Best Practices in Personalized Learning Environments (Grades 4 – 9)

October 2012

In the following report, Hanover Research first defines personalized learning and presents a summary of differences between traditional education and personalized education. We then review a variety of promising practices, including the development of sophisticated school- and district-wide data systems, the use of real-time student assessment to improve instruction, the creation of flexible learning options for students, competency- and performance-based curricular frameworks in lieu of the Carnegie unit, and online and blended learning approaches. This review and the included case studies focus on the application of these practices in the 4th through 9th grades.

HANOVER RESEARCH

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INTRODUCTION

Personalized learning is an emerging trend which seeks to support student-centered, 21st century teaching and learning. A growing body of research suggests that that overall student achievement is likely to increase when students are able to learn at their own pace with a variety of teaching styles and formats available to them. Personalizing students' education enables them to access a unique learning experience based upon their individual needs, rather than receiving instruction through a standard, paced curriculum. In its ideal form, the needs of students are put first and **students are able to direct "how, what, when, and where" they learn**.[1]

The intent of personalized learning is to "meet each child where he is and help him meet his potential" and to "educate the whole child."[2] Varied learning environments are encouraged, as personalized learning takes place both within and outside of the classroom. Strong emphases are placed on parental involvement and meaningful student-teacher-parent relationships, and technology is often utilized to enhance learning opportunities.[3]

The shift from teacher- and curriculum-centered learning to student-centered learning has long been underway in the U.S. school system, with roots in the theories of John Dewey, Lev Vygotsgy, and Jean Piaget.[4] Personalized learning, on the other hand, has only more recently developed prominence in the K-12 education community. Now, a recent (and presumably ongoing) Department of Education spotlight on personalized learning has firmly established the approach as a pillar of high-quality 21st century learning.

RACE TO THE TOP-DISTRICT COMPETITION

In August 2012, the U.S. Department of Education released its finalized application for the 2012 Race to the Top-District (RTTT-D) competition.[5] The Department's Absolute Priority 1 – the creation of Personalized Learning Environment(s) is at the center of this competition, as is described here:[6]

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[1] "About Personalized Learning." The APLUS+. http://www.theaplus.org/personalized-learning.php
[2] Wolf, M.A. 2010. "Innovate to Educate: System [Re]Design for Personalized Learning. A Report from the 2010 Symposium." Edited by Partoyan, E., Schneiderman, & Seltz, J. ACSD. P. 21. http://siia.net/pli/presentations/PerLearnPaper.pdf
[3] "FAQs About Personalized Learning." The APLUS+. http://www.theaplus.org/faqs-about-personalized-learning.php
[4] "Literature Review – Student Centered Classrooms." Iowa CORE. http://www.aea267.k12.ia.us/icc/files/CEI/StudCentClass_LitReview.pdf
[5] "Education Department Invites Districts to Apply for $400 Million Race to the Top Competition to Support Classroom-Level Reform Efforts." August 12, 2012. U.S. Department of Education. http://www.ed.gov/news/press-releases/education-department-invites-districts-apply-400-million-race-top-competition-su
[6] "Absolute Priorities." U.S. Department of Education. http://www.ed.gov/race-top/district-competition/absolute-priorities

Create student centered learning environment(s) that are designed to: significantly improve teaching and learning through the personalization of strategies, tools, and supports for teachers and students that are aligned with college- and career-ready standards (as defined in this document); increase the effectiveness of educators, and expand student access to the most effective educators in order to raise student achievement; decrease the achievement gap across student groups; and increase the rates at which students graduate from high school prepared for college and careers.

Later this year, close to $400 million will be distributed to award-winning school districts which have "the leadership and vision to move beyond one-size-fits-all models of schooling which have struggled to produce excellence and equity for all children."[7] In support of school districts applying to the Race to the Top-District competition, this report by Hanover Research offers an overview of best practices in personalized learning environments for the middle years (4th – 9th grades).

In the following pages, Hanover defines personalized learning and presents a summary of differences between traditional education and personalized education. We then review a variety of promising practices, including the development of sophisticated school- and district-wide data systems, the use of real-time student assessment to improve instruction, the creation of flexible learning options for students, competency- and performance-based curricular frameworks in lieu of the Carnegie unit, and both online and blended learning approaches. This review and included case studies focus on the application of these practices in the 4th through 9th grades.

KEY FINDINGS

- **Personalized learning** emphasizes student-led learning, learning outside the classroom, and increased parental involvement. The movement toward personalized learning has grown from a pervading sense of the inadequacy of traditional education; many feel that the assembly-line model of education is outdated and increasingly irrelevant in a dynamic, technology-centered modern society. Allowing students to largely direct and set the pace of their education is expected to increase achievement.

- The creation of **personalized learning plans for all students** can increase student motivation. Students are encouraged to set personal learning goals, and the regular assessment that is typically a part of personalized learning initiatives enables the student to receive regular feedback on their progress. Research demonstrates that positive feedback such as the progression toward a chosen goal is highly motivating to students. Additionally, students who track their own progress toward these goals

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[7] Munoz, C. May 22, 2012. "U.S. Department of Education Stakeholders Forum: District RTT." Transcript downloaded from: www2.ed.gov/news/events/052212-transcript.doc

are more likely to make greater gains toward reaching their goals than students who do not.

■ Some states and districts are replacing the Carnegie unit with a P-20 continuum and **non-grade band curricular framework**. Performance- or competency-based student grouping empowers students to master content and progress at their individual pace. According to some educators today, this shift away from standardized age- and grade-level groupings is "the single most significant policy enabler for personalized learning."[8]

■ The **portfolio schools model** is one avenue for empowering students (and their families) to direct their education in the way best fitted to their needs and interests. Potfolio school districts feature a variety of educational options including magnet and public charter schools. This approach can be costly, and researchers have yet to prove that a move toward greater diversity in educational options consistently improves student achievement.

■ **Technology** supports personalized learning in a number of ways. First, students can utilize interactive, innovative teaching interfaces via software and applications to learn traditional materials at their own pace. Second, technology also facilitates assessment and monitoring of student progress in real-time. Finally, technology serves to increase student engagement with course material and enables learning to take place at any time, from anywhere.

■ As the RTTT-D application notes, education leaders should **engage stakeholders** when selecting and implementing personalized learning initiatives and frameworks. Blended learning, portfolio schools, and the elimination of the Carnegie unit in particular demand extensive communication with and support from stakeholders. Furthermore, parental engagement and after-school programming have the potential to enrich personalized learning initiatives and are linked with increased student achievement.

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[8] Wolf. Op. cit., p. 21.

SECTION I: DEFINITIONS OF PERSONALIZED LEARNING

Although personalization has reached ubiquity in the consumer-driven landscape of the 21st century, "education has only scratched the surface on personalizing the learner experience."[9] The need to personalize education is based upon several background assumptions about the nature and present state of education. These were revealed during a 2010 ASCD (Association for Supervision and Curriculum Development) symposium of over 150 leaders in education as consisting of the following:[10]

- The industrial-age, **assembly-line educational model**—based on fixed time, place, curriculum, and pace—is insufficient in today's society and knowledge-based economy. Our education system must be fundamentally reengineered [...] to address both the diversity of students' backgrounds and needs as well as our higher expectations for all students.

- **Educational equity** is not simply about equal access and inputs, but ensuring that a student's educational path, curriculum, instruction, and schedule be personalized to meet [the student's] unique needs.

- Personalized learning requires [...] a leveraging of modern technologies [and is] enabled by **smart e-learning systems**, which help dynamically track and manage the learning needs of all students, and provide a platform to access myriad engaging learning content, resources, and learning opportunities [...] which are not all available within the traditional classroom.

As is apparent from these key background assumptions, personalized learning is a response to the modern educational landscape and its perceived inefficiencies and ineffectiveness. The premise of the theory rests on the assumption that **given the ability to self-direct their learning, students will make greater gains in achievement due to increased interest and customization**. The concept is relatively new in the arena of educational theory, and there is no broad, unifying definition of personalized learning as of yet.

DEFINITIONS OF PERSONALIZED LEARNING

In this subsection, we present definitions developed by the Personalized Learning Foundation, ASCD, and the Association of Personalized Learning Schools and Services (APLUS+). It is clear that these definitions aim to describe similar movements, though emphases may be placed differently between different organizations' conceptualizations of personalized learning. For instance, the ASCD does not consider the value of the role of the parent or community, or the relationship between teachers, parents, and students, while

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[9] "What is Personalized Learning?" Personalized Learning Foundation.
   http://personalizedlearningfoundation.org/id3.html
[10] Wolf. Op. cit., p. 6. Quoted from source with minor alterations.

these elements appear in both the APLUS+ and Personalized Learning Foundation definitions.

PERSONALIZED LEARNING FOUNDATION

The personalized learning model exists in several slightly different iterations across supporting agencies. The Personalized Learning Foundation, for instance, states that the key attributes of a personalized learning initiative include the following:[11]

> … strong emphasis on parental involvement, smaller class sizes, more one-on-one teacher and student interaction, attention to differences in learning styles, student-driven participation in developing the learning process, technology access, varied learning environments, teacher and parent development programs, and choices in curriculum programs.

ASCD

In 2010, attendees at an ASCD symposium on personalized learning agreed on five "essential elements" of personalized learning, namely: [12]

Definitions of personalized learning vary, but all agree that education should be learner-centered, not curriculum-centered.

- Flexible, anytime/everywhere learning;
- Redefine teacher role and expand "teacher;"
- Project-based, authentic learning;
- Student-driven learning path; and
- Mastery/competency-based progression/pace.

ASSOCIATION OF PERSONALIZED LEARNING SCHOOLS AND SERVICES (APLUS+)

The Association of Personalized Learning Schools and Services (APLUS+) is a membership-based organization consisting of over 40 personalized learning charter schools in California that has also attempted to develop a definition of personalized learning. APLUS+ defines the fundamental aspects of personalized learning as follows:[13]

- Putting the needs of students first;
- Tailoring learning plans to individual students;
- Supporting students in reaching their potential;
- Providing flexibility in how, what, when, and where students learn;
- Supporting parent involvement in student learning;

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[11] "What is Personalized Learning?" Op. cit.
[12] Wolf. Op. cit., p. 7.
[13] "About Personalized Learning." Op. cit.

