Early Progress

Interim Research on Personalized Learning

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RAND Corporation

The RAND Corporation is a nonprofit institution that helps improve policy and decisionmaking through research and analysis.

Bill & Melinda Gates Foundation

Guided by the belief that every life has equal value, the Bill & Melinda Gates Foundation works to help all people lead healthy, productive lives. In developing countries, it focuses on improving people's health and giving them the chance to lift themselves out of hunger and extreme poverty. In the United States, it seeks to ensure that all people—especially those with the fewest resources—have access to the opportunities they need to succeed in school and life. Based in Seattle, Washington, the foundation is led by CEO Susan Desmond-Hellmann and Co-chair William H. Gates Sr., under the direction of Bill and Melinda Gates and Warren Buffett.

Table of Contents

Introduction

The Bill & Melinda Gates Foundation is committed to ensuring that students graduate high school ready to succeed in college and careers. As part of this commitment, the foundation has partnered with a number of leading schools, educators, and other funders in the emerging field of personalized learning. We believe these new instructional approaches and school models hold promise as a way to maximize the impact of teachers and schools on their students' success.

Through the foundation's investments, we seek to identify, strengthen, and refine promising personalized learning practices; determine which are most effective; and encourage innovative educators and other leaders to spread the most successful practices to other classrooms, schools, and districts.

In reviewing emerging personalized learning models, the foundation—as well as a number of leading schools, educators, and other funders—generally looks for the following:

Systems and approaches that accelerate and deepen student learning by tailoring instruction to each student's individual needs, skills, and interests. Students have a variety of rich learning experiences that collectively will prepare them for success in the college and career of their choice. Teachers play an integral role by designing and managing the learning environment, leading instruction, and providing students with expert guidance and support to help them take increasing ownership of their learning.

The concept of personalized learning is still evolving as new models, approaches, and supporting technologies emerge. Still, many of the early adopting schools appear to be implementing similar practices. These include a focus on learner profiles that enable each student to be known well; the development of personalized learning plans for students; progress based on demonstrated knowledge and skills, rather than seat time; and flexible learning environments. All of these schools also are focused on preparing students for the Common Core State Standards and the critical-thinking and problem-solving skills students will need to persist and succeed in college and careers. And these schools are creating new roles and opportunities for teachers, who have been deeply engaged in the design of such schools.

Characteristics of Schools in the Initial Study

23 public charter schools

Nearly 5,000 students

2 years implementing personalized learning practices

predominantly urban locations

Student population predominantly from low-income families

Next Phase of the Study

29 additional public charter and district schools

This interim report from the RAND Corporation is the first in what will be a series of research reports based on an ongoing long-term study of foundation-funded schools that are using a variety of approaches to personalized learning. Although the early results are encouraging, the study does not attempt to make claims about which aspects of these schools contributed to the gains in student learning to date.

The foundation commissioned RAND to conduct the ongoing research to:

- identify the most promising and important features of these new models;

- document the challenges schools face as they implement these models;

- learn which components of personalized learning are most critical in the success of these new models of teaching and learning; and

- provide a source of independent feedback for the foundation and its school grantees.

This research is part of the foundation's ongoing commitment to spread effective practices across districts and charter networks, support innovative roles for teachers, and support implementation of college-ready standards.

All of the schools in the study received funding from the Bill & Melinda Gates Foundation, either directly or through intermediary organizations, to implement personalized

learning practices. Each of the participating schools in this study is affiliated with at least one of the following three foundation-supported initiatives: Next Generation Learning Challenges, Charter School Growth Fund's Next-Generation School Investments, and the Bill & Melinda Gates Foundation's Personalized Learning Pilots. (See page 28 for more detailed descriptions of these initiatives.)

This initial report focuses on the results for nearly 5,000 students attending 23 public charter schools that have been implementing personalized learning practices for the past two years and have two years of assessment data. Student learning growth was measured using the Northwest Education Association (NWEA)'s Measures of Academic Progress (MAP) math and reading assessments each fall and spring.

The next stage of the research will include 52 schools: the original 23 schools, which will have three years of implementation and assessment data, and an additional 29 schools, which will include both public charter and district schools that have two years of implementation and two years of achievement data.

Schools participating in this study did so anonymously. This enabled them to focus on the work of implementing the models without the distraction of excessive external attention being placed on their preliminary results. We commend these innovative schools and their leaders for their willingness and commitment of time and effort to participate in the study, so that others can benefit from what they are learning about implementing personalized learning practices. We are sharing findings with the field as they emerge, so that our grantees and partners can learn along with us as we collectively gain a greater understanding of what systems and approaches associated with personalized learning show greatest promise.

Key Findings

According to these early findings, students attending the schools in the study made gains in mathematics and reading over the last two years that are significantly greater than a virtually matched comparison group made up of similar students selected from comparable schools. So far, the gains in both math and reading translate into "effect sizes" of 0.41 in math and 0.29 in reading, which are relatively large compared with those in studies of other types of interventions. Effect size is the standard way researchers measure the impact of an educational strategy. Although results varied considerably among the 23 schools, nearly two-thirds had statistically significant positive results in either math or reading. Moreover, students generally ended the school year with math and reading test scores above or near the national average, after having started the school year generally performing below the national average.

In addition to focusing on student achievement results, the RAND research focuses on the variety of personalized learning approaches that are being used in these schools, characteristics of the school environment, and the successes and challenges the schools are facing as they implement these new models.

Table 1: **Schools in the study had large effect sizes based on increases in students' math and reading scores**

	EFFECT SIZE		NUMBER OF STUDENTS	
	Math	Reading	Math	Reading
All 23 Schools	**0.41**	**0.29**	**4,792**	**5,014**
Grades K–2	0.56	0.39	2,574	2,644
Grades 3–5	0.27	0.22	1,133	1,147
Grades 6–8	0.20	0.14	884	934
Grades 9–12	0.22	0.14	201	289

Note: All results displayed are significant at the $p < 0.05$ level after adjustment for multiple hypothesis tests.

Overall, researchers found many positive developments in the schools' environments, including positive perceptions among teachers about professional development, working conditions, and access to and use of technology that were conducive to implementing personalized learning practices. While some obstacles to implementation remain, data from teacher and student surveys, teacher logs, interviews with school administrators, and site visits reveal many encouraging observations from educators about the potential for success.

Although this interim report describes a variety of personalized learning practices that are being used by teachers across the 23 schools in this study, as well as positive features of the school environments, it is not yet possible to identify which particular instructional approaches may account for the positive student learning outcomes identified in math and reading. We anticipate that future reports will shed light on that issue, in addition to providing outcomes data from a larger and more diverse set of schools.

These findings build on an emerging evidence base about the promise of personalized learning practices and the role of technology as an enabler, which includes other recent studies such as the Center for Reinventing Public Education's report *Is Personalized Learning Meeting Its Productivity Promise? Early Lessons from Pioneering Schools* (May 2014); a new SRI international study *Blended Learning,* funded by the Michael & Susan Dell Foundation (May 2014); and recently released data about student performance in the personalized learning model used by New Classrooms: Innovation Partners for Learning (fall 2013).

The interim findings of the new RAND study are largely positive and promising, offering hope for the future. We believe these new findings will help inform the broader field, including leading-edge practitioners working in and with schools, as well as policymakers and grant makers who share an interest in personalized learning.

We look forward to what the next stages of research will bring. We are committed to continuing to share ongoing research publicly, including more detailed reporting on the implementation of personalized learning practices in a larger number of public charter and district schools, more information about how these new learning practices are continuing to evolve, and additional years of data on what impact these practices are having on student performance.
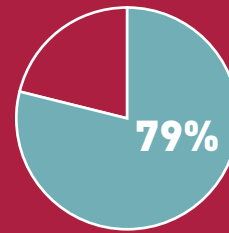
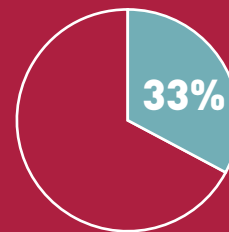**79%** Teachers who at least weekly receive data about which students have achieved mastery
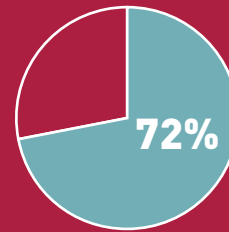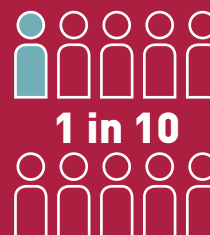
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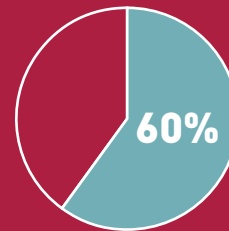
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33% Teachers who at least weekly receive test scores in subjects other than math or reading

1 in 10 Teachers who daily receive student data

Common Elements of Personalized Learning

In reviewing models that deliver more personalization in the teaching and learning process, the Bill & Melinda Gates Foundation—as well as a number of leading schools, educators, and other funders—generally looks for the following:

Systems and approaches that accelerate and deepen student learning by tailoring instruction to each student's individual needs, skills, and interests. Students have a variety of rich learning experiences that collectively will prepare them for success in the college and career of their choice. Teachers play an integral role by designing and managing the learning environment, leading instruction, and providing students with expert guidance and support to help them take increasing ownership of their learning.

