needed to implement personalized learning.

### Possible Approaches:

- *Elevate the teaching profession to attract and retain high quality and capable candidates.* This may include incentives for entering the education field, providing a range of opportunities through pre-service, residency, and other alternative route opportunities.
- *Develop a purposeful pipeline for school leaders.* Several initiatives strive to more effectively prepare administrators, including NAESP, Leading Learning Communities, the North Carolina Distinguished Leadership in Practice for Digital Learning program, and the Harvard Advanced Principal Institute.
- *Work to develop closer partnerships and increase transparency* among universities, alternative preparation programs or organizations, and K-12 education systems to ensure feeder programs understand and are preparing educators and administrators for needs in schools and districts. This should include a willingness to consider data on how educators and administrators are performing.
- *Take action on feedback* from teacher working conditions and other perception data, including national surveys and local focus groups, to better understand how to retain excellent teachers. This may include funded hybrid roles and recognition of collaborative and peer-coaching positions.
- *Support school administrators* through flexibility for staffing and other strategies and options to meet the needs of school(s) and students.

- *Identify interview protocols and questions* to support education leaders hiring educators who need to be prepared for a technology-enabled personalized learning environment.
- *Explore micro-credentials or badges* competency-based professional learning opportunities.



### Professional Development and Support

Teacher professional development was the most identified resource challenge to the implementation of personalized learning. Understanding what types of professional learning opportunities will help educators and how to make this integral to the education system requires new approaches and resources, including time. Administrator professional development is critical in that school and district leaders need to understand and be able to articulate, model, and lead technology-enabled personalized learning. Ensuring that administrator professional learning is a priority is essential. For this professional learning to be effective, it must be job-embedded, ongoing, and involve collaboration with peers. A culture in which personalized learning is encouraged and expected cannot exist without professional learning opportunities and support for educators.

Thirty-two survey respondents identified “teacher professional development” as one of the three most important tactics/practices to redesigning education to personalize learning, making it the top response.

*When asked “What skills do teachers need to implement personalized learning?” Summit participants identified the following:*

- Apply instructional strategies that help place students in the locus of control of their own learning (27)
- Use a wide range of data to inform curriculum and instruction (26)
- Effectively utilize technology throughout the curriculum (26)
- Embed appropriate formative assessment into the curriculum to inform instruction and enable “assessment as learning” (25)
- Apply appropriate instructional strategies depending on the student needs (23)
- Understand how individual students learn most effectively (19)
- Understand student understanding on specific standards (9)
- Understand practical universal design for learning methods of instruction and curriculum (4)

### Possible Approaches:

- *Grow capacity of the field* to offer and develop professional development that specifically addresses the needs of educators and administrators striving to implement personalized learning.
- *Establish professional development* and time required to fully and effectively participate in professional development for all stakeholders are priorities at the state, district, and school.
- *Develop professional development that is personalized* and meets the requirements of effective professional development, including ongoing, job-embedded, and personalized (driven by data with specific goals) to teacher needs.
- *Recognize role of formal and informal professional learning*, including coaching, mentoring (virtual or face-to-face), and other experiences through social media and professional learning networks.





## Conclusion

There is growing consensus that the success of our students and our nation requires the modernization of our education system to be student-centered and personalized. Personalized learning does not require that all learning is digital, but it cannot be achieved at scale without technology. Technology-enabled personalized learning means that technology is used to identify student needs, dynamically customize a playlist of student learning experiences, support teachers, and learn what works best with which students to inform the development of ever smarter educational systems.

Technology-enabled personalized learning is complex and requires many different components of the education system to work together to meet the needs of each student. These include the five strands that were the focus of the TEPL Summit – technology, data, content, research, and human capacity. For each, several challenges exist that must be addressed collectively to enable the entire system to work.

Technology advancements certainly underscore the potential for realizing personalized learning, but they are not a silver bullet for meeting the needs of each student. Despite the scale, scope and complexity of the task, the 2014 Summit participants agree that personalized learning through technology is attainable. By addressing the challenges through the possible solutions identified, the education field can accelerate the progress toward personalized learning for all students.