- Encouraging relationships between student, parent, teacher, school, and community;

- Preparing students to be life-long learners; and

- Engaging and motivating students by supporting their learning in a way that is relevant to each student's life, interests, and goals.

COMPARISON OF TRADITIONAL AND PERSONALIZED LEARNING ENVIRONMENTS

Some key elements of personalized learning are presented in Figure 1 in the form of a comparison between this model and the more traditional learning system it has been designed to replace.[14] This comparison highlights the long reach of the personalized learning design, as it seeks to modify and improve nearly every aspect of traditional education.

Figure 1: Current System of Education versus a Personalized Learning System

TRADITIONAL SYSTEMS	PERSONALIZED LEARNING SYSTEM
Mass production	Mass customization
Time constant/achievement variable; seat time	Time variable/Achievement constant; mastery/competency based (with concern for student readiness for learning new/advanced concepts)
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 assessment of knowledge/skills, learning styles, and interests
Institution/teacher centered	Student-centered
Fixed place, school based	Anywhere and Everywhere; Mobile
Academics addressed in isolation	Learning plan recognizes and integrates "whole child" range of social, emotional, and physical needs
Fixed time; September-June	Flexible schedule, anytime, extra time as needed
One-size fits all instruction/resources	Differentiated instruction
Teach the content	Teach the student; collaborative learning communities
Comprehensive teacher role	Differentiated and specialized teacher roles
Geographically determined and limited instructional sources	Virtually unlimited, multiple instructional sources
Limited/common system; determined curriculum-to-life path	Unique student voiced curriculum-to-life path
Limited and locked student report card	Portable electronic student portfolio record
Printed, static text as dominant content medium	Digital, interactive resources as dominant content medium
Isolated data and learning objects	Interoperable data and unbundled learning objects
Physical/Face-to-face learning	Online learning platform to enable blended learning

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[14] Wolf. Op. cit., p. 13.

Informal learning disconnected	Informal learning integrated

Source: ASCD

SECTION II: THE ROLE OF DATA AND ASSESSMENT

Effective collection of, analysis of, and responsiveness to student data is central to the development of personalized learning environments at all grade levels. According to educators who participated in the 2010 Personalized Learning Symposium,[15]

> Personalized learning requires sophisticated data and assessment systems, which dynamically track, illustrate, and translate the data to inform not only the student and teacher, but also help determine the instructional tools, content, and learning approach best suited for each student – and all this must work together seamlessly.

The U.S. Department of Education has also drawn attention to the importance of developing student data systems and assessment practices. In 2009, the National Center for Educational Evaluation and Regional Assistance published an Institute of Educational Sciences (IES) Practice Guide titled "Using Student Achievement Data to Support Instructional Decision Making."[16] This practice guide made several recommendations, each of which is grounded in research and the expertise of a panel of veteran educators. Due to the status of research on this topic, the panel was not able to point to rigorous research studies proving that the recommended practices lead to improved student achievement. Based on IES evidence standards, the level of evidence for each recommendation is "low." Nevertheless, the practice guide makes use of what research there is available on this topic and highlights promising approaches for district leaders, school administrators, and classroom teachers to consider. These recommendations are as follows:[17]

- Make data part of an ongoing cycle of instructional improvement
- Teach students to examine their own data and set of learning goals
- Establish a clear vision for school-wide data use
- Provide supports that foster a data driven culture within the school
- Develop and maintain a district-wide data system

In Appendix A of this report, we provide the panel's "Checklist for Carrying Out the Recommendations." In this section, Hanover highlights approaches to using student data to improve student achievement through the personalized learning.

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[15] Wolf. Op. cit., p. 25.
[16] Hamilton, L., et. al. September 2009. "Using Student Achievement Data to Support Instructional Decision Making." http://ies.ed.gov/ncee/wwc/pdf/practice_guides/dddm_pg_092909.pdf
[17] Ibid., p. 8.

STUDENT DATA SYSTEMS

The implementation of "a robust data system" is critical to success in the RTT-D initiative for personalized learning. According to the application details, systems should feature the following:[18]

- Ongoing and regular feedback, including, at a minimum, frequently updated individual student data that can be used to determine progress toward mastery of college- and career-ready standards […] or college-and career-ready graduation requirements;

- The LEA and school infrastructure supports personalized learning by using information technology systems that allow parents and students to export their information in an open data format […] and to use the data in other electronic learning systems (e.g., electronic tutors, tools that make recommendations for additional learning supports, or software that securely stores personal records); and

- Ensuring that LEAs and schools use interoperable data systems […] (e.g., systems that include human resources data, student information data, budget data, and instructional improvement system data).

A number of initiatives are currently underway to develop — and encourage the use of – multifaceted student data systems. For example, the Shared Learning Collaborative, a joint project of the Carnegie Corporation, Gates Foundation, and CCSO, is currently piloting a set of technology services allowing schools to "connect student data across disparate sources."[19,20] Like foundations and non-profit organizations, the for-profit sector is also responding anxiously to the aforementioned RTT-D requirements. Oracle, "the leading provider of business intelligence and analytics solutions," has turned its attention to marketing the company's school district data management products.[21] Oracle Fusion Middleware is said to promote the development of a "personalized learning environment" by enabling "school districts to build a single, secure environment for the delivery of data, curriculum, assessments, instructional resources and collaboration tools."

ASSESSMENT FOR LEARNING

In traditional education settings, emphasis is placed on summative formal assessments of student learning which typically occur once or twice per year. These are administered as mandated by federal legislation, particularly by the No Child Left Behind Act. While these infrequent assessments serve to measure overall student progress, they provide no

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[18] Evans, M. "A Guide to Personalizing Learning – Suggestions for the Race to the Top-District Competition." Innosight Institute. P. 8. http://www.innosightinstitute.org/innosight/wp-content/uploads/2012/09/A-guide-to-personalizing-learning.pdf
[19] "How do we ensure that new teaching solutions and existing administration systems work together, so that educators, students and parents have the data they need?" LEAD Commission. http://www.leadcommission.org/few-school-leaders-have-appetite-vision-change
[20] Shared Learning Collaborative. http://slcedu.org/
[21] "Oracle Solutions for $400M District Race to the Top Grant." Oracle. http://www.oracle.com/us/industries/education-and-research/oracle-race-top-br-1653116.pdf

meaningful feedback on the success of individual teaching strategies or curricular innovations, nor do they allow teachers to identify the immediate learning needs of students throughout the year.

In contrast, personalized learning requires **frequent student progress checks** and **dynamic teacher responses to student data**. Educator development and professional learning communities can empower teachers to implement this approach, and technology can equip teachers with regular feedback on student learning progress and make connections between teaching strategies and specific outcomes. [22] **Student progress tracking** is particularly effective when the following guidelines are used:[23]

- **Address a single goal** within all assessments. Each assessment item should be tied to a single goal, enabling accurate tracking of concept mastery.

- **Use rubrics** instead of points. The best results are seen when students are assessed on a rubric rather than given points for correct answers. A points system can be skewed from assessment to assessment, depending on the number of difficult and easy items per test. A rubric scoring system can simply indicate whether each question reveals mastery of the topic, or if work is needed.

- **Use different types of assessments**. Demonstrations, probing discussions, unobtrusive observations, and student-generated assessments can be combined with standard question-and-answer assessments to accurately measure student understanding.

Continual assessment can not only help teachers direct the course of student learning and increase student engagement with their own learning goals, but can also increase students' motivation to learn. Current cognitive research indicates that individuals are motivated by demonstrations of success and competence. Personalized learning environments, which let students direct their learning toward areas of interest, increase the sense of ownership students feel over their own learning. **Continuous assessment** can enhance motivation in such environments in the following ways:[24]

- Continuous assessment emphasizes progress and achievement rather than failure;
- Provides feedback to move learning forward;
- Reinforces the idea that students have control over, and responsibility for, their own learning;
- Builds confidence in students so they can and need to take risks;
- Maintains relevance and appeal to students' imaginations; and

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[22] Wolf. Op. cit., p. 8.
[23] Ibid.
[24] Ibid. p. 7.

- Provides the scaffolding students need to excel.

ASSESSMENT FOR LEARNING IN THE MIDDLE GRADES

Assessment also has the power to enhance student motivation when **students are able to track their own progress over time**. Research has shown that when middle grade students track their own progress, particularly in graphic displays, gains in learning as demonstrated by test scores are significant. A meta-analysis of 14 independent action research studies (10 of which were conducted in middle grade classrooms[25]) found that student progress tracking resulted in a 32 percent gain in achievement.[26] According to an article in the Association for Middle Level Education's magazine, good student-centered assessments empower students in a variety of ways:[27]

- [**Middle grade students benefit from**] identifying the attributes of a good performance by using a rubric to analyze strong and weak anonymous work samples;
- Learning and using strategies to self-assess;
- Partnering with their teachers to set goals on what comes next in their learning based on current results;
- Generating their own practice tests or test items using their understanding of the learning targets and working with each other to prepare and deepen their understanding; and
- Working with clearly communicated learning goals to keep track of their success and communicating that success to others, as in student-led conferences.

