Evaluate academic performance

with and without technology

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No Child Left Behind (NCLB) has focused national attention on chronic academic underachievement. Adequate Yearly Progress (AYP) is a mathematical metric designed to demonstrate sustained incremental effort at closing the achievement gap. By 2014, all students are expected to be performing at grade level.

The exclusive focus of NCLB on assessment has overlooked a critical factor in the academic achievement equation, that is, interventions associated with teaching and learning. As a result, teachers and administrators continue to puzzle over what can be done to enhance academic achievement.

Clearly, technology is one of many powerful tools in our educational tool-kit. For students with disabilities, the power and potential of assistive technology makes it possible for students to complete tasks that are ordinarily difficult or impossible.

This article will describe easy-to-use procedures to collect and evaluate evidence about the impact of technology to enhance academic performance. While this work has been developed in the context of assistive technology research, the procedures have application for anyone interested in evaluating the effectiveness of technology for enhancing academic performance.

Locating Evidence of an Academic Performance Problem

Schools have been failing large numbers of students long before NCLB was around. The problem is not about performance standards. Rather, do we have a responsibility to do more than simply fail students that are not benefiting from the current models of one-size-fits-all instruction?

For example, in science, Tom is expected to read each chapter and answer the 20 questions at the end of each chapter as part of his weekly homework assignment. Consider the data presented in Figure 1 that illustrates his scores on these weekly reading assignments for the first five weeks in the quarter. Does Tom have an academic performance problem?

If a student has repeatedly failed, how much failure data do we need before we have enough evidence that the student can't perform the task? When do we intervene? And, what do we do? If we refuse to intervene, is there any doubt that failure will be the outcome?

Technology Interventions

As the teacher learns more about Tom, she discovers that his reading level is many grades below the readability level marketed by the publisher of his textbook. In conversations with assistive technology specialists, she learns about technologies known as text-to-speech. Her district has several text-to-speech options available. ReadPlease (http://www.readplease.com) is free downloadable software for Windows that will allow Tom to copy and paste text from a CDROM

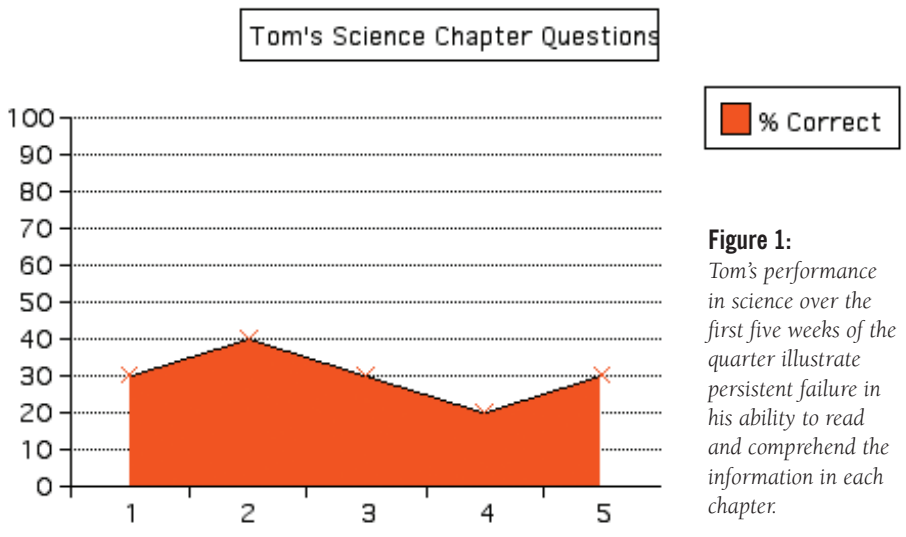

Figure 1: *Tom's performance in science over the first five weeks of the quarter illustrate persistent failure in his ability to read and comprehend the information in each chapter.*