The adoption of these approaches has significantly increased over the past several years, in part driven by rapid advances in technology platforms and digital content. Despite the changing landscape, there also appear to be some consistencies in approach around the following components:

LEARNER PROFILES: Teachers have an up-to-date record that provides a deep understanding of each student's individual strengths, needs, motivations, progress, and goals to help inform his or her learning.

PERSONAL LEARNING PATHS: All students are held to high expectations, but each student follows a customized path that responds and adapts based on his or her learning progress, motivations, and goals. For instance, a school might use weekly updates about a student's academic progress and interests to assign her a unique schedule that includes multiple learning experiences (or "modalities"), such as project-based learning with a small group of peers, independent work on discrete skills and complex tasks, and one-on-one tutoring with a teacher.

COMPETENCY-BASED PROGRESSION: Each student's progress toward clearly defined goals is continually assessed. A student advances and earns course credit (if applicable) as soon as he or she demonstrates an adequate level of mastery.

FLEXIBLE LEARNING ENVIRONMENTS: Student needs drive the design of the learning environment. All operational elements—staffing plans, space utilization, and time allocation—respond and adapt to support students in achieving their goals. For instance, schools might give teachers more time to deliver small-group instruction by taking away other responsibilities, or schools might recruit parents and community volunteers to provide daily after-school tutoring to every struggling reader.

In addition to pursuing at least some of these personalized learning practices, the 23 schools featured in this interim report also used multiple other educational and operational strategies. Most common among these included the implementation of the Common Core State Standards; a comprehensive human capital strategy that recognizes and supports excellent teaching and school leadership; new roles and opportunities for teachers; and the use of digital content in core subject areas to complement teacher-led instruction.

Methodology

The findings in this report are from 23 public charter schools that are pursuing a variety of personalized learning practices and that are funded directly or indirectly by the foundation via the initiatives described on page 28. Each of the schools in this study was selected through a competitive selection process. Although the criteria for selection differed based on the source of funding, all of the participating schools underwent a rigorous evaluation of their leadership team and their instructional vision before receiving a grant.

The study schools are predominantly located in urban areas and tend to serve large proportions of minority students from low-income families: 87 percent of the students are eligible for free or reduced-price lunch, 86 percent are children of color, and 100 percent live in a predominantly urban location.

Although there are additional schools participating in the study, the interim findings report only on the 23 schools that have implemented personalized learning models for at least two years and have administered the MAP math and reading assessments over the same time period. Future reports will include an analysis of the original group of 23 public charter schools, which will have three years of MAP data and implementation experience, and 29 additional schools, both district and public charter schools that have at least two years of MAP data and two years of implementation of personalized learning practices.

RAND Corporation researchers obtained and analyzed both qualitative and quantitative data from each school to create a broad picture of the schools' efforts to implement personalized learning and to understand the outcomes that resulted from the adoption of these new teaching and learning practices.

RAND collected the following information to conduct its analyses:

STUDENT PERFORMANCE DATA: Students generally took the MAP math and reading assessments online at least twice per school year in the fall and spring. MAP is an adaptive online test, which means the test software adjusts the consecutive difficulty of questions in response to an individual student's answers: If a student responds incorrectly, the next question is easier; if a student responds correctly, the test software skips ahead to a more complex question. The MAP assessment can provide information about how much progress a student makes over the course of a school year.

RAND collected the following information to conduct its analyses:

Student Performance Data

Teacher Logs

Teacher Surveys

Student Surveys

One-Hour Interviews

TEACHER LOGS: Teachers completed logs online describing their daily instructional practice over a 10-day period. Each day, teachers focused on the perspective of one student during the first 45 minutes of math or reading instruction. Teachers were asked to focus on a different student for each day that they kept the log. Researchers collected the log data compiled by teachers for one period in the spring of the 2012–13 school year and three periods during the 2013–14 school year, and they will collect logs for two periods during the 2014–15 school year.

TEACHER SURVEYS: These surveys asked teachers to provide their opinions about various aspects of the models, including professional training and support, access to resources, the quality of instructional and curricular materials, use of different models of classroom instruction, use of technology in the classroom, use of data to assess student progress, and obstacles to implementation. For the 2013–14 school year, the surveys were distributed online to a sample of 93 teachers in 17 of the schools, and the response rate was 58 percent. Although most of the survey items were developed specifically for this study, a few were adapted from other RAND surveys or from surveys developed by the University of Chicago Consortium on Chicago School Research (CCSR).

STUDENT SURVEYS: These surveys asked students to describe their study habits, attitudes toward learning, opinions about their school, the level of access to technology, and other topics. The student surveys were administered by RAND researchers in the spring of the 2012–13 school year and the fall and spring of the 2013–14 school year. For the 2013–14 school year, RAND distributed the surveys online to more than 1,600 students in grade 6 or above, and the response rate was 84 percent. As with the teacher surveys, RAND developed many of the items specifically for this study, but the surveys also included original or modified versions of items from the CCSR's surveys; the High School Survey of Student Engagement, developed by the Center for Evaluation and Education Policy at Indiana University; and the Tripod survey, developed by Harvard University's Ronald Ferguson to measure student opinions of teacher quality.

ONE-HOUR INTERVIEWS: For some of the schools, RAND researchers interviewed an administrator at the school, district, or charter management organization level. The aim was to speak to the one person most knowledgeable about the school. The administrator interviews also helped gather other information about instructional practices, including what types of technology the school was implementing, whether the school used standards-based grading, and whether there were opportunities for learning outside of school.

About the Comparison Group

The study includes an analysis of student and school performance data comparing the personalized learning schools with a virtual comparison group (VCG) identified by NWEA.

To establish a comparison pool of students, NWEA used its large national database of testing data to identify students with similar starting performance and demographic characteristics and from similar schools. For each student enrolled in a school in the study, NWEA provided MAP assessment data for up to 51 matched comparison students of the same gender, in the same grade, who scored similarly on the fall 2012 MAP assessments, and who attended non-study schools in the same type of location (i.e., urban) and with a similar proportion of low-income students.

This process enabled RAND to make more precise "apples to apples" comparisons of learning growth between the students at the personalized learning schools and a similar population of students attending other schools.

The observable characteristics of the comparison students were well matched to those of students in schools participating in the study. However, an important caveat is that the comparison students could possess other unidentified or unobserved differences that could confound efforts to measure the impact of the personalized learning environment. Such differences would create selection bias, which could account for performance differences between students in the study and the virtual control groups. As one example, many of the schools in the study are schools of choice. At these schools, families may place a different emphasis on education. The researchers performed a secondary analysis to check for this type of bias. After conducting this analysis, the researchers found the results remained unchanged and saw no evidence that the effect sizes were biased by the fact that all of the 23 schools in the study are public charter schools. However, all potential selection biases cannot be checked, which leaves open the possibility that the treatment effect estimates are inaccurate.

The VCG approach also assumes that the students in the comparison groups are attending more traditional schools that are not using personalized learning practices, but there is no way to verify this assumption. If this assumption is not true—if any of the comparison schools were indeed using personalized learning practices—estimates comparing personalized learning students to the comparison students could be biased.

Additionally, RAND researchers have noted other caveats regarding the data sources and how they may be interpreted, including the limitations of the MAP assessments, particularly in the earliest and highest grade levels; the possibility that personalized learning practices may be implemented only in a limited set of grades or subjects in the participating schools; and the small sample sizes in some schools and grade levels. Given these limitations, the interim results should be interpreted with some caution. For these reasons, the study does not attempt to make claims about which aspects of these schools, including personalized learning, contributed to the gains in student learning that have been identified.

Summary of Findings

For each school represented in these interim findings, the study collected extensive information about the characteristics of its design and the unique ways it is approaching personalized learning. RAND researchers examined successes and challenges in the implementation of personalized learning practices in these schools, as well the student and school-level outcomes that resulted from these new teaching and learning practices. The researchers took both quantitative and qualitative indicators into account in their analyses.