TRAINING TEACHERS TO USE STUDENT DATA TO PERSONALIZE INSTRUCTION

The personalization of education relies heavily on the classroom teacher's ability to conduct ongoing formative assessments and progress checks, and adapt instruction to students' needs. Attentiveness to real-time data is especially critical in a competency-based model, which we will address later in this report.[28] According to a report conducted by SRI International for the U.S. Department of Education in 2011, "as data systems become more readily available to teachers, the ability to pose questions that generate useful data will

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[25] "Tracking Student Progress Scores and Scoring Scales." http://files.solution-tree.com/MRL/documents/stid20_summaryreport.pdf

[26] Marzano, Robert. "When Students Track Their Progress." *Educational Leadership*. December 2009/January 2010. 67:4 p. 86-87. http://www.ascd.org/publications/educational-leadership/dec09/vol67/num04/When-Students-Track-Their-Progress.aspx

[27] Chappuis, S., & Stiggins, R. "Finding Balance: Assessment in the Middle School Classroom." *Middle Ground – The Magazine of Middle Level Education,* October 2008, 12:2, pp. 12-15. http://www.amle.org/Publications/MiddleGround/Articles/October2008/Article1/tabid/1755/Default.aspx

[28] Evans. Op. cit.

become increasingly important."[29] The authors of this report outline five key skill areas teachers must master in order to effectively use student data to improve instruction:[30]

- **Data Location** - Find the relevant pieces of data in the data system or display available to them

- **Data Comprehension** - Understand what the data signify

- **Data Interpretation** - Figure out what the data mean

- **Instructional Decision Making** - Select an instructional approach that addresses the situation identified through the data

- **Question Posing** - Frame instructionally relevant questions that can be addressed by the data in the system

Unfortunately, pre-service teacher training programs rarely feature coursework on data collection and analysis methods that can be used for instructional personalization. A short term solution involves job-embedded in-service professional development focused on these topics. Long-term partnerships with local colleges and universities, however, should be developed to promote the inclusion of data literacy coursework in teacher training and credentialing programs.

PROFESSIONAL LEARNING COMMUNITIES

Research shows that traditional professional development, such as one-shot workshops and off-site professional conferences, tend to have a negligible effect on teacher practice and student achievement. Education policies and publications in the United States now promote ongoing, collaborative, school-based professional development which addresses concrete issues facing teachers in their specific context. Research suggests job-embedded professional development is best implemented through school-based learning communities in which "teachers engage actively in instructional inquiry […] focused on instructional improvement and student achievement."[31] Successful professional learning communities (PLCs) follow established protocols for regular meetings and may be comprised of grade-level or subject area teaching teams.

The 2011 DC Data Summit offered a workshop and materials on an approach to job-embedded data literacy development pioneered at Two Rivers Public Charter School

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[29] Means, B., Chen, E., DeBarger, A., & Padilla, C. 2011. "Teachers' Ability to Use Data to Inform Instruction: Challenges and Supports." Prepared for the U.S. Deortment of Education by SRI International. Downloaded from: http://www2.ed.gov/about/offices/list/opepd/ppss/reports.html

[30] Ibid., p. viii.

[31] Wei, R., Darling-Hammond, L., Andree, A., Richardson, N., Orphanos, S. February, 2009. "Professional Learning in the Learning Profession – A Status Report on Teacher Development in the U.S. and Aboard." School Redesign Network at Stanford University. P. 58. http://www.srnleads.org/resources/publications/pdf/nsdc_profdev_tech_report.pdf

(preschool – 8th grade).[32] The process, referred to as Data-Analysis-Strategy (DAS) Loop, organizes teachers into grade-level teams in which they engage in ongoing analysis of student assessment data and respond with personalized instruction.[33] The flow chart below depicts the cycle of the DAS Loop:

Figure 2: Data-Analysis-Strategy Loop[34]
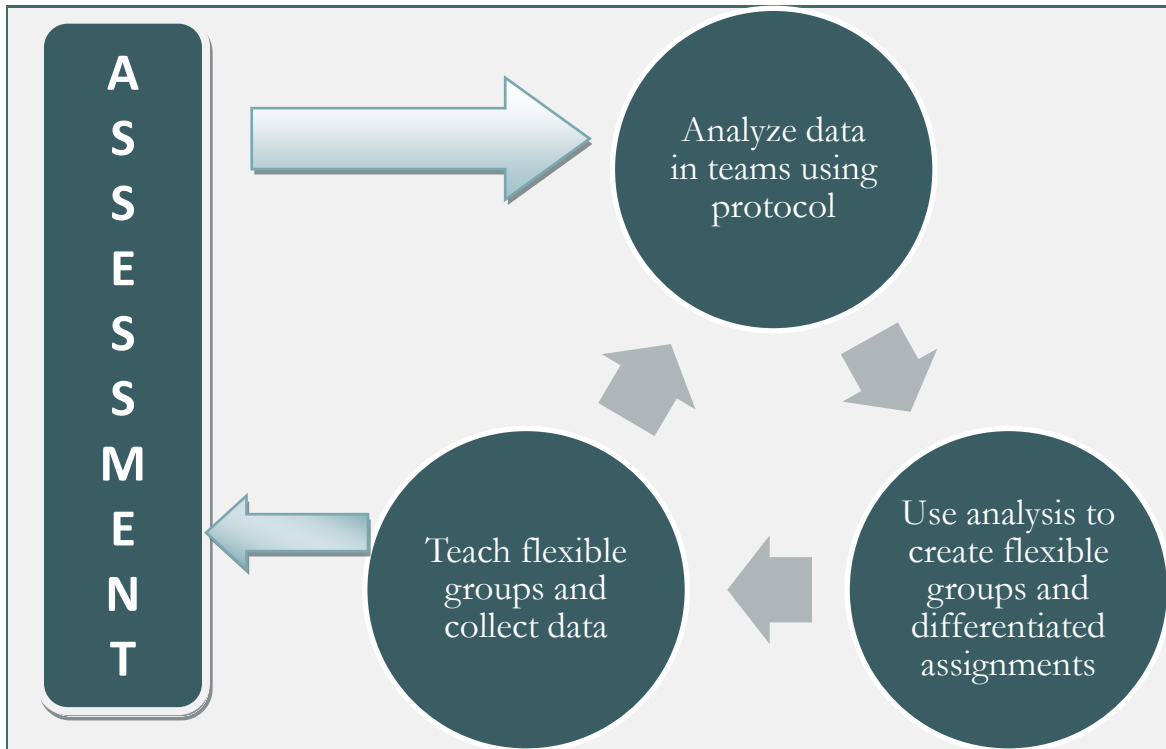
Source: Friends of Choice in Urban Schools; Two Rivers Public Charter School

As the figure above illustrates, assessment is the foundation of the DAS Loop. In the first step (not included in the flow chart), the school's administration isolates a skill for which the general student body needs targeted instruction. Next, teachers pre-assess their classes and meet in groups to analyze the data and divide individual students into flexible groupings. The specific minute-by-minute protocol for grade-level team data analysis meetings is included in **Appendix B** of this report. Teachers then design three assignments that increase in level of difficulty and are differentiated for the flexible student groupings. Flexible groupings are "fluid and flexible" ability groupings used to deliver "the most effective interventions and instructional scenarios" for a specific learning target.[35]

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[32] Patel, V., Hou, E., & Bello, M. July 12, 2011. "Pathways to Conceptual Understanding: Using Data-Analysis-Strategy Loop to Create Flexible Groups."
http://focusdc.org/datasummitdocs/DAS%20Loop%20workshop/Using%20a%20Data-Analysis-Strategy%20Loop%20presentation.pdf

[33] Ibid.

[34] Ibid., p. 14.

[35] Chapman, C, & King, R. 2009. *Differentiated Instructional Strategies for Reading*, 2nd Edition, p. 5.

Using the example of reading comprehension instruction, teachers are then encouraged to teach each targeted reading strategy explicitly. Middle school students, who have teachers in multiple subjects, are able to consciously practice each strategy in a variety of contexts and develop transferrable reading habits. Furthermore,[36]

> While demonstrating and explaining practical applications of the steps and procedures, [teachers should] verbalize the self-talk, or inside thinking, that accompanies each step. Model the strategy in various situations. Use guided practice sessions until students are able to apply the approach while reading independently.

Finally, at the end of the DAS Loop instructional period, another assessment is conducted and growth throughout the cycle is evaluated in the original teacher teams. This process is repeated at Two Rivers PCS each semester, with emphasis on a new skill for each Loop.[37]

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[36] Ibid., p. 168.
[37] Patel, et al. Op. cit.

SECTION III: NEXT GENERATION LEARNING

Next generation learning (NGL) involves the provision of "anytime, anywhere" instruction tailored to students' needs and interests. NGL requires the availability of diverse learning modalities promoting college and career readiness, facilitated by expert educators. In its description of "Competency-Based Learning or Personalized Learning," the Department of Education promotes the transition "away from seat time, in favor of a structure that creates flexibility, [and] allows students to progress as they demonstrate mastery of academic content, regardless of time, place, or pace of learning."[38] In this section we highlight several applications of NGL:

- Portfolio District Model
- Credit flexibility
- P-20 continuum and replacement of grade band framework
- Independent learning plans for all students

PORTFOLIO DISTRICT MODEL

In the last decade, the U.S. education sector has seen a growing number of increasingly decentralized "Portfolio Districts." These tend to be large urban school districts and include New York, Chicago, Denver and Washington, DC.[39] The portfolio school model, for which both Education Secretary Arne Duncan and the Obama administration have expressed support, replaces "one-size-fits-all" schools with diverse educational options for students of all grades.[40] This approach essentially blends four key strategies:

- The decentralization of public education
- The expansion of charter schools
- The identification and re-design/closing of "failing" schools
- Standardized testing as a means of accountability

In its "Guide to Personalized Learning," Innosight Institute notes that this model requires a significant amount of change in district operations. Instead of being tasked with "running schools," the district becomes the "authorizer of schools and purveyor of supporting services to schools."[41] Central responsibilities also include helping parents find the right schools for their students. It is important to note, however, amidst the increasing

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[38] "Competency-Based Learning or Personalized Learning." U.S. Department of Education. P. 4.
http://www.ed.gov/oii-news/competency-based-learning-or-personalized-learning
[39] Saltman, K. June 2010. "Urban School Decentralization and the Growth of 'Portfolio Districts.'"
http://greatlakescenter.org/docs/Policy_Briefs/Saltman_PortfolioDistricts_EXEC_SUM.pdf
[40] Ibid.
[41] Evans. Op. cit.

prevalence of the portfolio district approach, that education researchers have yet to develop a strong base of evidence that portfolio districts consistently advance student achievement. Critics also point to the considerable expenses associated with developing and implementing this approach. A policy brief on "Portfolio Districts," produced through collaboration between the University of Colorado and Arizona State University, suggests that district leaders consider several key questions including the following:[42]

- What funding will be needed for startup, and where will it come from?