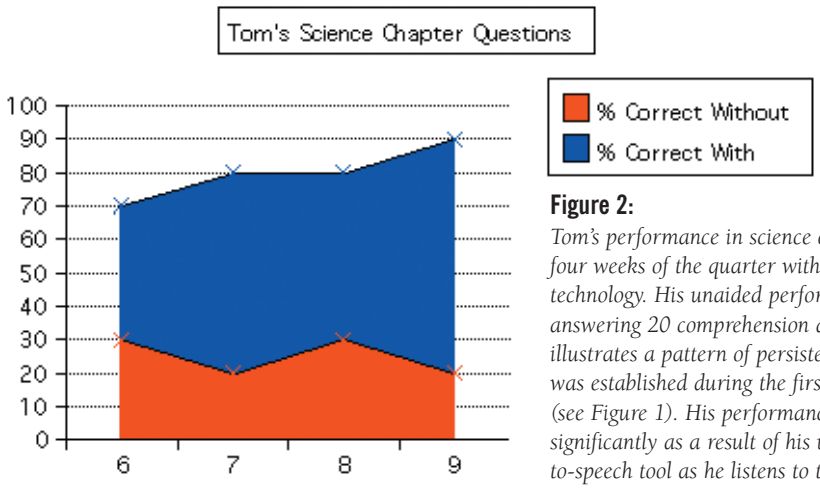

Figure 2:
Tom's performance in science over the final four weeks of the quarter with and without technology. His unaided performance in answering 20 comprehension questions illustrates a pattern of persistent failure that was established during the first five weeks (see Figure 1). His performance improves significantly as a result of his use of a text-to-speech tool as he listens to the computer read the information in his textbook. The difference between the two trend lines provides evidence of the boost in performance that can be directly attributed to Tom's use of technology.

that accompanies the textbook so he could listen to each chapter being read to him by the computer. Other specialized tools provide similar access: Read & Write Gold (TextHelp), WYNN, (Freedom Scientific) and Kurzweil 3000 (Kurzweil). To understand if any one of these technology tools will be helpful to Tom, the science teacher agrees to collaborate with the technology specialists in her building to collect and evaluate the impact of technology on Tom's academic performance.

Research Design

Assistive technology researchers have advanced a research design known as the Time Series Concurrent and Differential (TSCD) Approach as a means of collecting evidence about the impact of technology on performance (Smith, 2000). Basically, the research design involves a series of performance measures of an individual when s/he is completing a specific task, with and without the technology (aided vs. unaided performance). Graphing the data over a period of time will reveal patterns of performance that establish the impact of the technology. Readers interested in learning more about the application of this methodology may explore its application in reading (Edyburn, 2004), writing (Edyburn, 2003), and math (Edyburn, 2003).

Data Collection

When Tom's teacher suggests the possibility of using text-to-speech software, Tom is eager to give it a try. They decide that ReadPlease is a good option since he can install it on his home computer and use it without the knowledge of his classmates. The performance measures will remain the same: the 20 questions at the end of each chapter.

To measure Tom's performance without the technology, he will continue to study the textbook on Monday and Tuesday nights as he has done all quarter. On Wednesday during lunch he will complete the 20-questions at the end of the chapter. On Wednesday and Thursday nights he will listen to his textbook using ReadPlease. He will complete the 20-questions again on Friday during lunch to provide a measure of his performance when using the text-to-speech technology.

Data Analysis

The data presented in Figure 2 illustrate Tom's scores on his weekly reading assignments in science for the last four weeks in the quarter. The data in the lower half of the graph represent Tom's performance without the text-to-speech technology. The scores are similar to what we saw during the first five weeks. The evidence is clear that Tom cannot independently read and comprehend his science textbook as measured by the 20 comprehension questions at end of the chapter. In contrast, the data concerning Tom's performance after using the text-to-speech product illustrates a significant improvement in performance as a result of using the technology.