The findings are grouped into three categories:

1 **School Design Characteristics**

2 **Student Achievement Results**

3 **Teachers' and Students' Perceptions of the Schools**

School Design Characteristics

The following findings, which describe some of the primary design characteristics of the schools participating in the study, were derived from the teacher and student surveys, teacher logs, site visits, and interviews with school administrators.

Approaches to personalized learning vary, but common practices emerged.

This cohort of 23 schools share a desire to redesign public schools to better meet the needs of individual students. While the specific features of school models varied substantially, each of the schools in this study is implementing one or more key personalized learning practices: learner profiles, personal learning paths, competency-based progression, and/or flexible learning environments.

Collectively, the schools adopting these practices are doing so as part of more systemic efforts to rethink how teachers teach, how students learn, and how teachers and students interact with one another in the classroom. As an administrator at one school explained in an interview: "The goal is to make students independent, motivated, accelerated self-learners so that students can reach college and be able to drive their own learning, manage their own time, and seek help when they need it."

The schools also are redesigning how time is used during the school day and reconfiguring classrooms into more flexible learning environments that can be adapted for varied types of learning experiences. Three-quarters of the schools (17) provided data on flexible learning environments: 13 reported implementing extended days or extended years;

Key Findings

- Approaches to personalized learning vary, but common practices emerged.

- Teachers reported widespread use of competency-based instructional practices.

- Nearly two-thirds of teachers reported using learner profiles and personalized learning plans.

- Teachers used student data frequently and have relatively high levels of satisfaction with data systems.

- Technology is used extensively, but use varied widely even within the same school.

13 also reported employing flexible staffing; and 5 reported implementing flexible schedules. In some cases, schools reported they were planning to implement these features in the future.

Teachers reported widespread use of competency-based instructional practices.

Large majorities of teachers agreed that instructional practice reflects a wide variety of characteristics related to competency-based learning, which is instructional practices that require students to demonstrate an adequate level of mastery of specific skills or knowledge before advancing to new content.

One math teacher described what the process of tailoring content to different learning levels can look like: "In Algebra, students are broken into basic, proficient, and advanced problems. [The math problems are] not individualized by me, but students can access them and zoom through the easier problems to advanced. Students that have to home in on the basic can spend more time on that. Students choose what group of questions they want to work on. It's helped some students see where they are at and where they want to go and the advanced kids push the rigor of that."

86% Teachers give students the chance to work at their own pace.

The teacher and student survey findings, teacher logs, administrator interviews, and site visits all suggest that key aspects of competency-based instructional practices were being used, even in schools that had not fully implemented a competency-based learning model.

■ Nearly all teachers reported that students were aware of the goals they were expected to meet and that students had opportunities to work at different paces: **86 percent** of teacher respondents agreed or strongly agreed with

the statement that "I give students the chance to work through instructional material at a faster or slower pace than other students in this class."

■ **More than 70 percent** of teachers reported that they clearly presented objectives for assignments, devised strategies to allow students to track their own progress, and allowed different students to work on different topics or skills at the same time.

■ To some degree, students' perceptions were consistent with those of teachers, with majorities of students indicating awareness of the goals of instruction, opportunities for choice and for variation in pacing, and the availability of technology for tracking their own progress. However, there were some interesting discrepancies between some teacher and student responses, which will be an area of investigation in ongoing research.

Content mastery and critical thinking were identified as teachers' primary areas of focus in the teacher logs. This finding was also reflected in the administrator interviews.

Nearly two-thirds of teachers reported using learner profiles and personalized learning plans.

All of the schools reported they are at some stage of planning, piloting, or implementing learner profiles to guide instruction, and all but one were planning, piloting, or implementing personalized learning plans.

At schools using learner profiles, students might meet individually with their teacher at the beginning of the school year to work together to identify goals for the year ahead. A frequent cycle of follow-up meetings provides opportunities for students to reflect on how they are making progress toward those goals, what areas they may need to focus more attention on, and whether they need to revise any goals. To facilitate communication about student progress on a regular basis, schools seek to ensure that students, teachers, and parents can access frequently updated student performance data in a single online location.

■ **Nearly two-thirds** of teachers surveyed said they use learner profiles and personalized learning plans to document each student's strengths, weaknesses, goals, and individualized plans to accomplish these goals.

- Of those teachers who reported using personalized learning plans and learner profiles, **more than 80 percent** said they were created for all students; summarized the strengths, weaknesses, and progress of students; set personalized goals for students; and were updated regularly by teachers.

- However, teachers were less likely to report that students and parents accessed the plans, with slightly **more than one-third** of teachers saying that students accessed the plans to a great extent and only **15 percent** of teachers indicating that parents accessed the plans to a great extent.

Teachers used student data frequently and have relatively high levels of satisfaction with data systems.

One condition that seems to underlie the successful implementation of personalized learning is the availability of frequent, reliable data on how students are performing on specific standards and skills. Educators also cite the need for data systems that enable them to make sense of the data in a timely way.

- A majority of teachers reported receiving a wide variety of data sources at least weekly or more often: **79 percent** of teachers reported receiving data at least weekly about which students have achieved mastery, and **72 percent** reported receiving data at least weekly about students needing extra assistance. Many teachers **(60 percent)** also reported receiving data about non-achievement outcomes (e.g., student behavior, attitudes, or motivations). Conversely, only **one-third** of teachers reported receiving test scores in subjects other than math or reading on a weekly or more frequent basis. **Nearly 1 in 10** teachers reported receiving information on a daily basis about specific students achieving mastery.

- **Three-quarters** of teachers reported using student achievement and mastery data to at least a moderate extent to support personalized instruction, to provide recommendations for tutoring and other educational support services for particular students, and to reflect on and discuss learning with their students and other
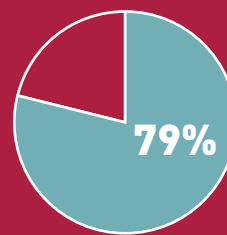
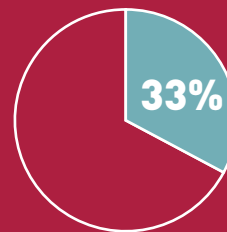**79%** Teachers who at least weekly receive data about which students have achieved mastery
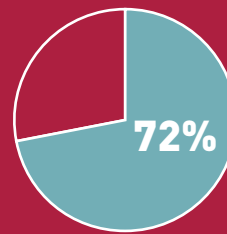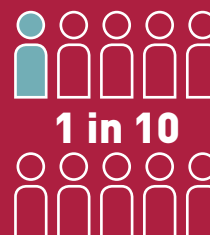
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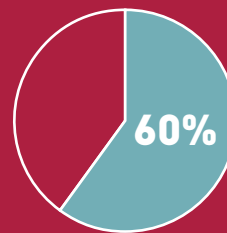
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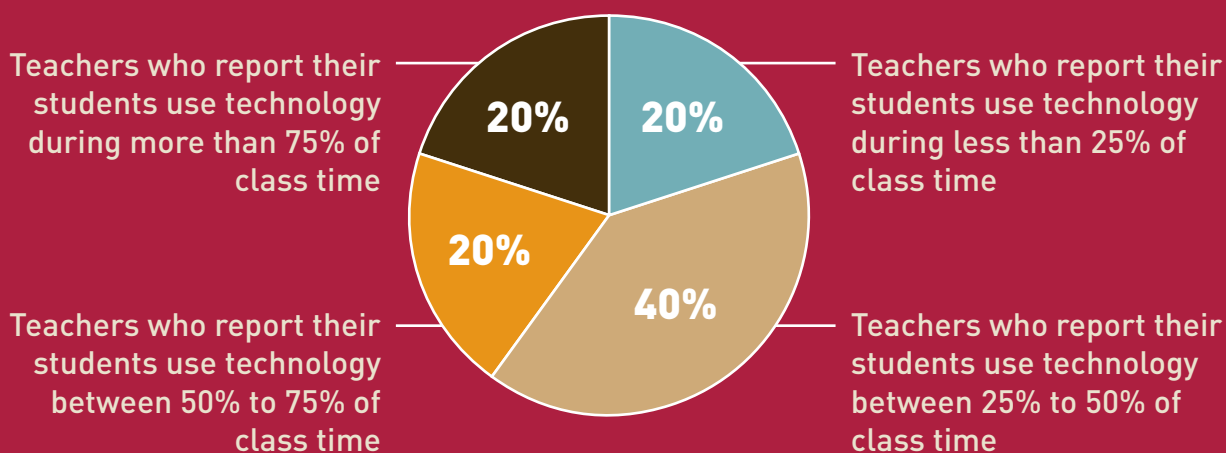**1 in 10** Teachers who daily receive student data

teachers. Specific personalized learning practices included grouping students, tailoring content for individual students, and identifying topics requiring more or less emphasis in instruction.