- What funding will be necessary for maintenance of the model? Where will continuation funds come from if startup funds expire and are not renewed?

- How will the cost/benefit ratio of the model be determined?

- What potential political and social conflicts seem possible? How will concerns of dissenting constituents be addressed?

HARTFORD SCHOOL DISTRICT'S PORTFOLIO OF SCHOOLS

Hartford Public Schools provides an example of a portfolio district with multiple options at the elementary and middle school levels. Located in Hartford County, Connecticut, this district serves 21,021 students and employs 1,520 full-time classroom teachers.[43] The HPS district describes its approach to personalized learning on its webpage:[44]

> By supporting a full range of quality school choices, we enable students to be matched with a classroom experience suited to what they want to learn, and how they are able to learn it best. A system known as student-based budgeting helps us distribute resources fairly to students across the district. Each student receives funding based on educational needs, and that funding follows the student to whatever school she or he attends.

The district includes the following notable school models for students in 4th through 9th grades:[45,46]

- Hartford Academy - Achievement First (AF) school model
  - Elementary Grades
  - Middle Grades

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[42] Saltman, K. "Urban School Decentralization and the Growth of 'Portfolio Districts.'" Great Lakes Center for Education Research and Practice. P. 4.
http://greatlakescenter.org/docs/Policy_Briefs/Saltman_PortfolioDistricts_EXEC_SUM.pdf

[43] "Hartford School District in Hartford County, CT." National Center for Education Statistics.
http://nces.ed.gov/ccd/districtsearch/district_detail.asp?Search=1&details=1&InstName=hartford&Zip=06103&DistrictType=1&DistrictType=2&DistrictType=3&DistrictType=4&DistrictType=5&DistrictType=6&DistrictType=7&NumOfStudentsRange=more&NumOfSchoolsRange=more&ID2=0901920

[44] "Our Schools." Hartford Public Schools. http://www.hartfordschools.org/index.php/our-schools

[45] Ibid.

[46] "Portfolio of Schools." Hartford Public Schools. Office of Talent Management.
http://talent.hartfordschools.org/index.php/component/schoolportfolio/

- **America's Choice** at Sand Elementary School (K-8)
- **Asian Studies** Academy at Dwight/Bellizzi Middle School
- **Breakthrough Magnet** School (PreK-8)
- **Classical Magnet** School (Grades 6-12)
- **Capital Preparatory Magnet** School (PreK-12)
- **Core Knowledge** Academy at Milner (PreK-8)
- The **Environmental Sciences Magnet** School at Mary Hooker (PreK-8)
- **Global Communications** Academy (Elementary)
- **Latino Studies** Academy at Burns Elementary School (PreK-8)
- McDonough **Expeditionary Learning** School (Grades 6-8)
- **Montessori Magnet** School at Annie Fisher (PreK-6)
- Moylan **Montessori / Expeditionary Learning** at Moylan (PreK-5)
- James H. Naylor **Professional Development** School (PreK-8)
- Noah Webster **MicroSociety Magnet** School (PreK-5)
- **STEM Magnet** School at Annie Fisher (K-8)

CREDIT FLEXIBILITY

In 2009, the Ohio State Board of Education adopted a plan to empower "students to earn units of high school credit based on a demonstration of subject area competency, instead of or in combination with completing hours of classroom instruction."[47] According to Ohio's Plan for Credit Flexibility,[48]

> Credit flexibility will pertain only to high school credit […] It could include a **middle grades student or younger who is eligible to earn high school credit**. For this reason, students may benefit from early exposure and awareness about their options for learning including demonstration of subject area competency.

Early access to credit flexibility programs offering high school credit is particularly important for "gifted" or "accelerated" middle grade students who are ready for advanced coursework. According to the Ohio Department of Education policy on "Credit Flexibility Guidance: Gifted Education," such courses offered "at the middle school for dual credit (middle and high school credit) fall under the credit flexibility provision."[49] Hanover has

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[47] "Credit Flexibility Guidance: Gifted Education." April 7, 2010. Ohio Department of Education. Downloaded from: http://www.education.ohio.gov/GD/DocumentManagement/DocumentDownload.aspx?DocumentID=82753

[48] Ohio Credit Flexibility Design Team. June 2009. "New Emphasis on Learning – Ohio's Credit Flexibility Plan Shifts the Focus from Seat Time to Performance," p. 10. Downloaded from: http://www.education.ohio.gov/GD/DocumentManagement/DocumentDownload.aspx?DocumentID=71895

[49] "Credit Flexibility Guidance: Gifted Education." Op. cit., p. 4.

identified opportunities for students in 6th grade and above to engage in an online flexible credit recovery program through the Warren County Educational Service Center.[50] North Ridgeville City Schools also promotes a credit flexibility program to 6th – 8th grade students at North Ridgeville Middle School. The district provides flexible credit for "alternative coursework, custom learning activity, assessment, and/or performance that demonstrate proficiency qualified to be awarded equivalent credit toward [high school] graduation."[51]

P-20 CONTINUUM AND NON-GRADE BAND SYSTEM

In a report from the 2010 Symposium on System [Re]Design for Personalized Learning, Mary Ann Wolf states that many participating educators consider the redefinition of the use of time and rejection of the Carnegie Unit to be the "single most significant policy enabler for personalized learning."[52] Wolf writes, "The fact that students are all born within a preset 12 month period does not, and should not, dictate their abilities or performance at a given time (or age)."[53] The re-defining of how class time is budgeted is one of the most radical facets of NGL – instead of designing education frameworks around traditional grade levels and prescribed seat time, **performance- or competency-based student grouping empowers students to master content and progress within a P-20 continuum at their individual pace**.

There is some evidence that mastery-based progression through course content is especially useful in the middle grades. According to Copper Stoll, Chief Academic Officer for the Adam's County School District 50 (Adams 50), after replacing grade levels with skill levels at Metz Elementary School, "discipline problems went down by 40 percent because kids were at their own level, not bored or frustrated."[54] In order to portray the extent of system re-design involved in this shift from the Carnegie Unit and grade-level grouping to personalized learning through performance-based grouping, we now provide an in-depth look into the case of Adams 50.

STANDARDS-BASED EDUCATION IN ADAM'S COUNTY SCHOOL DISTRICT 50

Adams 50 is located in a suburb outside Denver, Colorado.[55] According to NCES data for the 2009-2010 school year, the district enrolled a total of 9,862 students across 20 schools.[56] Describing the changing demographics of the region, the district website states:[57]

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[50] "WCESC Online Courses for Middle/High School Students." Warren County Educational Service Center.
http://www.warren.k12.oh.us/school_dept.aspx?schoolID=14&deptID=276
[51] "Credit Flexibility Program and Guidelines." North Ridgeville High School.
http://www.nrcs.k12.oh.us/CreditFlexibilityProgram.aspx
[52] Wolf. Op. cit., P. 22.
[53] Ibid., p. 24.
[54] "RISC, Making a Difference in Colorado Schools." Re-Inventing Schools Coalition.
http://www.reinventingschools.org/2010/02/09/3rd-test-position-for-carousel/
[55] "Adams County School District 50." Adams County School District 50. http://www.adams50.org/
[56] "Westminster, School District NO. 50, In the County of Adams." National Center for Education Statistics.
http://nces.ed.gov/ccd/districtsearch/district_detail.asp?Search=1&details=1&InstName=Adams+County+School+District+50&State=08&DistrictType=1&DistrictType=2&DistrictType=3&DistrictType=4&DistrictType=5&DistrictType=6&DistrictType=7&NumOfStudentsRange=more&NumOfSchoolsRange=more&ID2=0807230
[57] "Need for Change." Adams County School District 50. http://www.sbsadams50.org/need-for-change/

> Once considered a typical suburban school district, economic and demographic shifts within the larger metropolitan region [have] significantly changed the face of the district in a relatively short time to resemble that of an archetypal urban district with: low-income, majority minority enrollment, aging facilities and high mobility.

After two years on academic watch because of low student achievement and graduation rates (a 2009 article reported that fewer than 60 percent of the district's students graduate on time), the district decided to adopt an **extreme form of Standards-Based Education (SBE)** in an effort to improve achievement.[58] Beginning in the 2009-2010 school year, across all district schools the traditional 13 grade levels were replaced with ten levels. Students were tested for proficiency levels in reading, writing, and mathematics and placed in **multi-age classrooms** accordingly, **progressing to higher levels after demonstrating proficiency**.[59]

Test scores had been low and achievement gaps persisted during the previous decade.[60] Test scores initially declined in the transitional period (from 2009 to 2010), but then increased in all categories at the elementary and middle school levels from 2010 to 2011 (except middle school level reading, which held constant).[61] Though these increases in test scores between the 2010 and 2011 school years are promising, it is not yet clear whether these initial increases will evolve into a lasting trend with test scores climbing steadily upwards.

A particularly notable feature of the district's movement toward SBE was the involvement of the district's teachers, who were considered key partners in the decision to change the grade structure given that they would be the ones to carry out the transition "on the ground." In order to gauge their acceptance of the proposed model, **the district polled teachers to learn of their opinions of the new model**, which were overwhelmingly positive (85 percent voted in favor). Another facet of the district's implementation plan that is worth attention here is the ongoing attention that was awarded to **test scores**, which **provided a gauge for the new system's success**.[62]

Figure 3.1 presents the district's timeline for the development and implementation of SBE over the first five years.

