Academic Record

BY KATHLEEN KENNEDY MANZO

Students in Tim Comolli's electronic-arts class at South Burlington High School have won awards for their 3-D graphic designs; they've sold computer-generated logos to businesses in their South Burlington, Vt., community; and they've taught teachers how to use Internet search engines and sophisticated multimedia software.

Yet many of the students who are drawn to Comolli's class are teenagers who are struggling in most of their other classes. Once they see what they can do with technology, they begin to appreciate the importance of doing well not only in his class, but in their other subjects as well, Comolli says. "We've found that technology becomes the great equalizer [for struggling students]," says the English teacher, who began offering the course three years ago. "Kids who are having trouble in school have as good a success rate in my class as the advanced students, even more so."

Untapped Potential

Many researchers agree that well-designed educational software—combined with innovative instruction and aligned with the curriculum—can help raise the achievement of students who have struggled in the traditional classroom.

But too many students, they say, have been left on the wrong side of the digital divide because teachers haven't quite figured out how to use technology effectively with low achievers in ways that bolster academic learning.

"Computers are often used as a reward for the good kids," says Margaret Honey, the director of the Center for Children and Technology in New York City. "You get your work done and you get to work on the computer as a treat. Teachers often use technology as an enrichment activity."

And, she says, that widens the divide between high achievers and low achievers because it is usually the better-performing or more motivated students who get the rewards.

What's more, recent research confirms that meaningful technology experiences often elude academically struggling students.

According to the 1998 "Teaching, Learning, and Computing" survey of teachers and schools by the Center for Research on Information Technology and Organizations at the University of California, Irvine, teachers of low-achieving classes use substantially more skills-based software, while teachers of advanced students use a mix of more sophisticated programs.

Two studies—conducted in the late 1990s by Janet Ward Schofield and Ann Locke Davidson of the University of Pittsburgh—found that "low-performing students tended to have far less access to computers than higher-achieving students."

Similar to what Honey has found, the Pittsburgh researchers concluded that many teachers used computers, and particularly the Internet, as a reward for good performance in the classroom.

"Teachers ... tend to see Internet access as an optional privilege rather than as a basic resource, such as textbooks or library materials, to which all students should have access," according to their 1998 study, "The Internet and Equality of Educational Opportunity."

Teachers also tend to have far different expectations for how technology can be used for high achievers and low achievers. The "Teaching, Learning, and Computing" survey, for instance, noted that teachers generally believe that struggling students are less likely than their higher-achieving classmates to have successful experiences with technology. Moreover, devising methods for using complex software with lower-achieving students takes time and practice, which for many teachers means stealing attention away from covering important academic content.
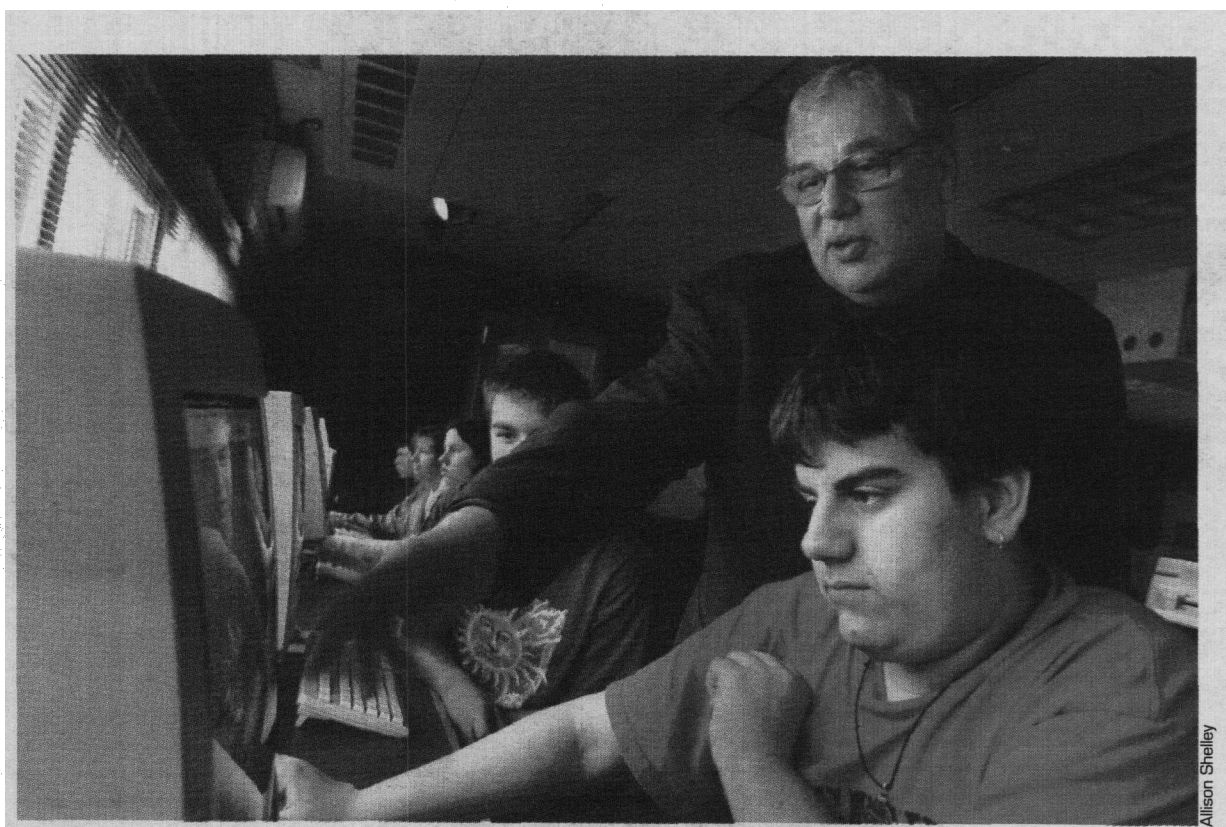
Another reason that low achievers are losing out, says Anthony S. Bryk, an education professor at the University of Chicago, is that technology is introduced as a remedial tool. And he says that is especially so in poor urban schools.