■ The logs maintained by teachers during the study show that student progress reports and assessments were the second most frequently used factor influencing decisions about what to teach and how to structure instruction. (The Common Core State Standards were the number one factor influencing teacher decisions about instruction.) While "personalized goals that had previously been developed for the students" was ranked somewhat lower (influencing teacher decisions less than half of the time), this was still consistent with schools' efforts to use student information to personalize and inform instruction.

Technology is used extensively, but use varied widely even within the same school.

Survey, log, and interview data indicate that most teachers used technology extensively in their instruction, but the amount of time students used technology, and the specific activities in which students engaged, varied widely—even within the same school.

■ The schools used technology as part of their instructional models. Of the 17 schools for which data were available, **10** reported that devices were available to most or all students, and **1** additional school reported that it was piloting this policy.

■ Slightly **less than half** of teachers said students use technology for educational purposes about a quarter to half of the time, and **about 20 percent** said students use technology between 50 to 75 percent of the time. Among the remainder, **nearly 20 percent** reported an even higher level of technology usage, and **nearly 20 percent** reported a fairly low level of technology usage.

■ Teachers reported that students use technology for a wide range of activities, including reading, engaging in discussions and collaborative problem solving, and watching instructional videos. The type of activities and amount of time students spent on each varied significantly between the schools.

■ Most administrators said in interviews that students were likely to spend different amounts of time using technology, depending on each student's individual needs.

Teachers who report their students use technology during more than 75% of class time — **20%**

20% — Teachers who report their students use technology during less than 25% of class time

Teachers who report their students use technology between 50% to 75% of class time — **20%**

40% — Teachers who report their students use technology between 25% to 50% of class time

Student Achievement Results

For the 23 public charter schools for which two years' worth of student achievement data were available, this study found that students attending these schools made gains in math and reading over the last two years that are significantly greater than a virtual control group made up of similar students selected from comparable schools.

These gains in both math and reading translate into effect sizes that are relatively large compared with those in studies of other types of interventions. Although results varied considerably from school to school, nearly two-thirds of the schools had statistically significant positive results. Moreover, students generally ended the school year with both math and reading test scores above or near the national average, after having started the school year generally performing below the national average.

Most schools had an impact on students' math and reading performance, although the impact is not directly attributable to personalized learning practices.

An effect size is the standard way researchers measure the impact of an educational strategy and provides a standardized measure for the impact of an intervention. This allows researchers to make comparisons across research studies.

The RAND researchers determined that the effect size in this study was relatively large when compared with effect sizes found in rigorous studies of other whole-school educational

Key Findings

- Most schools had an impact on students' math and reading performance, although the impact is not directly attributable to personalized learning practices.

- Elementary and middle school scores grew significantly, relative to national averages.

- Relative growth rates were higher for students with lower starting achievement.

- Results were widespread, with two-thirds of schools having statistically positive results.

interventions. This initial study only examined two-year results; future studies may investigate individual-year changes and patterns on a year-by-year basis.

The study analyzed math and reading scores for nearly 5,000 students enrolled in the 23 schools for both years. The two-year effect sizes for this student population across all schools were 0.41 in math and 0.29 in reading. There were positive and significant results across all grade levels, although the effects tended to be larger in the elementary grades. (This is reflected in Table 1.) Although the results at the high school level were significant, the number of students is relatively small when compared with other grade levels, so caution should be taken in interpreting the high school results.

This study's overall effect estimates of 0.41 in math and 0.29 in reading are larger than the typical effect sizes identified in other rigorous studies of large-scale educational initiatives. To get a sense of how big these effect sizes are, one can look to several

> *An effect size is the standard way researchers measure the impact of an educational strategy and provides a standardized measure for the impact of an intervention. This allows researchers to make comparisons across research studies.*

recent meta-analyses of other educational interventions. In a meta-analysis, researchers compare and contrast findings from multiple studies of the same topic to discern any common patterns or trends about the issue being studied and to identify any potentially contradictory or divergent conclusions.

Borman, Hewes, Overman, and Brown's 2003 *Comprehensive School Reform and Achievement: A Meta-Analysis* concluded that 75 percent of studies of educational interventions hadeffect sizes of 0.25 or smaller, and 95 percent of studies had effect sizes of 0.39 or smaller. This suggests that the reading and math effect sizes identified in the new RAND findings are larger than the effect sizes found in more than 75 percent and 95 percent, respectively, of studies of educational interventions.

Table 1: Schools in the study had large effect sizes based on increases in students' math and reading scores

	EFFECT SIZE		NUMBER OF STUDENTS	
	Math	**Reading**	**Math**	**Reading**
All 23 Schools	**0.41**	**0.29**	**4,792**	**5,014**
Grades K–2	0.56	0.39	2,574	2,644
Grades 3–5	0.27	0.22	1,133	1,147
Grades 6–8	0.20	0.14	884	934
Grades 9–12	0.22	0.14	201	289

Note: All results displayed are significant at the p < 0.05 level after adjustment for multiple hypothesis tests.

Additional meta-analyses also pointed to smaller average effect sizes. In one more-recent example, Betts and Tang's 2011 meta-analysis *The Effect of Charter Schools on Student Achievement* identified mean effect sizes of 0.01 to 0.06, with larger effect sizes for schools in one charter organization. And a 2013 meta-analysis reported in *Translating the Statistical Representation of the Effects of Education Intervention into More Readily Interpretable Forms,* by Lipsey et al., found a mean effect size of 0.08 at the elementary level and 0.15 at the middle school level when using broad-scope standardized assessments such as MAP. (The study's authors did not have enough data to estimate a mean effect size at the high school level.)

The effect sizes in the new RAND study still held, even when the researchers adjusted the comparison group to control for whether the students attended public charter schools or other schools of choice. Thus there is no evidence that the findings in the personalized learning schools were biased by the fact that all of these schools were public charter schools.

Elementary and middle school scores grew significantly, relative to national averages.

The interim results show that the average MAP scores of students attending the study's elementary and middle schools were generally below national averages in math

and reading at the beginning of the first year of the study, which is typical for the high-poverty student populations that these schools serve. But students made significant progress in both subjects, as measured by their performance on the MAP assessments by the end of the second year of the study. (See Charts 1 and 2.)

Elementary and middle school student MAP scores in MATH now exceed national average

Percentile Rank Equivalent of Average MAP Scores in Math

National Average (50)

Grades K–2 Average	Grades 3–5 Average	Grades 6–8 Average	Grades 9–10 Average
33 / 64	33 / 57	45 / 56	34 / 41