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[58] "District Eliminates Grade Levels." March 2009. *American School Board Journal*, pg. 7.
http://www.sbsadams50.org/pdf/March-2009-Up-Front.pdf
[59] Ibid.
[60] "Need for Change." 2011. Adams County School District 50. http://www.cbsadams50.org/need-for-change/
[61] "Student Achievement on the State Assessment (CSAP) Over Time by School Level." 2011. Adams County School District 50. http://www.sbsadams50.org/wp-content/uploads/2011/10/Student-achievement1.pdf
[62] "How Far We've Come." Adams County School District 50. http://www.sbsadams50.org/howfar/

Figure 3.1: SBE Implementation Timeline, Adams County School District 50[63]

YEAR	ACTIVITIES
Summer 2007	▪ District 50 is placed on "academic watch" at the end of the 2006-2007 school year, following "years of changing demographics, falling achievement scores and a declining enrollment."[64] ▪ A Board of Education member attended a symposium hosted by the Re-Inventing Schools Coalition (RISC) that talked about SBE as implemented in a small school district in Alaska. This model replaced grade levels with performance levels, built education around the needs of individual students, and did not practice "social promotion."
Spring Term 2008	▪ The district joined with RISC and educator Dr. Robert Marzano to "envision what SBS might look like in a district of 10,000 students." ▪ A team of educators traveled to Alaska to observe the model in action and learn about related challenges. ▪ The district polled district teachers for their opinions on SBS, and 85 percent voted to move ahead with the model. ▪ The Board of Education and the Westminster Education Association endorsed the implementation of SBS.
2008-2009 School Year	▪ The district piloted the SBS program in one elementary school and in select classrooms across the district.
2009-2010 School Year	▪ SBS was implemented district-wide at the elementary and middle school levels. ▪ In April 2010, the Board of Education unanimously passed a resolution to support implementation of SBS for the next five years. ▪ Test scores dropped the first year, "but teachers were quickly convinced that there was a new kind of learning underway."[65]
2010-2011 School Year	▪ SBS began to be phased in at the high school level. ▪ Test scores rose, especially at the elementary school level.

Source: Adams County School District 50

INDIVIDUAL LEARNING PLANS FOR ALL STUDENTS

"Personalized learning plans" and electronic portfolios can help focus and track students' progress through a NGL education framework. Fred Bramante of the New Hampshire State Board of Education, where the Carnegie unit is being replaced by a competency-based system, states that the creation of personalized learning plans for 100 percent of students is

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[63] Ibid.
[64] Ibid.
[65] Ibid.

critical for educators seeking to customize learning to students' needs and interests.[66] In "Cracking the Code: Synchronizing Policy and Practice for Performance-Based Learning," Susan Patrick advocates for the following personal learning plan features:[67]

- Personalized learning plans should be grounded in **lifelong learning standards**;
- Involve a variety of **personalized learning tasks** including independent and collaborative work, tutoring, small groups, and project-based learning;
- Include **anytime, anywhere learning** such as community-based learning and online modalities when relevant;
- Show competencies and **learning objectives** which have been mastered; as well as
- Real-time information about areas of current focus, and what the student needs to work on next.

STUDENT VOICE

The portfolio schools model, discussed earlier in this report, is one way to provide students and their families with the power to decide how they would like to learn and what curricular approach is best suited to their needs. Students' agency can be further developed through their involvement in the construction of their personalized plans. In *Schooling for Tomorrow: Personalizing Education*, Dave Miliband writes, "Personalized learning means every student enjoying curriculum choice, a breadth of study and personal relevance, with clear pathways through the system."[68] Miliband adds the distinction that students of different ages demand different avenues for choice and voice. For younger students, this means active engagement in "exciting curricula, problem solving and class participation. And then at 14-19, it means significant curriculum choice for the learner."

ELECTRONIC PORTFOLIOS

Electronic portfolios of student work complement personalized learning plans by allowing students to compile authentic artifacts of their learning through assignments, projects, and assessments. Susan Patrick suggests personalized learning plans function much like the system by which "scouts [earn] merit badges by effectively demonstrating their knowledge, skills, and dispositions through performance."[69] Teachers can meet periodically with individual students' parents to review the student's progress toward specific learning goals. Portfolios can also prove useful when students transfer to a different school and for parent-

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[66] Patrick, S., & Sturgis, C. "Cracking the Code: Synchronizing Policy and Practice for Performance-Based Learning," P. 12. http://www.inacol.org/research/docs/iNACOL_CrackingCode_full_report.pdf

[67] Ibid.

[68] Miliband, D. "Choice and Voice in Personalized Learning." In *Schooling for Tomorrow: Personalizing Education*, pp. 21-29, p. 25. OECD Publishing. http://www.oecd.org/site/schoolingfortomorrowknowledgebase/themes/demand/41175554.pdf

[69] Patrick, S., & Sturgis, C., Op. cit., p. 21.

teacher (and parent-student-teacher) conferences. [70] With the combination of a personalized learning plan and electronic portfolio, students are able to visualize where their learning will take them, motivating them to continue working toward their personal goals.[71] Examples of elementary-level student portfolio items are presented in Figure X:[72]

Figure 3.2: Elementary-Level Digital Student Portfolio Artifacts

Social Studies: Map of New Mexico	Art/Computer: Digital Self Portrait
Reading: Accelerated Reader Student Record	**Language Arts: Student Poetry**
***08/30/99 Summary *** Average percent correct..... 86.6% Average reading level....... 3.5 Tests taken.......................... 68 Tests passed...................... 64 Tests failed........................... 4 Points possible.................. 38.5 Points earned.................... 32.2 Points used......................... 0.0 Points available................. 32.2 Annual goal........................ 36.0 Percentage of goal earned... 89.4%	"Wolves" The wolves howl at the moon When it comes out But people think they're werewolves Killers of the night They aren't, they are hunters of the night And then the moon goes down It ends

Source: New Mexico State University – Regional Educational Technology Assistance

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[70] Smith, C. "Assessing and Reporting Progress through Student-Led Portfolio Conferences." Association for Middle Level Education. http://www.amle.org/Publications/WebExclusive/Portfolio/tabid/650/Default.aspx

[71] Snyder, J. "Proficiency-Based Assessment and Personalized Learning." Southeast Education Network. http://www.seenmagazine.us/articles/article-detail/articleid/2338/proficiency-based-assessment-and-personalized-learning.aspx

[72] "Digital Portfolios – Elementary Level." New Mexico State University – Regional Educational Technology Assistance. http://reta.nmsu.edu/Lessons/digital/elem/elemen.html

SECTION IV: PERSONALIZED LEARNING THROUGH TECHNOLOGY

Technology facilitates a greater degree of flexibility and individualization in education, supporting personalized learning initiatives. As one article from the Southeast Education Network states, "there is only so much that can be personalized with one teacher, 20 to 40 students, and print media and production methods."[73] The flexibility inherent in teaching and learning technologies allows students to direct their own learning, which improves their interest and engagement with the subject matter. In addition, technology allows students to explore multiple learning modalities so as to maximize their understanding of a subject. As one student in a technology-enhanced personalized learning environment stated, "If I don't understand something, I can try and learn it in a new way and take my time. I don't have to learn it the same way everyone else does."[74]

With at least "50 percent of all public school districts […] operating or planning some kind of online and blended learning programs," vendors of online learning products aim specifically to take advantage of the personalized learning market.[75] These include Alleyoop, an education startup backed by Pearson; Knewton, a web-based platform which mines performance data to recommend a student's next steps; and CompassLearning Odyssey, offering primary and secondary curricula and formative assessments.

A number of educational leaders are quick to note, however, that **personalized learning first and foremost is about innovative teaching, rather than access to technology**. Purchasing and providing software, laptops, and/or mobile devices alone is insufficient to change teaching and learning by itself; a shift in how lessons are designed is required to support the integration of technology into the classroom and effectively support student learning.[76] In this section we touch on fully online coursework, but focus predominantly on blended learning.

DEFINING BLENDED/HYBRID LEARNING

Blended learning is predicted by the North American Council for Online Learning (NACOL) to rapidly become the predominant model of K-12 instruction. This model increases flexibility for students and teachers because students can learn at an individualized pace. Blended learning can also address specific risk factors used to identify struggling students. NACOL

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[73] Snyder, J. Op. cit.

[74] West, D. October 6, 2011. "Using Technology to Personalize Learning and Assess Students in Real-Time." Brookings Center for Technology Innovation. P. 3. http://www.brookings.edu/research/papers/2011/10/06-personalize-learning-west

[75] Watson, et al., 2010. "Keeping Pace with K-12 Online Learning," p. 6. http://www.inacol.org/research/docs/Keeping%20Pace%20with%20K-12%20Online%20Learning%202006.pdf

[76] Ledesma, P. July 15, 2012. "Personalized Learning Requires Effective Teaching First, Technology Second." *Education Week*. http://blogs.edweek.org/teachers/leading_from_the_classroom/2012/07/personalized_learning_requires_effective_teaching_firsttechnology_second.html

uses the terms blended and hybrid learning interchangeably and offers the following definition from the University of Calgary:[77]

> The integration of face-to-face and online learning to help enhance the classroom experience and extend learning through the innovative use of information and communications technology. Blended strategies enhance student engagement and learning through online activities to the course curriculum, and improve effectiveness and efficiencies by reducing lecture time.

The body of research evaluating the effects of blended learning on student achievement in the middle grades is still in need of growth. However, we highlight here key findings that support this approach, some challenges and criticism, as well as blended learning models and programs best suited to personalize learning for this age group.

U.S. DEPARTMENT OF EDUCATION RESEARCH ON BLENDED LEARNING

The results of the U.S. Department of Education's 2009 meta-analysis of studies on K-12 online educational programming concur that blended instruction has a positive impact on learning. The findings indicated that "students in online conditions performed modestly better, on average, than those learning the same material through traditional face-to-face instruction" while "instruction combining online and face-to-face elements had a larger advantage relative to purely face-to-face instruction than did purely online instruction."[78] However, it is important to note that these studies looked at older students rather than elementary students, which is a limitation of current research regarding online and blended learning.