Under those circumstances, computers are used primarily to boost students' basic academic skills—not in ways that allow youngsters to delve deeply into a topic or examine a problem in a more sophisticated or original way.

"In those cases," says Bryk, "nobody is creating a vision for how technology can be used to improve student performance."

But some schools are making headway with the help of organizations like the Center for Children and Technology.
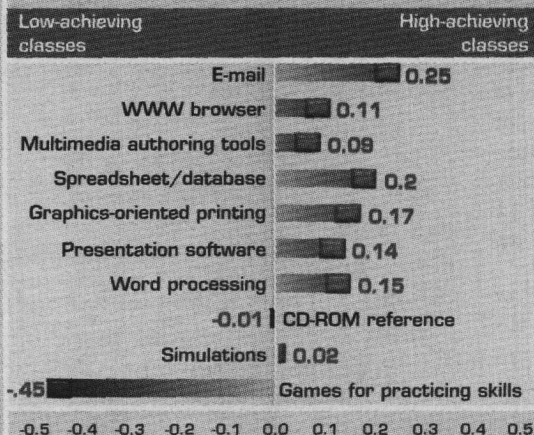
The center has provided laptop computers and lessons in high-level applications to 9th graders in Union City, N.J., who have been identified as at risk of performing poorly in school. The 40 students selected for the project agreed to certain responsibilities, such as improving their school attendance, raising their grades, and teaching others to use the technology.

In the three years since the project started, Honey reports, many of the students have made dramatic academic improvement, moving, for example, out of remedial classes—or, in several cases, from general education classes into honors programs.

Tim Comolli, an English teacher at South Burlington High School, designed an electronic arts class in which students learn how to use sophisticated computer animation programs. Some researchers say unmotivated or academically struggling students tend to have less access to quality technology learning than their more motivated or gifted peers. But Comolli says, in his electronic arts class, it's hard to tell the difference between high and low achievers.

Low Achievers Lose Out

Among teachers who use computers in the classroom, teachers of high-achieving classes are more likely to use complex applications such as graphics and presentation software, while teachers of low-achieving classes often use computers for more narrowly focused, drill-and-practice exercises.

Low-achieving classes		High-achieving classes
E-mail		0.25
WWW browser		0.11
Multimedia authoring tools		0.09
Spreadsheet/database		0.2
Graphics-oriented printing		0.17
Presentation software		0.14
Word processing		0.15
CD-ROM reference	-0.01	
Simulations		0.02
Games for practicing skills	-.45	

-0.5 -0.4 -0.3 -0.2 -0.1 0.0 0.1 0.2 0.3 0.4 0.5

NOTE: Scores are the standard deviations between the levels of use in low-achieving and high-achieving classes. Positive differences indicate greater use by teachers of high-achieving classes. Negative differences indicate greater use by teachers of low-achieving classes

SOURCE: Center for Research on Information Technology and Organizations, University of California, Irvine, "Snapshot#8" from the Teaching, Learning, and Computing, 1998 National Survey

Beyond Basics

Nevertheless, in most places, the general application of technology with low-achieving students is for "drill and practice" in academic skills.

Such uses of technology "may boost motivation in the short term—but, in the long run, worksheets are worksheets," quips Christopher J. Dede, co-director of the Technology in Education Program at Harvard University.

Plenty of evidence, Dede says, suggests that students can learn basic academic skills while engaged in more complex tasks.

Dede argues that research "has demonstrated convincingly that if kids are involved in problems that are sophisticated, and they find they don't have a basic skill to get to the sophisticated stuff, they are very motivated to learn the basic stuff."

Students in an inner-city Boston high school with minimal math and science skills, for instance, were able to demonstrate a deep understanding of Einstein's Theory of Relativity and answer complicated genetics questions using sophisticated computer programs that modeled real-world problems.

Their skills, in fact, were on a par with those of their peers in an affluent suburban school, according to research by Paul Horowitz, a senior research associate at the Concord Consortium, a research organization in Concord, Mass., that promotes educational improvement through technology.

The hands-on software programs, Horowitz says, can teach students basic science skills by having them actually do science, rather than trying to have them visualize the scientific concepts presented in textbooks.

"In a very important sense, both math and science are games, but their game-like nature doesn't come out in problems in a textbook," Horowitz says. "The computer can help create fantasy worlds. It's like the real world of a scientist, but it's simplified to the point where students can master [concepts] and figure out the rules of science." ■