- Fall 2012
- Spring 2014

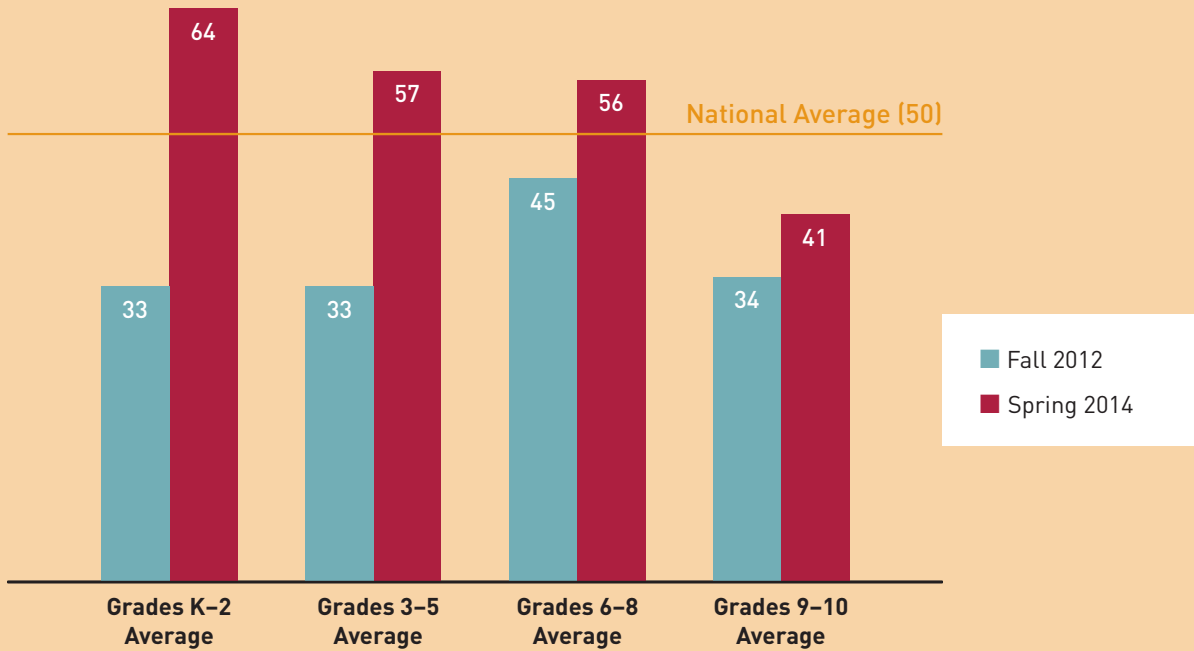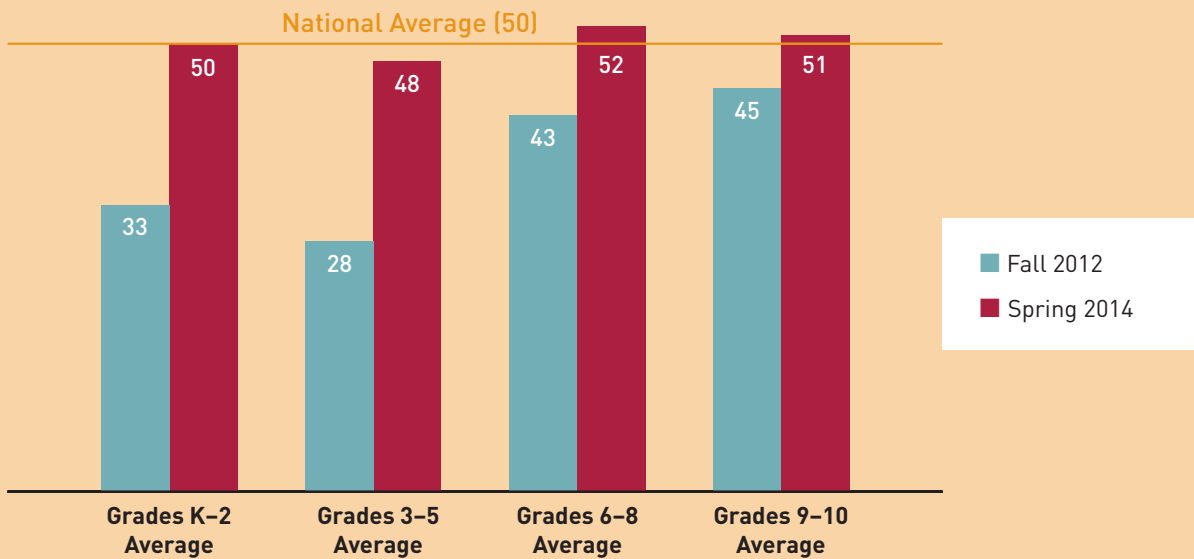**Student MAP scores in READING are now at or near national average**

Percentile Rank Equivalent of Average MAP Scores in Reading

National Average (50)

Grades K–2 Average	Grades 3–5 Average	Grades 6–8 Average	Grades 9–10 Average
33 / 50	28 / 48	43 / 52	45 / 51

- Fall 2012
- Spring 2014

Relative growth rates were higher for students with lower starting achievement.

For students enrolled in these schools during both the 2012–13 and 2013–14 school years, the percentage of students with growth that met or exceeded the peer average was significantly higher for students who started in the bottom quartile of achievement in fall 2012. (See Chart 3.)

Results were widespread, with two-thirds of schools having statistically positive results.

Although results varied considerably from school to school, and not every school performed well, nearly two-thirds of schools had statistically significant positive results in both math and reading. (See Charts 4 and 5.) Statistically significant negative results were very limited, occurring in only two schools in math and one school in reading.

CHART 3

Students achieving in the bottom quartile in 2012 had greater achievement gains than other students

Percentage of Students with Growth That Exceeded the Peer Average, 2012–14
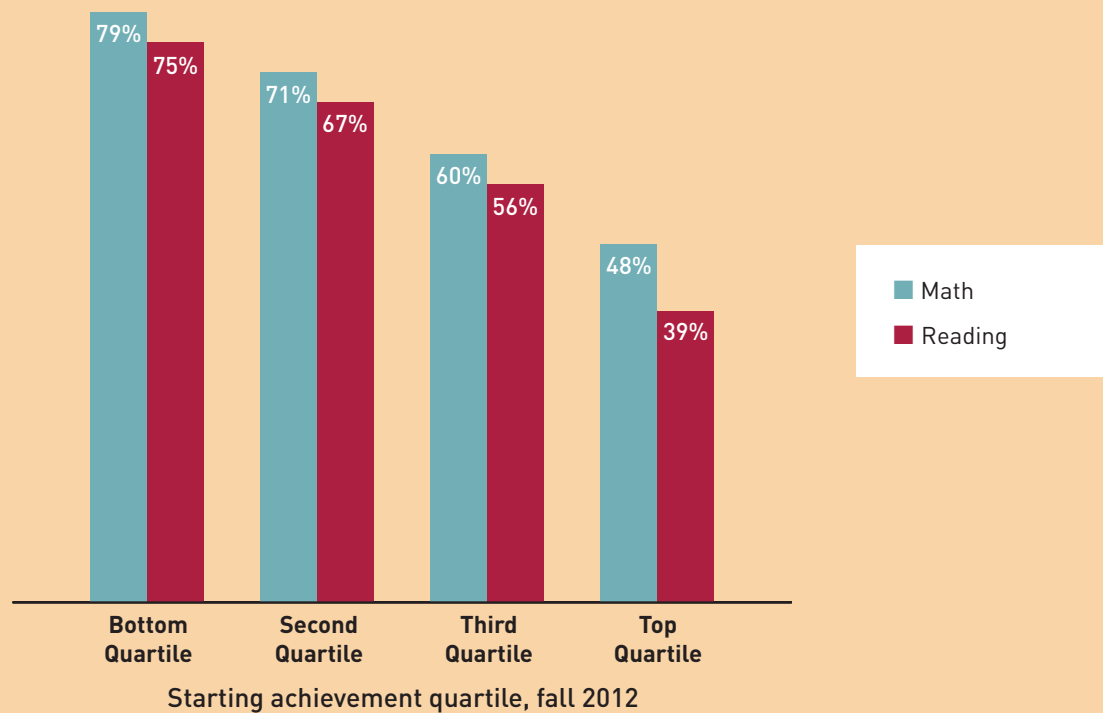

Math
Reading

	Math	Reading
Bottom Quartile	79%	75%
Second Quartile	71%	67%
Third Quartile	60%	56%
Top Quartile	48%	39%

Starting achievement quartile, fall 2012

CHART
4

Most schools had a statistically positive effect size for **MATH** scores

Math Effect Sizes by School, 2012–14

School	Effect Size
School 3	1.28
School 16	0.8
School 8	0.7
School 6	0.65
School 22	0.63
School 17	0.58
School 21	0.56
School 14	0.52
School 23	0.5
School 19	0.37
School 5	0.35
School 10	0.2
School 13	0.18
School 7	0.17
School 12	0.16
School 2	0.14
School 1	0.07
School 4	0.05
School 18	0.03
School 11	-0.14
School 9	-0.15
School 15	-0.2
School 20	-0.35

Effect Size Across All Schools (0.41)