BENEFITS OF BLENDED LEARNING FOR STUDENT MOBILITY

Research has shown that frequent school changes increases the likelihood that students will fall behind in their studies because student mobility makes it more difficult for teachers to identify students' needs in a timely and appropriate manner.[79] The concept of differentiated lesson plans refers to planning lessons to address the learning needs of small groups and individual students rather than the whole-class:[80]

> Differentiating instruction means "shaking up" what goes on in the classroom so that students have multiple options for taking in information, making sense of ideas, and expressing what they learn. In other words, a differentiated classroom provides

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[77] Watson, J. "Blending Learning: The Convergence of Online and Face-to-Face Education." North American Council for Online Learning. P. 5. http://www.inacol.org/research/promisingpractices/NACOL_PP-BlendedLearning-lr.pdf

[78] Means, B. et. al. 2010. "Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies." *U.S. Department of Education.* pp.: 1- A6. p. xiv-xv. http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

[79] Christenson, S. and Thurlow, M. 2004. "School Dropouts: Prevention Considerations, Interventions, and Challenges." *Current Directions in Psychological Science.* (13)1: pp. 36-39. http://www.jstor.org/stable/20182903

[80] Beecher, M. and Sweeny, S. 2008. "Closing the Achievement Gap With Curriculum Enrichment and Differentiation: One School's Story." *Journal of Advanced Academics.* 19(3): pp.:502-530. p. 512. http://www.eric.ed.gov/PDFS/EJ810785.pdf

different avenues to acquiring content, to processing or making sense of ideas, and to developing products so that each student can learn effectively.

Blended learning addresses these challenges since it is rooted in personalized instruction tailored to the specific needs of students.

DEMAND FOR PROFESSIONAL DEVELOPMENT

Some of the major challenges regarding the implementation of blended learning programs in elementary schools relate to the lack of training for teachers and the inherently confusing nature of online instruction. Instructors require professional development in order to effectively use instructional technology. They also need to be able to handle any routine complications that may arise with software or hardware used in their classroom.[81]

In addition to professional development and training, teachers need to be comfortable teaching blended courses, relying on real-time assessments, and thus adapting their approaches to lesson planning. For instance, School of One uses a computer algorithm to create lesson plans for the next day based on the results of the previous day's diagnostic tests of student comprehension.[82] Using this system, teachers no longer have to prepare new lessons on a daily basis because the software assigns each teacher a "bucket of approximately 30-40 lesson areas that they can be expected to teach in that grading period."[83]

BLENDED LEARNING IN SPECIFIC SUBJECT AREAS

The What Works Clearinghouse (WWC) has reviewed efficacy studies for a number of programs designed to supplement class instruction with supplemental computer technology. Some curricular approaches appear to have "potentially positive effects," ("evidence of a positive effect with no overriding contrary evidence") while others yield "no discernible effects" (no affirmative evidence of effects).[84] We present the findings of these meta-analyses here:

- **Literacy** – *SuccessMaker* is a computer-adaptive curriculum designed to supplement reading instruction in kindergarten through 8th grade classrooms. The program's software "analyzes students' skills development and assigns specific segments of the program, introducing new skills as they become appropriate." **Reading practice is** thus **personalized to students' abilities** on topics of "phonological awareness, phonics, fluency, vocabulary, comprehension, and concepts of print."[85] Based on

[81] Lin, Q. 2008. "Student Views of Hybrid Learning: A One-Year Exploratory Study." *Journal of Computing in Teacher Education.* 25(2): pp.: 57-66. p. 57. http://www.eric.ed.gov/PDFS/EJ834097.pdf

[82] Tucker, B. 2011. "My Visit to School of One. (Part I)." *Education Next.* http://educationnext.org/my-visit-to-school-of-one-part-i/

[83] Ibid.

[84] "Glossary." What Works Clearinghouse. Institute of Education Sciences. http://ies.ed.gov/ncee/wwc/glossary.aspx

[85] "Intervention: SuccessMaker." June 2009. What Works Clearinghouse. Institute of Education Sciences. http://ies.ed.gov/ncee/wwc/reports/adolescent_literacy/successmaker/index.asp

three studies meeting WWC evidence standards with reservations, *SuccessMaker* has <u>potentially positive effects</u> for 1) general literacy achievement and 2) comprehension. No effects were discerned for 3) reading fluency or 4) alphabetics.

- **Reading Achievement and Comprehension** – *READ 180* is designed for elementary through high school students reading below grade level. The program's **software** "**aims to track and adapt to each student's progress**."[86] Additional components, including workbooks, independent reading books, and audiobooks, are also included in the program. In a 2009 review, seven studies met WWC evidence standards with reservations. They focused on students ranging from 4th to 9th grade, and WWC determined that *READ 180* has <u>potentially positive effects</u> on both reading achievement and comprehension.

- **Math Word Problems** – According to the WWC, "a few well-designed studies" have found that integrating contexts with which students are familiar into math word problem design can increase levels of student mastery. "<u>Achievement gains</u> occurred when **computer programs were used to personalize problem contexts** for individual students or when contexts were based on the common preferences of student groups."[87]

- **Math Achievement**

  o The *Cognitive Tutor Algebra I* program "combines algebra textbooks with interactive software" using an artificial intelligence model which "customizes prompts to focus on areas where the student is struggling and sends the student to new problems that address those specific concepts."[88] Of the 14 studies reviewed by the WWC, one met evidence standards and indicated <u>potentially positive effects</u> on mathematics achievement.

  o *Plato Achieve Now* is a software-based curriculum designed for elementary and middle school grades. The program uses **computer-based assessments to "customize individual instruction**, allowing students to learn at their own pace with content appropriate for their skill level."[89] Of 13 studies reviewed by the WWC on the effectiveness of *PLATO Achieve Now*, only one met evidence standards. This study found <u>no discernible effects</u> on math achievement for participating 6th grade students.

- **Procedural Flexibility** – A study of eight- and nine-year old students in the United Kingdom suggested that supplemental computer practice can help facilitate the development of **multiple strategies for problem solving**. Intervention students in

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[86] "READ 180 - Report Summary." October 2009. What Works Clearinghouse. Institute of Education Sciences. http://ies.ed.gov/ncee/wwc/interventionreport.aspx?sid=571

[87] "Improving Mathematical Problem Solving in Grades Four through Eight." May 2012. National Center for Education Evaluation and Regional Assistance. P. 11. http://ies.ed.gov/ncee/wwc/pdf/practice_guides/mps_pg_052212.pdf

[88] "Cognitive Tutor - Report Summary." July 2009. What Works Clearinghouse. Institute of Education Sciences. http://ies.ed.gov/ncee/wwc/interventionreport.aspx?sid=87

[89] "PLATO – Report Summary." March 2010. What Works Clearinghouse. Institute of Education Sciences. http://ies.ed.gov/ncee/wwc/interventionreport.aspx?sid=378

this study used a computer program which asked them to develop multiple coin combinations for a specific monetary amount. WWC reports that "these <u>students scored significantly higher</u> on procedural flexibility than comparison students, who did not use the computer program and were not asked to generate multiple combinations."[90]

- **Science Achievement** - *Technology Enhanced Elementary and Middle School Science* (*TEEMSS*) is an **inquiry-based** physical science curriculum for 3rd through 8th grade students. Student use **handheld computers** to "gather and analyze data, and formulate ideas for further exploration."[91] The program's software enables teachers to view students' **electronic portfolios**, facilitate **data sharing among student devices**, and use electronic student responses to spark class discussions. The one study which met WWC evidence standards, which focused on 3rd and 4th grade students, indicated <u>potentially positive effects</u> on science achievement.

ONLINE COURSEWORK

The development of fully online courses and schools are connected with the "anytime, anywhere" learning initiatives central to NGL. However, most single-district programs primarily serve high school grade levels, and more occasionally, **middle school** levels. A smaller, but growing, number of districts offer online and blended options for **elementary students.**[92]

Programs are funded primarily by the district from public funds. In most cases, there is **no difference in funding** between online students and students in the physical setting. While programs are mostly **supplemental**, some serve full-time students.

Research has identified characteristics of successful online students, which include intrinsic motivation, independent learning skills, interest in computers, and involvement in outside hobbies, activities and relationships.[93] Online coursework may be most beneficial to the following student populations:

- Students who require **flexible learning schedules** and have adult supervision, including:[94]
  o Serious performers and athletes

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[90] "Improving Mathematical Problem Solving in Grades Four through Eight." Op. Cit., p. 64.

[91] "Technology Enhanced Elementary and Middle School Science (TEEMSS) – Report Summary." May 2012. What Works Clearinghouse. Institute of Education Sciences.
http://ies.ed.gov/ncee/wwc/interventionreport.aspx?sid=610

[92] Watson, et al. Op. cit., p. 34.

[93] Watson, John and Butch Gemin. 2010. "The State of Online Learning in Maryland, 2010-2011." p. 24
http://www.marylandpublicschools.org/NR/rdonlyres/D895AEF0-476A-46CF-86E5-A77C87A4E129/27450/OnlineLearning_MD_2010_2011.pdf

[94] Ibid., p. 24

- o Migrants
- o Homebound, seriously ill, or severely handicapped students

- ▪ Students who need to **recover credits** from failed courses in order to graduate (this is most common at the high school level but may also apply to middle grades)[95]

- ▪ **Gifted students** who have proven their ability to excel in a subject and want to progress quickly in it in order to take advanced classes [96]

- ▪ **Independent learners**, or potentially gifted students, who achieve little in class but still perform well on tests, may be well-served by programs that allow them to go at their own pace

- ▪ Disabled students in need of **assistive technology**[97,98]

SPOTLIGHT ON DISTANCE LEARNING: COMMONWEALTH CONNECTIONS ACADEMY[99]

The Commonwealth Connections Academy (CCA), a K-11 Pennsylvania public school, has an online delivery system. However, CCA believes a face-to-face component would help students achieve grade level proficiency. To provide extra support, CCA implemented a drop-in center "where online students work with highly-qualified teachers in person (usually the same teachers the students work with online) to address deficiencies." The drop-in center also hosts special activities for students and teachers, such as an award-winning guest speaker.