With the many challenges and possible solutions identified within each of the Summit strands, the following emerge as the priorities that can be more effectively addressed collectively rather than independently:

1. Development and adoption of technical standards for tagging content, defining and exchanging data, and easing integration of the myriad components of the TEPL ecosystem needed to support educators, recommendation engines, and related pedagogical research.
2. Data policies, agreements, and research protocols needed to scale R&D across data silos about what works with which types of students in which conditions.
3. Redefining educator roles and supporting their professional development to ensure the human capacity needed to shift from a traditional teaching model to a student-centered TEPL model.

### Follow-Up

A follow-up National Summit will be held in Fall 2015 to build upon the challenges, solutions, and next steps identified in this paper. Every day, educators are making progress to more effectively personalize learning for students; but the many students who do not yet have the education described in this document require that the education industry accelerates the pace and realizes the potential to meet the needs of all students.





## Resources

The Physical Size of Big Data

<http://www.domo.com/blog/2013/05/the-physical-size-of-big-data/>

Innovate to Educate: System [Re]Design for Personalized Learning / A Report From The 2010 Symposium hosted by SIIA, CCSSO and ASCD

<http://www.siiia.net/Portals/0/pdf/Education/PerLearnPaper.pdf>

[See also Symposium Archive <http://www.siiia.net/pli/>]

How Much Data is Created Every Minute?

<http://www.domo.com/blog/2012/06/how-much-data-is-created-every-minute/>

Interoperable Assessment Technology Standards Public Responses to RFI

<http://www.ed.gov/oii-news/interoperable-assessment-technology-standards-public-responses>

Transforming Data to Information in Service of Learning

<http://www.setda.org/web/guest/datatoinformation>

Promoting Data in the Classroom: Innovative State Models and Missed Opportunities

[http://www.newamerica.net/publications/policy/promoting\\_data\\_in\\_the\\_classroom](http://www.newamerica.net/publications/policy/promoting_data_in_the_classroom)

Learning Analytics : Drivers, Developments and Challenges

<http://oro.open.ac.uk/36374/>

Are Personalized Learning Environments the Next Wave of K-12?

[http://www.air.org/sites/default/files/AIR\\_Personalized\\_Learning\\_Issue\\_Paper\\_2013.pdf](http://www.air.org/sites/default/files/AIR_Personalized_Learning_Issue_Paper_2013.pdf)

Can Personalized Learning Deliver Better Learning Outcomes?

<https://www.edsurge.com/n/2013-11-08-can-interest-based-personalization-deliver-better-learning-outcomes>

A K-12 Policy Framework for Competency Education: Building Capacity for System Change

[http://www.competencyworks.org/wp-content/uploads/2014/01/CompetencyWorks\\_A\\_K-12\\_Federal\\_Policy\\_Framework\\_for\\_Competency\\_Education\\_February\\_2014.pdf](http://www.competencyworks.org/wp-content/uploads/2014/01/CompetencyWorks_A_K-12_Federal_Policy_Framework_for_Competency_Education_February_2014.pdf)

Re-Engineering Information Technology; Design Considerations for Competency Education

[http://www.competencyworks.org/wp-content/uploads/2013/02/iNACOL\\_CW\\_IssueBrief\\_ReEngineering-CompEd\\_final.pdf](http://www.competencyworks.org/wp-content/uploads/2013/02/iNACOL_CW_IssueBrief_ReEngineering-CompEd_final.pdf)