Note: Solid bars represent significance at the $p < 0.05$ level after adjustment for multiple hypotheses tests. School numbers were assigned randomly to ensure anonymity. Outlined bars are not statistically significant.
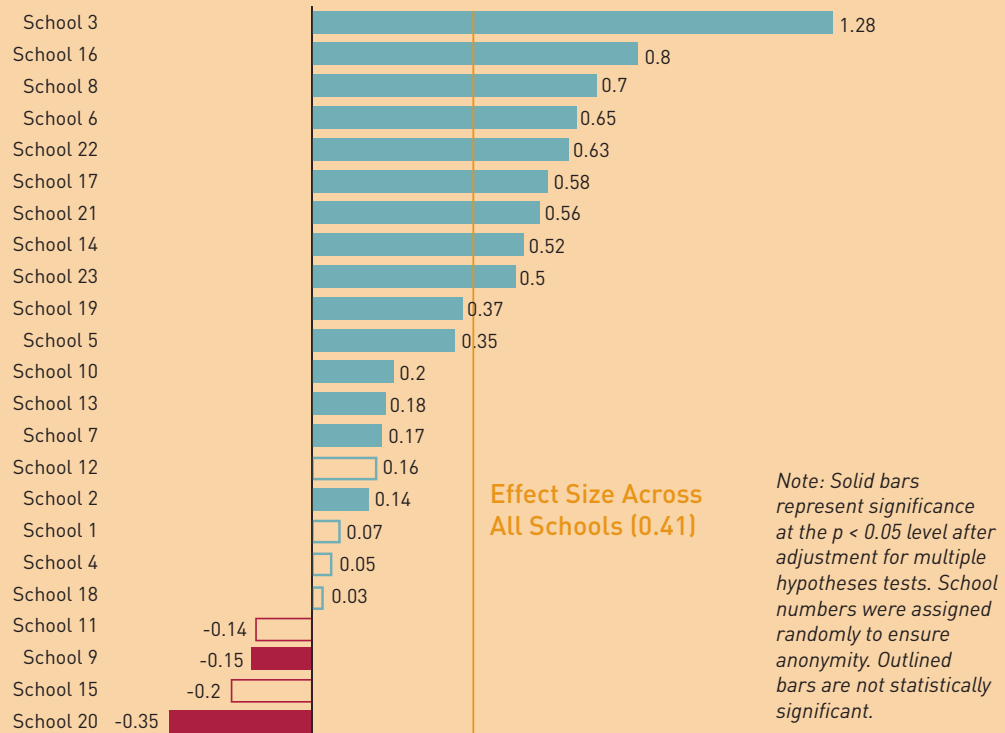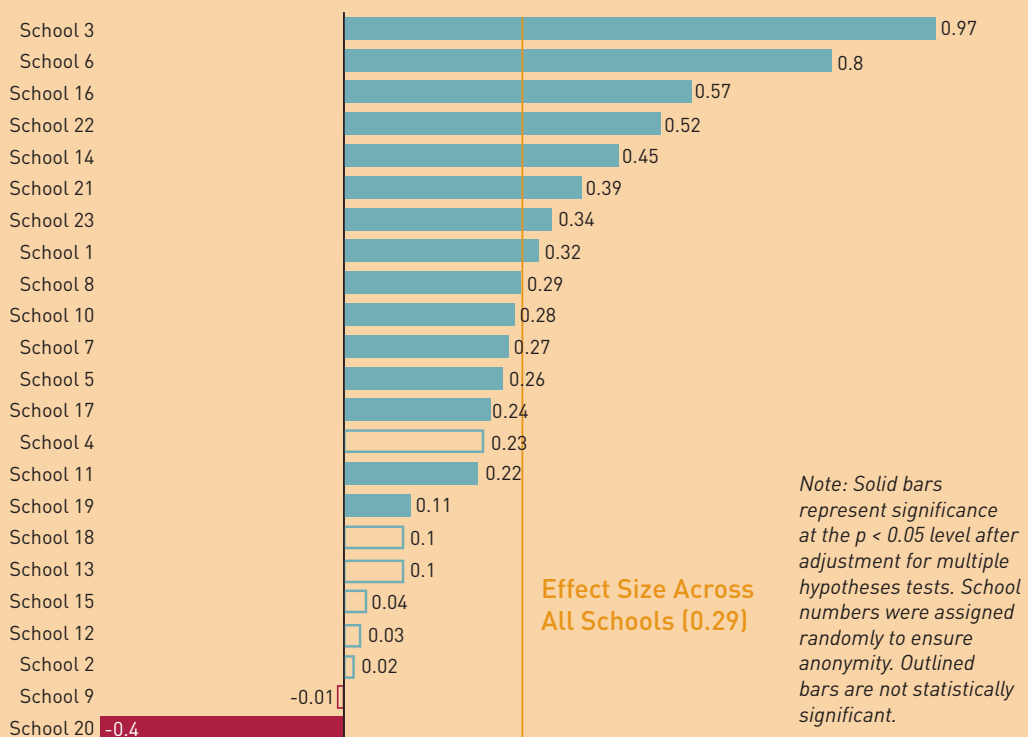
CHART
5

Most schools had a statistically positive effect size for **READING** scores

Reading Effect Sizes by School, 2012–14

School	Effect Size
School 3	0.97
School 6	0.8
School 16	0.57
School 22	0.52
School 14	0.45
School 21	0.39
School 23	0.34
School 1	0.32
School 8	0.29
School 10	0.28
School 7	0.27
School 5	0.26
School 17	0.24
School 4	0.23
School 11	0.22
School 19	0.11
School 18	0.1
School 13	0.1
School 15	0.04
School 12	0.03
School 2	0.02
School 9	-0.01
School 20	-0.4

Effect Size Across All Schools (0.29)

Note: Solid bars represent significance at the $p < 0.05$ level after adjustment for multiple hypotheses tests. School numbers were assigned randomly to ensure anonymity. Outlined bars are not statistically significant.

Additional analyses provide insights and raise questions to be explored in year three of the study.

RAND researchers performed exploratory analyses and sensitivity tests to examine how robust the interim results are and to gain greater insights about the underlying drivers of the results.

First, student achievement results were similar when the comparison group was drawn only from schools of choice. Second, the VCG method appears to set a higher benchmark for performance than NWEA's standard conditional growth model, which is based on student grade and starting performance only. The researchers also conducted additional analyses on changes in student population from year to year to assess the potential for a first-year effect—whether students experience more growth in their first year in these schools than in subsequent years. They also examined the accumulation of student-level learning gains from year to year, such as whether gains in the first year persist and whether students continue to experience above-average gains in later years.

These additional analyses provide important insights and raise important questions to explore in the third year of the study. At that time, the 23 schools profiled in this report will have three full years of operation using personalized learning practices and three years of MAP data, and an additional 29 schools will have operated with a personalized learning model for two years and will have two years of MAP data.

- **The student achievement results were similar when the comparison students were drawn only from schools of choice.** This is an important consideration because all of the schools in the study are schools of choice, and students' families make an affirmative decision to enroll their children in them. Family involvement in education might influence student achievement in positive ways unrelated to the schools' influence on achievement. Since students in the comparison group would likely include a significant

percentage of students from schools that are not schools of choice, a difference in family involvement could bias the results. To address this concern, another VCG was created by drawing students only from schools of choice, which was defined as public charter, academy, private, magnet, and parochial schools. The results from the schools of choice VCG were very similar to the reported results for the original comparison group. Thus, there is no evidence that the analyses reflected in this report are meaningfully biased by using the standard VCG matching criteria, which do not take into account whether a school is a school of choice.

■ **The VCG method appears to set a higher benchmark for performance of the schools in this study than NWEA's conditional growth model, which only uses grade level and starting performance to calculate typical growth on the MAP assessment for students.** The VCG method compares students in the study schools to the norms of similar students by taking into account additional student-level characteristics (e.g., gender) and school-level characteristics such as poverty level and type of geographic locale (e.g., urban). Given the relationship between poverty and student achievement, it was reasonable to expect that the VCG might generate lower typical growth for students in high-poverty schools than NWEA's standard growth model, which is based on a nationally representative sample. However, the VCG analysis produced results counter to this expectation, setting higher benchmarks for typical growth than the NWEA standard-growth model. While the results using the two methods were highly correlated, using the NWEA model produced effect sizes that were 50 to 100 percent larger than the VCG method reported here. This finding for the VCG method is probably not generalizable and could be related to the mix of high-poverty schools that are using the MAP assessment.

■ **Researchers performed additional analyses to examine changes in the student population over time and how effects play out over time.** First, they conducted an analysis looking only at students who were enrolled in the same school for both school years, which did not produce different results from those reported here. This suggests that possible changes in the student population, such as attrition of students who are performing poorly, do not explain the large effects. Second, the researchers conducted an analysis

to determine whether students experience larger growth in their first year at a personalized learning school. The results were mixed and inconclusive. Finally, researchers analyzed the accumulation of student-level learning gains over each school year. The results suggest that student learning gains accumulated in both the 2012–13 and 2013–14 school years—but at a slower rate in the second year—and that the larger effects in year one were partially offset by larger summer achievement declines for the personalized learning students than for the comparison group.

The student achievement results were similar when the comparison students were drawn only from schools of choice. This is an important consideration because all of the schools in the study are schools of choice, and students' families make an affirmative decision to enroll their children in them.

Teachers' and Students' Perceptions of the Schools

Key Findings

- **Schools share a strong focus on student learning and high expectations.**

- **Teachers reported working in a supportive environment.**

- **Satisfaction with the ability of the physical classroom environment to support personalized learning was mixed.**

- **Teachers generally felt positive about their ability to use technology.**

- **Some obstacles relate directly to personalization, but many of the most frequently reported obstacles are related to more persistent challenges faced by schools.**

The following findings provide some data about the experiences and attitudes of teachers and students in the 23 schools. These data were derived from teacher and student surveys as well as teacher logs, administrator interviews, and site visit reports.

Schools share a strong focus on student learning and high expectations.

