By Andrew A. Zucker

Assessment Made Easy

By all accounts, the Denver School of Science and Technology (DSST) is a special school. It was the first public charter high school in Denver to become a one-to-one laptop school, thanks to a $1 million gift from Hewlett-Packard. And even though the school accepts applicants via a lottery system and its charter requires that 40% of its students come from low-income families, its test scores are among the highest in the state, and every graduating senior was accepted to a four-year college or university. That is extremely rare, if not unprecedented, in Denver, where the average public school graduation rate is 52%. (See Diversity and Degrees below.)

I directed a study of DSST's one-to-one program in 2007 with funding from the Colorado Children's Campaign (see Study Methods on page 19). I've evaluated other one-to-one laptop programs, and I think DSST is noteworthy both for its success in improving student performance and for its use of laptops for assessment. The Gates Foundation has also donated money to the school to document its program so that other schools can study and learn from it.

DSST's teachers and students like the program, too. More than 80% of the school's teachers report that computers and related digital tools are "very important" to them as a teaching tool. The great majority of students report that the laptops have a "very positive" (65%) or "somewhat positive" (29%) impact on how much they learn in school. The students also report that the laptops positively influence how well they work with other students and how interested they are in school, their grades, and other outcomes.

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DIVERSITY AND DEGREES

DSST's mission is to provide a diverse student body with an outstanding liberal arts high school education focused on science and technology. The school, which graduated its first senior class in 2008, aims to create a community of learners and a school culture that fosters both academic and personal success for its students.

DSST's charter requires that at least 40% of students qualify for free or reduced-price lunch. Thirty-five percent of the students are Caucasian, 29% are African-American, 25% are Hispanic, 7% are multiracial, 2% are Asian, and 1% are classified as "other."

STUDENTS FLOURISH IN A ONE-TO-ONE LAPTOP PROGRAM

STUDY METHODS

Data for the study of DSST's one-to-one laptop program came from interviews, focus groups, classroom observations, document reviews, and online surveys of teachers and students. The response rate for the teacher surveys was more than 90% of 32 teachers, and the response rate for the student surveys was 77% of 428 students. These high response rates provide confidence that the survey data fairly represent the full range of experiences and views of teachers and students.

As DSST's website reports, 100% of its first two graduating classes have been accepted to four-year colleges.

Lightning-Fast Grading

One reason the laptop program has improved student performance is that it has enabled a model allowing instant assessment and feedback. Getting feedback about your work is an essential part of learning for anyone. And yet, in most schools, it often takes days to grade assignments and tests, which makes it more difficult for students to learn from what they have done or even to know whether their work is right or wrong. Teachers at one-to-one laptop schools, however, can give their students almost instant results.

Both students and teachers are enthusiastic about using their computers for assessment. When asked what has been the most helpful use of technology by DSST teachers, one student wrote, "Tests being graded almost immediately." Another reported, "The test taking has been much better."

Seventy percent of DSST students use an assessment program that is installed on all of the school's laptops about once a week. Another 21% report using the program nearly every day.

The software lets teachers separate their tests into questions that can be machine graded and those that are open ended and thus require more time for grading. According to one Spanish teacher, because the students receive instant feedback about the machine-graded items, "I could focus [my effort] on the essay."

Another teacher said that the software's reports about student and class performance are very valuable to her and her students. "I'm not a numbers person, so I would never run that kind of report [without the software]," she said. "It helps tremendously to be able to give students feedback tied to college-readiness standards."

Mathematically experienced teachers also find the assessment software useful. "It's invaluable," said one physics teacher. "We use it just about every class. You get immediate results. You also get a rich array of analysis tools. It will tell me all the questions that some threshold percentage of students got wrong. I might set it to 70%. If a lot got it wrong, we can go over it. I usually do that the very same period. It's an opportunity for me and for the students, and a good time to correct misconceptions right away. Or I can set it up for instant feedback directly to students as soon as they complete the test."

One teacher uses the software every week to place a question about the lesson's learning objectives on each laptop. She calls the question an "exit

slip" because students must answer it at the end of class. As students respond to the question, their answers become visible on the teacher's computer. Teachers can make the aggregated, anonymous results visible to the whole class on a display device to help students understand common misconceptions. The next day, the teacher can adjust instruction depending on how many students have understood the lesson's learning objectives. This requires little time beyond developing and entering the question, because the software automatically scores short-answer questions, saves the data, and analyzes it at the click of a button.

Reteach Weeks

Schools can use data gathered via students' laptops to tailor instruction to their individual needs, as DSST does every trimester during "reteach weeks."

Early on, the school developed a set of college-readiness standards in each subject based on the ACT program. These standards guide instruction, and the school measures individual progress toward their mastery.

DSST teachers try to focus on helping students improve their scores. "It's all about doing better," a teacher of 9th and 10th graders said about the unique approach the school has adopted.

Once a trimester, the school uses assessment software to administer interim assessments, including multiple-choice questions that DSST has aligned to the ACT standards. Immediately following the assessments, teachers hold data-analysis sessions to identify student weaknesses and design lessons to address them. Then they schedule "reteach" weeks to provide instruction and support for targeted standards on which students did poorly.

Tying questions to standards, which computers make easier, helps both students and teachers. In fact, the great majority of students report that these reteach weeks are either "very helpful" (44%) or "somewhat helpful" (35%). Forty-one percent of teachers agree that the reteach weeks are "very important" for DSST students, and another 48% report that they are "somewhat important." Interestingly, more Hispanic students (53%) and African-American students (45%)—who typically receive lower test scores in urban school systems—than Caucasian students (33%) report that the reteach weeks are "very helpful." (However, these differences are smaller if you include students who say the reteach weeks are "somewhat helpful.")