SIIA Primer on K-20 Education Interoperability Standards

<http://www.siiia.net/LinkClick.aspx?fileticket=zuf9QNK3BZ4%3d&portalid=0>



## Appendix A

### Definitions & Resources

#### Working Definitions:

<b>Recommendation Engine</b>	Software algorithms designed to connect learners to learning objects (digital or otherwise) based on learner's profile and any preset Learning Plan
<b>Learning Objective</b>	Description of specific, observable, expected student behaviors; specific descriptions of what students should know and be able to do; a specific definition of observable actions or products that demonstrate the student's mastery
<b>Learning Resource</b>	Granular content asset - a single content item, practice item or assessment item which is aligned at the lowest level of a learning objective [see definition for learning objective] focused on a specific knowledge, skill, concept, behavior, disposition, etc.
<b>Learning Object</b>	Combination of one or more learning resources [see definition for learning resource] specifically designed to focus on a select set of one or more learning objective(s) and capable of standing on its own for instructional purposes
<b>Learning Object Repository</b>	Database of learning objects designed to store the learning objects themselves and the metadata used to describe the learning objects
<b>Metadata</b>	Data about data - descriptions about the characteristics of a person, place or thing (e.g., learning resource, learning object, learner, educator, etc.) - characteristics, such as titles, levels, types, alignments, preferences, etc.
<b>Paradata</b>	Automated and human-contributed data about learning object usage  Used in survey research originally - data about the process by which the survey data were collected. Paradata is also being used to describe how content is used in digital education systems
<b>Learning Progression</b>	Research-based sequence by which a person acquires knowledge and skills
<b>Learning Pathway</b>	Selected steps (in the past, present and future) that a person takes along their learning journey; these steps may or may not follow a prescribed learning progression
<b>Learning Plan/IEP</b>	Personalized description of a learning pathway for each individual learner
<b>Learner Profile</b>	Characteristics of a learner such as his/her preferences, interests, aspirations, educational history, levels of learning, learning styles, educational programs (ESOL, Gifted, etc.), academic needs, and capabilities
<b>Interoperability</b>	Allowing data systems and software applications to share information and work seamlessly together through the use of common data exchange formats
<b>Interoperability Standards</b>	Set of specifications that allow for information exchange among those systems and applications that are in compliance
<b>Adaptive Learning</b>	An educational method where computers adapt the presentation of educational material according to students' learning needs, as indicated by their responses to questions and tasks.
<b>Big Data</b>	The term for a collection of data sets so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications. It originally referred to university research servers that were analyzing large data sets in the sciences, but the term has expanded in usage over time as a way to talk about large data sets in corporations and other institutions. It's a word that marketers have caught on to.

<b>Data Analytics</b>	Process of inspecting, cleaning, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names, in different business, science, and social science domains. Data mining is a particular data analysis technique that focuses on modeling and knowledge discovery for predictive rather than purely descriptive purposes.
<b>Machine Learning</b>	Concerns the construction and study of systems that can learn from data. For example, a machine learning system could be trained on email messages to learn to distinguish between spam and non-spam messages. After learning, it can then be used to classify new email messages into spam and non-spam folders. In education, it has come to mean adaptive learning in technology platforms.



## Appendix B

### Survey Results

Following are preliminary results from the survey of Summit invitees and participants. The survey was shared with about 150 stakeholders – education administrators, application and content developers, nonprofit leaders, and researchers – and completed by more than 50.

#### I. Defining Personalized Learning

**What challenges in your own school or district (or ones with which you work) are you addressing or trying to solve through personalized learning? Identify the top 3. \***

- Improve achievement for all students (39)
- Implement competency/mastery-based education (vs. seat-time) (27)
- Implement student-centered learning (23) & Create a more student-centered model where student the student voice is empowered to help determine their own learning path (23)
- Increase student engagement (20)
- Close the achievement gap for low performing students (16)
- Implement the new Common Core State Standards or other College and Career Ready Standards (15)
- Address 21st century skills, deeper learning, or the 4 Cs (15)
- Serve students with disabilities or related learning needs (12)
- Address the needs of the 'whole child' beyond cognitive/academic (10)
- Improve opportunities for students in need of enrichment or acceleration (9)
- Expand teacher professional development (1)

Rank each of the following elements/strategies in their importance to redesigning your school or district (or ones with which you work) to a model of personalized learning (with 1 being not important and 5 being essential).

For each, rank your actual progress in changing your school/district to implement each of these elements/strategies or the progress you are making with a district with which you are working (with 1 being not yet started and 5 being significant progress):

Scale 1-5	Importance	Progress	Diff
Differentiating instruction/content customized to each student's unique needs, enabled by data and intelligent grouping of learners and educators	4.40	2.85	1.55
Mastery/competency-based pace/progression and ongoing assessment (vs. seat time, age-based cohorts, and end of year/course-only summative testing)	4.36	2.96	1.42
Student-driven learning path, including what is studied (e.g., which course) and how (e.g., which learning module)	3.92	2.63	1.29
Redefining (e.g., sage to guide) and differentiating teacher roles (e.g., emphasizing their unique strengths such as presenter, guide, grader, etc.)	3.85	2.76	1.09
Flexible learning opportunities (e.g., anytime/everywhere; integration of third-party formal or informal learning; expanded day/week/year calendar)	3.83	2.9	0.93
Project-based, experiential learning	3.75	2.8	.95
Incorporating Universal Design for Learning (UDL) for multiple means of representation, engagement, and expression within the learning experience	3.26	2.61	.65