Struggling students are identified through "indicators found in test scores, course activities and portfolio assignments." Early identification practices help educators know which students are in need of the drop-in center. According to Susan Shubert, Elementary Principal of the Commonwealth Connections Academy, "the face-to-face time at the drop-in center has helped us (teachers and administrators) identify barriers to student's learning and provide solutions through a model 21st century virtual delivery system." Shubert added, "In some cases, it's simply identifying a student that has trouble organizing information and making accommodations and modification to address the student's specific learning needs, such as providing graphic organizers and discussing note taking strategies."

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[95] Ibid., p. 24.

[96] "Credit Flexibility Guidance: Gifted Education." Op. cit.

[97] Muller, Eve. 2010. "Virtual K-12 Public School Programs and Students with Disabilities: Issues and Recommendations." p. 3. http://www.projectforum.org/docs/VirtualK-12PublicSchoolProgramsandSwD-IssuesandRecommendations.pdf

[98] Although disabled students may benefit from online classes, there are still additional legal and administrative frameworks they must pass through which have not caught up with virtual education. These include adherence to the plans for accountability, evaluation, and assessments outlined in students' Individualized Education Program (IEP).

[99] Watson, J. "Blended Learning: The Convergence of Online and Face-to-Face Education." Op. Cit. p.8-9.

SECTION V: CASE STUDIES OF PERSONALIZED BLENDED LEARNING

A common theme throughout the literature on blended learning is that the decision to implement a blended curriculum should be primarily based on the mindset of student progress. To that end, blended instruction is a pedagogical approach "that combines the effectiveness and socialization opportunities of the classroom with the technologically enhanced active learning possibilities of the online environment, rather than a ratio of delivery modalities."[100] The movement toward blended learning, as this section illustrates, is therefore a "fundamental redesign of the instructional model."

The three case studies presented in this section highlight personalized learning initiatives that support a standard outcome: improving student learning by moving at the student's pace, and increasing parent and teacher engagement with the student's needs. We note that comprehensive information is not available for many personal learning initiatives, as the trend is relatively young. These cases were chosen either due to the comprehensiveness of information available about them, or because they present a unique element or strategy for personalized learning in the middle grades.

NEW YORK CITY DEPARTMENT OF EDUCATION

The New York City Department of Education developed the "School of One" program, which began as a summer and after school program and has since been expanded for the full school year. Within this model, all students receive a learning style assessment as well as **daily assessments to identify their present level of ability** and their upcoming instructional needs. Students also receive a daily "playlist" from a bank of available instructional lessons and activities that are tailored to their individual needs and skills.

The program aims to provide "personalized, effective, and dynamic classroom instruction."[101] With constant assessment and a bank of available options for daily learning, students each receive profoundly different instruction. Every student progresses through the standard New York State Department of Education curriculum, but at a pace dictated by their own abilities.

Not only can students progress at a pace that suits their needs, they are also able to be targeted for **specific teaching and learning strategies to suit their individual learning styles**. Some students, for instance, learn best when taught amongst a group, while others have better success learning from software. The School of One uses a combination of "learning modalities, including teacher-led large and small group instruction, small group

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[100] Dziuban, C. et. al. 2004. "Blended Learning," *Educause. Review*. 2004(7): pp.: 1-12. p. 3. http://net.educause.edu/ir/library/pdf/ERB0407.pdf

[101] "School of One." New York City Department of Education. P. 1. http://schools.nyc.gov/NR/rdonlyres/9435AD08-90F3-42AA-838C-6372C3B5D2E6/0/SchoolofOneBrochure_FINAL.pdf

collaborative activities, virtual software-based instruction, virtual live instruction, independent learning, and one-on-one tutoring."[102]

The role of the teacher undergoes fundamental changes in the School of One model. Instead of one teacher being responsible for teaching all content to all students in the class throughout the year, **several teachers divide the concepts to be taught during the year** and instruct groups of students in their specific topics. Lessons in those topics might be delivered several times per year based on student progress.

The School of One holds to the essential elements of personalized learning as it:[103]

- Adopts a student-centered learning paradigm

- Dramatically shifts the teacher's role to being part of a collaborative team that works with a larger universe of students, but also provides more one-on-one or small group time with many as needed

- Capitalizes on technology to match students with resources, address the many different learning styles, provide additional time on task, adjust to a student's pace, and provide multiple pathways

- Utilizes computer-based assessments to power the algorithms critical for the real-time development of the daily playlist at the center of the personalization.

MILLIS PUBLIC SCHOOLS, MILLIS, MA

Millis Public Schools (MPS) implemented a pilot personalized learning initiative in 2011 across 8th grade classrooms. In the program, iPads facilitate the learning process. Students in pilot schools **receive iPads and are able to take them from school to home**, to support research conducted at the district level to determine how the devices help improve productivity, engagement, and learning.[104]

Over 40 third party applications ("apps") were selected by teachers for use on the district's iPads. These included a graphing calculator for Algebra, iPocketDraw for Science, and Popplet Lite to create story boards in English.[105] Upon the completion of the pilot program, students were surveyed on their use of particular applications and services and their utility in the learning process. A majority of students found the following applications "very easy to use:"[106]

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[102] Ibid. P. 3.
[103] Wolf. Op. cit., p. 19.
[104] "1-to-1 Personalized Learning Initiative." Millis Public Schools. School of One. New York City Department of Education. http://schools.nyc.gov/NR/rdonlyres/9435AD08-
[105] "Grade 8 Mobile One-to-One with iPads." Millis Public Schools. P. 4. http://www.millisps.org/sites/default/files/iPadEvaluation_Final_0.pdf
[106] "iPad Pilot Final Evaluation Survey." Millis Public Schools. P. 6. http://www.millisps.org/sites/default/files/SurveySummary_11072011.pdf

- Pages
- Keynote
- Drawcast
- Safari
- Transjugator

- iTranslate
- Google Mail
- Calendar
- Notes

Additionally, the following websites providing learning content were rated as useful or very useful: Study Island, Quest, Moodle, Youtube, Teacher Tube, and iBooks. Students further noted that they did not find TED, USA Today, Llife, and Kahn Academy as useful as other websites.[107]

A final evaluation of the pilot program found that **the iPad had "exceeded expectations" for its utility in transforming teaching and learning**. Students were able to "communicate, collaborate, analyze, and create" with the devices, as well as tailor their learning experience to suit their personal needs.[108] The program has received approval and support to expand through 2016. The iPad initiative holds to the elements of effective personalized learning through increasing student engagement and productivity, increasing 21st century skill development, extending learning experiences beyond the school day, increase access to technology tools, and promoting self-directed learning.[109]

ACADEMY OF PERSONALIZED LEARNING, REDDING, CA

The Academy of Personalized Learning is a K-12 public charter school that aims to offer an educational option to parents who seek a greater level of involvement in their children's education. Teachers work with parents and students to assess student needs, interests, and learning styles and to plan for student success through curriculum choice, small classes, online classes, vendor course instruction, and community-based instruction.[110] **Teacher, parent, and student meetings are held at minimum once every 20 school days**, creating an ongoing dialogue between educators and stakeholders to ensure each student is learning effectively.

Coursework is aligned with California State Standards and emphasizes core subjects. In order to maintain charter status, students must take standardized state assessments, though the school "recognize[s] that standardized tests do not always accurately reflect a student's knowledge and skills."[111] In addition to the state-mandated tests, students also undergo pre- and post-testing in the first and last weeks of school via a computerized, interactive interface called **EdPerformance**. The program provides parents and teachers instant feedback on students' reading and math skills.[112]

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[107] Ibid., p. 5.
[108] "Grade 8 Mobile One-to-One with iPad Final Evaluation." Millis Public Schools.
    http://www.millis.k12.ma.us/node/982
[109] "Grade 8 Mobile One-to-One with iPads." Op. cit., p. 3.
[110] "About Us." Academy of Personalized Learning. http://www.ourapl.org/about.htm
[111] "APL Student and Parent Handbook." Academy of Personalized Learning. P. 9. http://www.ourapl.org/about.htm
[112] "Required Student Testing." Academy of Personalized Learning. http://www.ourapl.org/Testing.htm

The school **does not provide students with computers**, but does make use of several online course options. Language education is available via Rosetta Stone and PowerSpeak, and OdysseyWare courses are also available. Students must enroll specifically in these courses to take advantage of the school's online offerings.[113]

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[113] "Online Courses Portal." Academy of Personalized Learning. http://www.ourapl.org/Online_Portals.htm

SECTION VI: THE SCHOOL AND THE COMMUNITY

Personalized learning tends to place a high value on the role of family engagement and community partnerships. In fact, the RTT-D application requires evidence of "meaningful stakeholder engagement" in the development of the proposal and meaningful stakeholder support for the proposal. [114] Effective implementation of personalized education frameworks and initiatives requires that district leaders and school administrators effectively involve these and other stakeholders in the process.

COMMUNICATING WITH STAKEHOLDERS

Leadership is one of the most important components of success during periods of change. A change controller must be proactive, rather than reactive, when it comes to planning systemic change. [115] Communication plays an important role in change situations. Parents, teachers, and community partners should be involved in the decision-making processes, and any adaptations should be clearly communicated during the transition period.