- Even though **more than half** of the teachers who responded to the surveys said working in a school with a personalized learning environment played no role (34 percent) or only a small role (26 percent) in their decision to accept their jobs, the survey respondents universally agreed that teachers at their schools were extremely focused on improving student learning. **One hundred percent** of survey respondents agreed or strongly agreed with this statement: "The teachers at my school are highly focused on the mission of improving student learning." Among this group, about half, 53 percent, said they strongly agreed with this statement; the remaining 47 percent agreed; and no respondents disagreed or disagreed strongly.

- In their surveys, students described school environments as supportive and characterized by high expectations and were generally very positive about their school climate and their own engagement in it. But student and teacher perceptions diverged somewhat regarding how much choice and control students have about which topics they study, which instructional materials they use, and to what extent they can track their own progress.

Teachers reported working in a supportive environment.

Teachers reported generally supportive environments, with positive perceptions of their working conditions, professional development and training, and overall support.

- Teachers were largely positive about their professional development experiences as they related to personalized learning. **Ninety-one percent** agreed or strongly agreed that they have been encouraged to study and improve their own practice, and **83 percent** said their professional training "has been designed to address needs revealed by analysis of student data." In addition, **69 percent** of the teachers surveyed agreed or strongly agreed that their professional development experiences have helped them understand how to personalize goals for students, and **64 percent** agreed or strongly agreed that their professional development experiences have helped them understand how to offer instruction that better addresses individual students' needs.

- However, not all of the findings about professional development were positive: About half of the teachers reported that their professional development experiences "have taken more time than they were worth" **(50 percent)** or that the training tried to cover too many topics **(48 percent)**.
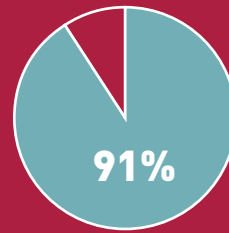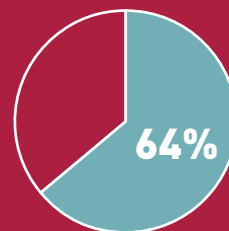
91% Teachers who said their professional development encouraged them to study and improve their practice
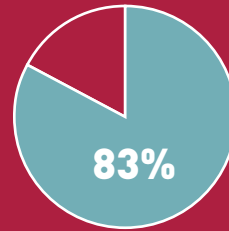
83% Teachers who said their professional training was designed based on student data
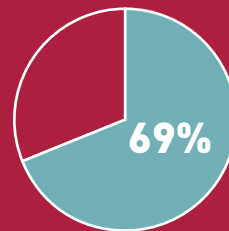
69% Teachers who agreed or strongly agreed that professional development helped them understand how to personalize goals for students

64% Teachers who agreed or strongly agreed that professional development helped them offer instruction to meet individual students' needs

Satisfaction with the ability of the physical classroom environment to support personalized learning was mixed.

- More than three-quarters of teachers **(77 percent)** reported that they had classrooms with furniture that could be easily rearranged and that this facilitated personalized learning. About another **one-quarter to one-third** of teachers reported having other physical features present that facilitate personalized learning, including comfortable non-traditional furniture such as couches, floor pillows, rugs, or stuffed chairs (36 percent); larger open instructional spaces (28 percent); and open instructional spaces with small rooms for individual or small group instruction (23 percent).

- But not all teachers were satisfied with the physical environment's suitability for implementing personalized learning practices: **23 percent** of teachers reported they had classroom furniture that could not easily be rearranged and that this hindered personalized learning. And interestingly, while **28 percent** of teachers said they had large open instructional spaces that facilitated personalized learning practices, an equal proportion, another **28 percent,** said they had these large spaces but that this room configuration hindered, rather than facilitated, personalized learning practices.

Teachers generally felt positive about their ability to use technology.

In their surveys, teachers generally felt positive about their ability to use technology, their training, their access to materials, and their access to data needed for making decisions about instruction. But teachers also said some obstacles still existed relating to training—lack of input in how technology is used, the time required to use it in personalized instruction, and access to technology hardware.

81% Teachers have access to high-quality technology-based curriculum.

76% Teachers have professional develpment that helped them use technology in the classroom.
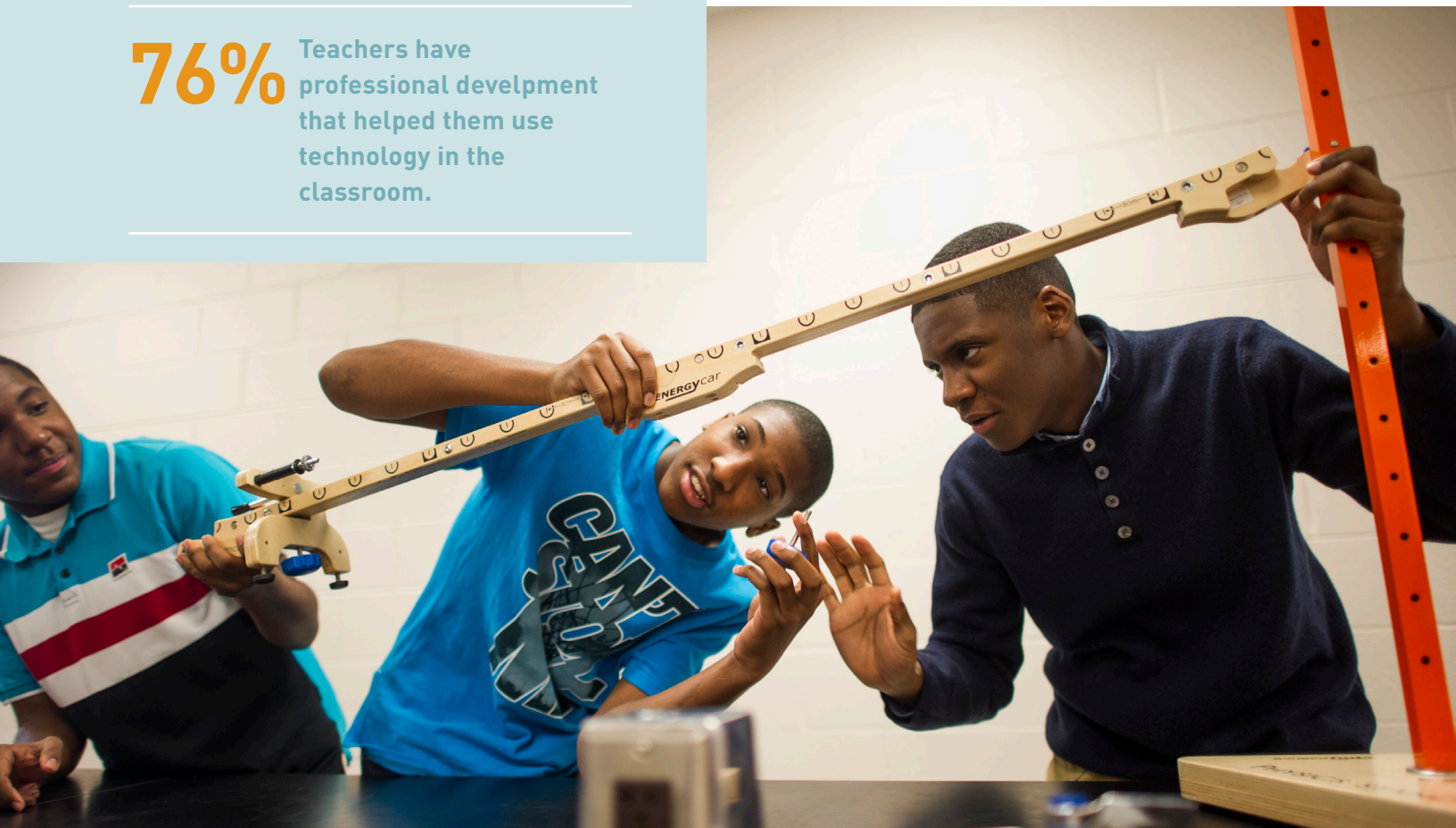
- **Eighty-one percent** of teachers surveyed agreed or strongly agreed that they had adequate access to a high-quality technology-based curriculum.

- **Seventy-six percent** of teachers agreed or strongly agreed that they had professional development experience that helped them use the technology in their classroom.

- A majority of teachers were also satisfied with their access to data for decision-making: **71 percent** agreed or agreed strongly with the statement: "I can use the school's data system to easily produce or view reports I need." **Three-quarters** of teachers agreed or strongly agreed that their school's data and assessment systems were easy to use; provided useful information related to personalized learning, including the student skills and experience necessary to guide instruction and information about students of varying achievement levels; and enabled the adaptation of pace and content to meet student needs.