Students take the PLAN, EXPLORE, and ACT tests in grades 9, 10, and 11 to help prepare them for college-level work. DSST students are also tested as part of the Colorado Student Assessment Program. Their scores are among the highest in Colorado on both the ACT and the CSAP tests.

Real-Time Edits

Language arts teachers at DSST also use the instant feedback made possible by student laptops to improve their teaching of writing. One experienced teacher explained that students send her electronic copies of their essays, which reduces paper use and saves time. The laptops allow students to type their work, which is often faster than writing with a pen or pencil, both for the students and for the teachers, who don't have to decipher students' handwriting.

During the same class period, the teacher can use her tablet computer and a projector to display a paragraph written by one of the students. She marks up the student's work—the name can be confidential—using a stylus to write on her tablet. The whole class can watch and listen as she explains her editing, and they can help with the process, as well. This allows all the students to learn while the subject matter and their writing process is still fresh in their minds. And when she is done editing all the papers, she can save or e-mail students' edited copies back to them.

Language arts teachers are also enthusiastic users of Moodle, an open-source program that enables class discussions to continue online in a password-protected environment.

In one class, a certain number of Moodle posts are due from students

In most schools, it often takes days to grade assignments and tests, which makes it more difficult for students to learn from what they have done or even to know whether their work is right or wrong.

LAPTOP LABS

DSST uses the Physics First approach, which requires all ninth graders to enroll in physics. Two-thirds of all seniors also take either honors or Advanced Placement physics.

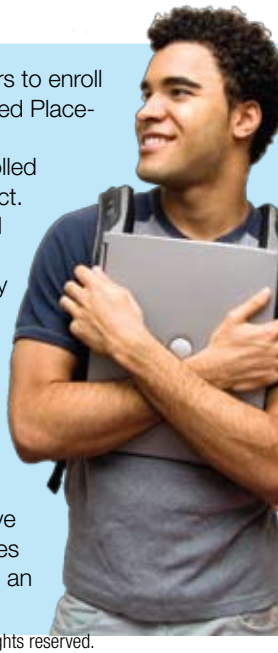
As part of the DSST survey, more than 120 students who were enrolled in physics provided information about the use of laptops in that subject.

Eighty-six percent use the laptops, connected to probes that record and instantly download scientific data to the laptops, at least once a week to collect data, and 92% use them to analyze data. The majority also use laptops to communicate about science at least weekly.

The physics teachers also use online simulations developed by a Nobel Prize winner at the University of Colorado. More than half of DSST physics students use these simulations at least once a week.

They also use an electronic physics textbook that is stored on each laptop. Students can click on animations or simulations included in the textbook.

"I believe that the most helpful use of technology has been interactive lessons or lectures about specific topics," wrote one student. "It makes it so much easier to understand a concept if you can see it happen in an animation."



A one-to-one laptop program in itself is unlikely to make a weak school into a strong one. To take advantage of computers, schools still need thoughtful administrators, high-quality teachers, an effective curriculum, and all the other components that make a school excellent.

every week. Feedback from surveys shows that the students like online discussions.

"The online forum is really cool," said the teacher of this class. "Shy kids benefit especially" because they don't have to be as assertive in the classroom. Whereas the teacher might have wondered if such quiet kids were even keeping up during traditional in-class discussions, she can read their online posts and be able to better assess their understanding of the topic.

Secrets to Success

DSST's one-to-one laptop program incorporates many elements besides computers, including the software installed on each laptop, training for ninth graders, professional development for teachers, an active e-mail system, technical support provided on site, and a wide variety of related technologies, including computer probes for science labs (see Laptop Labs on the facing page) and more than a dozen computer servers supporting wireless Internet networks, e-mail, voicemail, VOIP, and other applications. But the true secret to the school's success with its one-to-one program is that DSST uses it to support its core mission. The school is clear about its goals and uses laptops, including assessments delivered electronically, to help meet those goals.

In addition, the school's administration gives teachers a great deal of latitude to determine just how they will use the laptops, but it also supports them with professional development, software, a robust network, and good technical support. By design, much of the demand for computer applications has been generated by teachers making decisions about the software, websites, or other technology applications that serve their own and their students' needs. Although some uses of computers are mandated by the administration (such as using Infinite Campus, Web-based software used by all Denver Public Schools to record and report students' grades and attendance), the department chairs, teachers, and students make most of the decisions about how, when, and where to use the laptops. For example, the assessment software, was originally adopted by one teacher at the school, not mandated by administrators. Before long, other teachers also began to use the software.

A one-to-one laptop program in itself is unlikely to make a weak school into a strong one. To take advantage of computers, schools still need thoughtful administrators, high-quality teachers, an effective curriculum, and all the other components that make a school excellent. But if those elements are in place, providing a laptop to every student can help make assessment and many other tasks more efficient and more useful.

Resources

Denver School of Science and Technology: www.scienceandtech.org

PhET Interactive Simulations: http://phet.colorado.edu/new/index.php

Physics First: www.aapt.org/upload/phys_first.pdf

A Study of the 1:1 Laptop program at the Denver School of Science & Technology (2007) by Andrew A. Zucker, EdD, and Sarah T. Hug, PhD: http://scienceandtech.org/documents/Technology/DSST_Laptop_Study_ExecSum.pdf

Andrew A. Zucker, EdD, is an evaluator and technology developer for such clients as government education agencies, schools, and nonprofit organizations. His latest book is Transforming Schools with Technology: How Smart Use of Digital Tools Helps Achieve Six Key Education Goals (2008, Harvard Education Press).