Personalized learning initiatives should result in increased parental engagement, as well improved partnership with community organizations and programs which have the potential to provide personalized learning opportunities for students. Based on the research presented in this report, potentially significant areas of change involved with personalized learning include the following:

- Increased educational choice for families with the portfolio schools model
- The replacement of the Carnegie unit with multi-age groupings and a performance-based curricular framework
- Blended and online learning , including extended learning opportunities
- Parent understanding of and attentiveness to student data and personalized learning plans
- Expectations of community partners (i.e. after-school programs and tutors) to align with personalized learning practices and frameworks

Areas such as these would require extensive stakeholder communication and engagement. The Rhode Island Department of Education, for example, recently held a conference for a broad range of stakeholders to "establish common language, understanding, and strategies for growth of digital learning in the state to spur educators on the front lines to lead the

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[114] "District Capacity and Success Factors." U.S. Department of Education. http://www.ed.gov/race-top/district-competition/selection-criteria-b-district-capacity

[115] Kiger, P. July 2007. "HR as a Change Agent in the Downturn." Workforce Management Online. www.workforce.com/archive/feature/24/99/79/249987.php (Access by membership only).

innovation."[116] Educator, parent, and community support of personalized learning initiatives can improve the transition process.

PARENTAL INVOLVEMENT

A 2005 Harvard Family Research Project (HFRP) meta-analysis focused on the "overall impact of parental involvement on the student population" indicated that "parental involvement is associated with higher student achievement outcomes" on grades, standardized assessments, teacher ratings, and various additional measures.[117] Research by Joyce Epstein has identified six key types of parental involvement in the middle grades:[118]

Figure 6.1: Types of Parental Involvement in the Middle Grades

TYPE OF INVOLVEMENT	DESCRIPTION
Parenting	Activities are designed to help families understand young adolescent development, acquire developmentally appropriate parenting skills, set home conditions to support learning at each grade level, and help schools obtain information about students.
Communicating	Activities focus on keeping parents informed through such things as notices, memos, report cards, conferences about student work, and school functions.
Volunteering	Activities incorporate strategies to improve volunteer recruiting, training, and scheduling.
Learning at Home	Activities allow coordination of schoolwork with work at home (e.g., goal setting, interactive homework).
Decision-making	Activities are designed to solicit the voice of parents in decisions about school policies and practices.
Collaborating with the Community	Activities acknowledge and bring together all community entities (e.g., with the community businesses, religious organizations) with a vested interest in the education of young adolescents.

Source: National Middle School Association.

A DC Data Summit presentation on family engagement suggests additional strategies for engaging parents with the personalized learning framework and increasingly data-driven education:[119]

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[116] Evans. Op. cit., p. 11.

[117] Jeynes, W. December 2005. "Parental Involvement and Student Achievement: A Meta-Analysis." Harvard Family Research Project. http://www.hfrp.org/publications-resources/browse-our-publications/parental-involvement-and-student-achievement-a-meta-analysis

[118] "Parental Involvement." August 2006. National Middle School Association. http://www.amle.org/portals/0/pdf/research/Research_Summaries/Parent_Involvement.pdf

[119] Parades, M., & Spielberg, L. July 12, 2011. "We're All In This Together: Promising Practices for Sharing Student Data with Families." Presented at DC Data Summit. P. 7. http://focusdc.org/datasummitdocs/We%27re%20All%20in%20this%20Together-Sharing%20Data%20with%20Families.pdf

- Work with families to co-construct rigorous goals for their child for the long-term and short-term
- Share what is being taught in class and how it is being taught so that families can understand what their child is and should be learning
- Regularly share data so that families can monitor how their child is doing relative to their goals, to grade-level standards, and to their peers
- Communicate with and model for families ways that they can support their child's learning

INCLUSIVE COMMUNITY PARTNERSHIPS

Some community partnerships may be able to alleviate potential barriers to student learning. In some cases this involves inviting supports for at-risk student populations including ethnic and cultural minorities, English Language Learners, and other context-specific populations. One example, included in the recruitment of "teaching assistants from the local ethnic minority population and ensuring the school is accessible to families by providing multilingual signs around the school."[120]

The Oakland Unified School District (OUSD) models this approach to personalized learning by prioritizing the inclusion of "student and family support services accessible to all students." Named California's most improved urban school district, OUSD has created a four-phase strategic plan to "transition into a full-service community school district that supports the unique needs of each child."[121] Initiatives which are particularly relevant to middle grade students include The Bully Project, OUSD volunteer opportunities for "adults with a wide variety of backgrounds and skill sets" to provide students with "personalized attention," and the Oakland Community Resource Directory.[122]

"EXTENDED SCHOOLS"[123]

Work-related learning, internships at the middle school level, and volunteer activities can also increase student motivation. These approaches empower students to envision the real-world applicability of their classroom learning and raise their aspirations for the future. According to a U.K.-based investigation into schools dedicated to personalized learning, "extended schools" which facilitate student learning in the surrounding off-campus community equip them to develop their personal learning goals and engage in targeted learning activities – inside *and* outside the school campus. The resulting report suggests that the extension of schooling into the community is correlated with the following outcomes:

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[120] Sebba, J., et. al. "An Investigation of Personalized Learning Approaches Used by Schools." University of Sussex - Department for Education and Skills. P. 79. http://www.canterbury.ac.uk/education/tf-mentors/ActivitiesforMentoring/Personalised/documents/DfESReport.pdf

[121] "Oakland Transforms into a Full-Service Community School District." The Whole Child. http://www.wholechildeducation.org/what-works/examples/oakland-transforms-into-a-full-service-community-school-district

[122] Oakland Unified School District. http://publicportal.ousd.k12.ca.us/ousd/site/default.asp

[123] Sebba, J., et. al. Op. cit. p.14.

- Raised attainment

- Increased student engagement with learning

- Growing trust and support between families and schools

AFTER-SCHOOL PROGRAMS

After-school programs arranged by the district, individual schools, and local non-profit organizations have the potential to extend personalized learning frameworks beyond structured school time. According to an IES report on best practices among after-school programs at the elementary and middle school levels, programs which "adapt instruction to individual and small group needs" are more highly associated with "positive academic effects."[124] The HFRP adds, after school programming should be "based on youth choice and voice, culture, individual needs, multiple intelligences, and personal engagement."[125]

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[124] Beckett, M., et. al. July 2009. "Structuring Out-of-School Time to Improve Academic Achievement." Institute of Educational Sciences. P. 24. http://ies.ed.gov/ncee/wwc/pdf/practice_guides/ost_pg_072109.pdf#page=30
[125] Deschenes, S., Arbreton, A., Little, P., Herrera, C., Baldwin Grossman, J., Weiss, H., and Lee, D. 2010. "Engaging Older Youth: Program and City-Level Strategies to Support Sustained Participation in Out-of-School Time." Harvard Family Research Project. http://www.hfrp.org/out-of-school-time/publications-resources/engaging-older-youth-program-and-city-level-strategies-to-support-sustained-participation-in-out-of-school-time

APPENDIX A: USING STUDENT ACHIEVEMENT DATA TO SUPPORT INSTRUCTIONAL DECISION MAKING

The following is a checklist for carrying out the recommendations included in the 2009 IES practice guide "Using Student Achievement Data to Support Instructional Decision Making."

Checklist for Carrying Out Recommendations

Recommendation 1. Make data part of an ongoing cycle of instructional improvement	**Recommendation 4. Provide supports that foster a data-driven culture within the school**
☐ Collect and prepare a variety of data about student learning. ☐ Interpret data and develop hypotheses about how to improve student learning. ☐ Modify instruction to test hypotheses and increase student learning.	☐ Designate a school-based facilitator who meets with teacher teams to discuss data. ☐ Dedicate structured time for staff collaboration. ☐ Provide targeted professional development regularly.
Recommendation 2. Teach students to examine their own data and set learning goals	**Recommendation 5. Develop and maintain a districtwide data system**
☐ Explain expectations and assessment criteria. ☐ Provide feedback to students that is timely, specific, well formatted, and constructive. ☐ Provide tools that help students learn from feedback. ☐ Use students' data analyses to guide instructional changes.	☐ Involve a variety of stakeholders in selecting a data system. ☐ Clearly articulate system requirements relative to user needs. ☐ Determine whether to build or buy the data system. ☐ Plan and stage the implementation of the data system.
Recommendation 3. Establish a clear vision for schoolwide data use	
☐ Establish a schoolwide data team that sets the tone for ongoing data use. ☐ Define critical teaching and learning concepts. ☐ Develop a written plan that articulates activities, roles, and responsibilities. ☐ Provide ongoing data leadership.	

Source: U.S. Department of Education

APPENDIX B: DATA ANALYSIS STRATEGY LOOP

Data Analysis Strategy Loop - Analyzing Student Work Data Protocol[126]

5 Minutes: *Examine* the data. Make "Page One" Comments (observations and questions only, no interpretation or judgment allowed) on the work. Presenter is silent.

Answer the following questions:
1. How was student knowledge assessed?
2. What factual knowledge, procedural knowledge, and conceptual knowledge are assessed by the assignment?
3. What do you notice about the data?
4. What do you wonder about the data?

5 - 10 Minutes: *Analyze* the data. Make "Page Two" comments (judgments, interpretations, implications, ideas for addressing concerns are fine at this point). Presenter is silent and takes notes.

Answer the following questions:

1. What does the data tell us about student learning and thinking?
2. In general, at what stage are students in their understanding and competency with the factual, procedural, and conceptual knowledge?
3. What are next steps for teaching these students? What opportunities do they need to deepen their understanding?
4. Which students need additional practice? Is there a student or a group of students that don't understand the factual, procedural, or conceptual knowledge? If so, what re-teaching needs to occur? In what ways can the knowledge, skills, and understandings be broken down into smaller parts that tie back to the larger conceptual understanding?
5. Which students need additional challenge? Is there a student or a group of students that have mastered the skill? If so, what extensions of the factual, procedural, and conceptual knowledge need to be provided for them? How can they be challenged to deepen their thinking and understanding of the core concepts?

5 - 10 Minutes: *Discussion* with presenter. Questions answered. Group discusses implications, ideas, suggestions for the particular classroom, for the classrooms of other participants, and for the school as a whole.

5 Minutes: *Debrief*. Each member of the group has a chance to make final comments about their analysis and the process.

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[126] "DAS Loop – Analyzing Student Work Protocol." Friends of Choice in Urban Schools. http://focusdc.org/2nd-annual-dc-data-summit-workshop-materials

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