- Among the more critical findings from the surveys: **55 percent** of teachers reported that their students' inadequate technology skills was a minor or major obstacle. Teachers also reported inadequate opportunity to provide input in how technology is used **(50 percent)**; inadequate professional development **(45 percent)**; that it took them too much time to develop content for technology-based instruction **(41 percent)**; an inadequate number of computers or other devices **(39 percent)**; a lack of high-quality content for technology-based instruction **(39 percent)**; or a lack of alignment between the content students learn online and the content they are trying to teach **(39 percent)**. The lower ratings for professional development on this particular question may indicate that, overall, teachers perceived their professional development as helpful, but when they faced specific obstacles, they needed additional or different types of professional development to develop the skills necessary to address these particular problems.

- Slow Internet connections or inadequate bandwidth also were reported as barriers by some teachers **(27 percent)**, and "my own limited technology skills" was cited as an obstacle by only **18 percent** of teachers. Another **20 percent** reported hardware-related problems, such as insufficient computing power or lack of compatibility between hardware and software, as a minor or major obstacle.

Some obstacles relate directly to personalization, but many of the most frequently reported obstacles are related to more persistent challenges faced by schools.

While a majority of teachers reported positively about their access to curricular materials and data needed for decision-making, they also said they needed more information to help them better assess student mastery.

In one school site visit, a principal noted that the school was still working on defining mastery consistently and calibrating student grades with the different ways students can show mastery. One teacher said that explaining mastery to students and parents can sometimes be challenging "because students' grades tend to be lower [than with traditional grades]. When I was in middle school, if you did all your work, you'd get at least a B. Mastery-based grading is if you really understand [the content] and you're not just completing every worksheet."

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But another teacher observed that students are quickly learning how to use software to track their own incremental progress: "The topics are broken down by units, learning clusters, and topics. [The students] track the average from the class and the score on their quiz for that topic. They track how they did on that same standard/topic on their unit test,

and benchmarks. I have assessed them five times on the same things, but at different times and different points of access. I also do a differentiation system, where everyone is basic, proficient, and advanced. Everyone can move up after the benchmarks."

Some teachers cited as an obstacle the time, skills, and effort required to differentiate the content, structure, and pacing of lessons to meet individual student needs. One teacher described the shift to personalized learning practices as a work in progress, but one they are striving toward: Flexible teaching that is truly responsive to student

> *"Things are changing. This year's seniors had more drive and academic mindset than some other classes have had."*

needs is "the ultimate challenge of teaching," this teacher observed. "Ask any first-year teacher, and they just want to have a lesson instead of 30 lessons. Even though I'm more experienced, I still kind of struggle with that. It's definitely an issue and you can always do more. I do find that I am able to do a couple of things well, which is provide lots of choices in assignments, mindful groupings, and developing leadership opportunities," such as recognizing students' different strengths and weaknesses and allowing different types of leadership to shine.

"The technology does allow another way to provide those choices and access so different groups can do different things at the same time," the teacher added.

Other teachers cited time as a barrier. In the surveys, 60 percent of teachers said the "excessive amounts of time I need to spend developing personalized content" was a minor or major obstacle.

Finally, teachers cited as challenges several social and behavioral issues, including student behavior and high absenteeism.

- **More than half** of teachers said high levels of student disciplinary problems pose an obstacle to implementing personalized learning: 42 percent said a high level of discipline problems are a minor obstacle, and 12 percent cited it as a major obstacle. **Eighteen percent** of teachers said high student absenteeism is a minor obstacle, and **7 percent** reported it as a major obstacle.

- In their logs, **most** of the teachers did not report emphasizing improvement in student behavior and socio-emotional skills. This was consistent with some of the challenges teachers reported in their interviews, which was that their efforts to ensure that students reach grade-level performance left them few opportunities to emphasize improvements in non-academic outcomes.

Looking forward, teachers seem generally optimistic about the prospects of personalized learning and its impact on student achievement and on the broader school community. Teachers at one site visit school said they are seeing the higher expectations translate into a change in school culture over the long term, to one in which there is more emphasis on college-going: "Last year, our graduating seniors have had a different experience than the incoming freshman. They receive consistent college messaging. This year's seniors felt supported … . Things are changing. This year's seniors had more drive and academic mindset than some other classes have had." The teacher also noted that a higher percentage of students went to selective colleges and received other recognition.

Overall, researchers found many positive developments in the schools' environments, including positive perceptions of professional development, working conditions, and access to and use of technology that were conducive to implementing personalized learning practices. While some obstacles to implementation remain, the surveys, logs, interviews, and site visits reported many encouraging observations from educators about personalized learning's potential for success.

Conclusions and Implications for Further Study

RAND's interim findings are largely positive and promising. They indicate that compared to their peers, students in schools using personalized learning practices are making greater progress over the course of two school years and that those students who started out behind are now catching up to perform at or above national averages.

We are optimistic about the implications that these findings have for the personalized learning field. These educators and students are thinking about schooling differently and showing some early positive results—but it is still early. The individual schools in this study are still refining their models, and the data on these schools are still limited. There also were mixed results—such as that some of the schools performed better than others. However, because many more schools performed well than performed poorly, we believe that the overall findings provide enough evidence to continue investing in this emerging field.

We look forward to what the next stages of research will bring. We are committed to continuing to share ongoing research publicly, including more detailed reporting on the implementation of personalized learning practices in a larger number of public charter and district schools, more information about how these new learning practices are continuing to evolve, and additional years of data about what impact these practices are having on student performance.

Future findings from this study and others should provide additional analyses and insights into these schools and others that are adopting similar personalized learning practices. For the personalized learning field to advance beyond a select group of schools, it is essential to understand not just whether these schools are having an impact on student learning, but which aspects of successful school models are most responsible for the achievement gains. It also will be important to study the impact that these emerging approaches have on other important college

and career readiness skills, such as critical thinking, collaboration, persistence, and self-monitoring. We hope that the next stage of this research and contributions from other researchers will shed additional light on the most promising of these new practices, and we look forward to the additional insights the next stage may provide about how schools are working to overcome any obstacles to implementation.

Participating Initiatives

The Next Generation Learning Challenges (NGLC) initiative supports school districts, charter management organizations, and partner organizations that embrace personalized learning as a means to dramatically increase college readiness rates, particularly among low-income students and students of color.*

The NGLC investments are focused in three areas:

- Catalyzing innovation in school design, aligned with principles of personalized learning

- Collecting and sharing evidence of promising practices and lessons learned

- Fostering communities of innovators and adopters of personalized learning practices

To be considered for funding, these schools applied for a competitive grant via a "wave" of funding designed and organized by NGLC. In their application, schools were required to describe with specificity how their models would support personalized learning. While all of these schools have a high degree of integrated technology as part of their school designs, they vary considerably in the methods and degrees to which they use technology to support personalized learning.

* The NGLC initiative is managed by EDUCAUSE, a nonprofit association dedicated to advancing the use of information technology in higher education, in association with other organizational partners including the League for Innovation in the Community College; the International Association for K–12 Online Learning; and the Council of Chief State School Officers. NGLC receives primary funding from the Bill & Melinda Gates Foundation, with additional support from the William and Flora Hewlett Foundation, the Eli and Edythe Broad Foundation, and the Michael and Susan Dell Foundation.

The Charter School Growth Fund (CSGF) was founded in 2005 to transform K–12 education by investing in innovative public charter school models that work for underserved students. Since 2005, CSGF has supported the dramatic growth of more than 40 of the nation's most successful charter school management organizations (CMOs). Similar to a venture capital firm, it provides financing, business planning, strategic support, and other resources to help CMOs grow to scale and build sustainable networks of excellent schools. Since 2010, CSGF has supported the creation of new public charter schools and the expansion of existing schools, to serve an additional 225,000 children in

some of the country's most high-performing public charter school networks, including the creation of a new investment pool, Fund II.

A key strategy of Fund II is to invest in school operators that are developing "next-generation" schools. Typically, these models combine advances in personalized learning practices with key tenets from high-performing public charter school operators. To date, school operators using next-generation approaches are serving nearly 12,000 students, with the potential to reach more than 30,000 students by the end of the investment period.

The Bill & Melinda Gates Foundation's Personalized Learning Pilots is a three-year initiative, begun in 2012, to deepen and expand personalized learning in a set of schools from high-performing public charter school networks. The financial support was intended to help the schools integrate personalized learning practices more deeply into instruction at the classroom and/or school level. If the early evidence was positive, the foundation expected that these schools would eventually expand the use of personalized learning to additional schools within their networks.

The foundation awarded grants to schools through a series of competitive selection processes. Schools that applied were asked to describe their vision for integrating personalized learning into core literacy and/or math instruction; demonstrating innovative uses of human capital, time, and space; and allowing students to advance through content and earn credit (if applicable) based on demonstrating adequate mastery of knowledge and skills.

BILL & MELINDA
GATES *foundation*