**Which tactics/practices are most important to a school/district in redesigning education to personalize learning? Identify the top 3.**

- Teacher professional development (32)
- Data systems for collecting, managing, analyzing and accessing actionable information (28) & Smart, data-driven learner profiles (21)
- School technology access (devices, network, broadband, etc.) (19)
- Adaptive, interactive digital content (17)
- Formative assessments (17)
- Home technology access (devices, broadband), including to learning resources (8)
- Enterprise platform for managing/accessing content, data, communications, etc. (8)
- Student grouping/rotations (5)
- Online courses with virtual instructors (4)
- Smart, data-driven educator profiles (3)
- Expanded repository of instructional materials (1)
- Other:

**What skills do teachers need to implement personalized learning? (Identify your top 3.) \***

- Apply instructional strategies that help place students in the locus of control of their own learning (27)
- Use a wide range of data to inform curriculum and instruction (26)
- Effectively utilize technology throughout the curriculum (26)
- Embed appropriate formative assessment into the curriculum to inform instruction and enable “assessment as learning” (25)
- Apply appropriate instructional strategies depending on the student needs (23)
- Understand how individual students learn most effectively (19)
- Understand student understanding on specific standards (9)
- Understand practical universal design for learning methods of instruction and curriculum (4)
- Other:

**Which of the following standards and related technical efforts are you familiar with? (check all that apply)**

**Which of the following standards and related technical efforts are most important to the sector’s work on personalized learning? Please check up to three.**

Standard	Which are you familiar with? (check all)	Which are most important? (check 3)	Importance Rank
SCORM - collection of standards and specifications for web-based e-learning.	36	7	4
inBloom - Data and content services integrate student records and learning resources that currently live in a variety of different places and formats to enhance access and integration	35	12	1
SIF (Schools Interoperability Framework) - includes technical standards and exchange standards for the entire K-12 education landscape	31	4	7
Learning Registry - paradata framework initiated by USED, provides input for “big data/learning analytics”	28	12	1
Learning Object Metadata (LOM) - specifies the syntax and semantics of Learning Object Metadata.	25	8	3
LRMI Proof of Concept Project - using the CCSS identifiers to tag resources	22	4	7

Assessment Interoperability Framework (AIF) - joint assessment technical standard framework created by the SIF Association and IMS Global	22	6	5
Common Cartridge - content packaging complement to LTI, defines a package interchange format for learning content, able to run on any compliant LMS platform.	21	5	6
IMS LTI (Learning Tools Interoperability) – offers a standard to allow remote tools and content to be integrated into a learning management system	21	9	2
CCSS formal identifiers - adopted by ASN, Academic Benchmark and inBloom	19	3	8
CEDS - USED-NCES common education data standards	17	4	7
Dublin Core - metadata that includes a set of vocabulary terms which can be used to describe resources for the purposes of discovery	17	0	11
Ed-Fi - Dell Foundation effort to create a data standard (unifying data model and data exchange framework) combined with a free tool suite	17	2	9
Web Content Accessibility Guidelines (WCAG) 2.0 – created by the W3C to define how to make Web content more accessible to people with disabilities.	17	1	10
CCSS Granular Identifiers - led by SETDA and supported by PARCC and SBAC	15	8	3
Applied Minds Learning Map Data Model - coordinated with but not dependent upon CCSS, submitted to inBloom	14	8	3
Question & Test Interoperability v2.1 (QTI) - APIP without the accessibility features	14	3	8
Dynamic Learning Maps (DLM) Project at University of Kansas - generating learning maps for ELA and Math that include branches in the map based on learner variability (e.g., adaptations for those with visual impairments, etc.)	12	6	5
IMS Access for All and IMS Metadata - accessibility and general metadata binding for tying together various metadata formats	12	2	9
IMS APIP (Accessible Portable Item Protocol) – provides a standard for creating accessible assessment items for item developers with a data model for standardizing the interchange file format for digital test items.	12	3	8
Experience API (xAPI; aka TinCan API) - aims to track learning experiences including traditional records such as test score or completion as well as learner actions like reading an article or watching a training video; designed to support existing SCORM®	10	9	2

Interactive Whiteboard Common File Format (IWB) – a technical standard for a content interoperability format for interactive whiteboards	9	0	11
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## II. Challenges & Barriers

### Identify the top 3 most challenging resource issues in the implementation of personalized learning in your own school/district (or in schools/districts with which you work).

- Alignment at a granular enough level between learning standards, performance standards, curriculum, assessments and content (18) & Sequenced curriculum and lesson plans aligned to standards at a sufficiently granular level (6) = 24 Total
- Teacher professional development/support (21)
- Accessible and actionable data about student performance and needs (18)
- School or district administrator understanding of what personalized learning means (15)
- Adaptive, interactive digital content (8) & Digital content and curriculum (7) = 15 Total
- Student devices in school (14)
- Quantity/quality of formative assessments to help determine student progress, characteristics and needs (11)
- Student home access (devices, broadband, etc.) (9)
- Parent and community understanding of what personalized learning means (8)
- Enterprise platform for managing/accessing content, data, communications, etc. (7)
- Instructional strategies (4)
- Student grouping/rotations (3)
- School broadband (3)
- Staffing (2)
- Accessible resources for students with disabilities (0)
- Repository of instructional materials (0)
- Other:

### Identify the 3 most challenging technical, regulatory, and business issues to your implementation of personalized learning (or of schools/districts with which you work)? Optional: Please describe the challenge.

- Data interoperability (e.g., exchanging data between systems) (22)
- Translating big data across silos (e.g., districts, data systems, vendors, etc.) to understand what works with which students in which conditions (21)
- Seat-time regulations versus competency-based flexibility (20)
- Misalignment between goals of standardized education (“equal and appropriate for all”) and aspirations of personalized learning (19)
- Technology application integration (e.g., single sign-on) (13)
- Content tagging for search/alignment (e.g., to learning standard, media type, learning sequence, etc.) (10)
- Content integration/portability between platforms (9)
- Student data privacy restrictions and regulations (e.g., FERPA, COPPA, etc.) (8)
- Procurement process (8)
- Research about what works best, with which students, and in which situations (6)
- Resource access on multiple platforms (e.g., devices, browsers, LMSs, etc.) (5)
- Vendor content/software packaging and licensing models (4)
- Other:

## III. Summit Agenda

### What are the most important technical aspects for the Summit to address? Identify your top 3.

- Learning analytics and algorithms (27)
- Granular scope and sequencing, learning maps (25)
- Integration of data and content to support recommendation engines (23)

- Content repositories that reach across content sources (both free and fee) (21)
- Data tagging/interoperability (13)
- Metadata for resource/content tagging (11)
- Big data (11)
- Enterprise approach to technology architecture (e.g. SSO, security, IDAM, etc.) (10)
- Device management (6)
- Cloud computing (2)
- Social media (2)
- Other:

**What issues related to policies and business models are the most important for the Summit to address? Identify your top 3.**

- Alignment between goals of standardized education (“equal and appropriate for all”) and aspirations of personalized learning (26)
- Policies and terms for sharing of personal student information with third parties (e.g., vendors, researchers, nonprofits, other schools) (17)
- Shift from seat-time regulations to competency-based learning (17)
- Translating big data across silos (e.g., districts, data systems, vendors, etc.) to understand what works with which students in which conditions (16)
- Content repositories that reach across content sources (both free and fee) (15)
- Balance between proprietary platforms and open standards (13)
- Research agenda/process to help identify what works best with which students in which conditions (13)
- Procurement process (10)
- Vendor content/software packaging and licensing models (9)
- Technology integration (e.g., single sign-on) (8)
- Student data privacy restrictions and regulations (e.g., FERPA, COPPA, etc.) (8)
- Other:

**FOR THE FULL SET OF SURVEY RESULTS, SEE:**

<https://docs.google.com/document/d/1ziHBF6OAV2mZFxsX0ITlbhBOgWYpWjf5ROnmwK9vLHg/edit?usp=sharing>