Decision-Making

The TSCD provides an easy-to-use research design for measuring the impact of technology on academic performance. In Tom's case, the data reveal a significant improvement in his academic performance when his work is aided by an appropriate technology tool over his unaided performance. The area in the graph between the two performance trend lines provides evidence of the boost that can be directly attributed to the technology.

We may observe several types of performance patterns using the TSCD model. First, as is often the case with many struggling students, unaided performance is often flat and persistently within an unacceptable range (0 - 60%). Flat profiles are clear evidence that what we are currently doing is not working. Second, some profiles of unaided performance begin to go up over time. For example, in the case of solving math problems, if we provide a computational tool (e.g., calculator, WebMath) as the technology intervention (aided performance) and observe scores rising during the performance assessment of unaided performance, we can attribute the gains as evidence of learning. This means the technology is serving as a scaffold or perhaps has removed barriers to engagement.

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Finally, profiles, such as Tom's, which show a distinct improvement over time between performance with technology vs. unacceptable performance without technology, make a convincing case that the technology is serving an assistive technology function.

During parent-teacher conferences at the end of the quarter, Tom, his parents, and his science teacher review his science performance and decide that text-to-speech is a valuable technology tool for enhancing his academic performance. Given the obvious initial success, they commit to exploring additional text-to-speech tools such as Kurzweil, Read & Write Gold, and WYNN, which will allow Tom to place any of his textbooks on a scanner to have the information brought into the computer and then read to him. They are also intrigued by the possibilities of a new product, Key to Access, (Premier Assistive Technology) which features a suite of assistive technology programs, including text-to-speech software, on a single USB drive that Tom can carry in his pocket and use on any computer at school, home, library, or a friend's house.

Concluding Thoughts

These procedures provide a method for collecting evidence about the impact of technology on the academic performance of individual students. The tools and procedures can be readily applied to a variety of technology interventions to provide teachers, technology specialists, and administrators with data-based evidence about whether or not specific technology applications do indeed enhance academic performance.

The use of technology tools and cognitive supports represent essential and underutilized interventions for enhancing the academic performance of struggling students. In closing: How much failure data do we need before we "know" a student can't do a specific academic task? And, more importantly, what do we do about it?

References

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Edyburn, D.L. (2003). Measuring assistive technology outcomes in mathematics. Journal of Special Education Technology, 18(4), 76-79.

Edyburn, D.L. (2003). Measuring assistive technology outcomes in writing. Journal of Special Education Technology, 18(2), 60-64.

Smith, R.O. (2000). Measuring assistive technology outcomes in education. Diagnostique, 25, 273-290.

Products

Key to Access
http://www.premier-programming.com/keytoAccess/Key.htm

Kurzweil 3000
http://www.kurzweiledu.com/

ReadPlease
http://www.readplease.com/

Read & Write Gold
http://www.texthelp.com/

WebMath
http://www.webmath.com/

WYNN
http://www.freedomscientific.com/LSG/

as advance organizers. Some great examples include Glencoe, Harcourt, and Macmillan/McGraw-Hill. Many education publishers have Web sites that support their texts. Don't overlook these valuable resources.

A unit strategy that promotes cooperative learning and generating and testing hypotheses is the WebQuest. Not to be confused with a Web scavenger hunt, a WebQuest is an organized activity following a specific model. Visit Bernie Dodge's WebQuest Page for an overview of this model and hundreds of WebQuests, organized by grade level and discipline.

Homework policies and daily assignments can be posted on a school's Web site for easy access. Also, for a fee, several companies host school and teacher Web pages (e.g., eBoard.com, Myclass, and Blackboard).

Organizing and Brainstorming Software. Software for these activities can be integrated into a number of the instructional strategies. For example, Kidspiration, Inspiration, and Kid Pix offer great graphic organizers for identifying similarities and differences. These applications come with templates that allow younger students to drag pictures and older students to type words into the appropriate boxes as they sort, classify, and compare items. Students can also create Venn diagrams and comparison tables.

Inspiration is another great resource for classroom activities that require students to summarize text. Rapidfire is a brainstorming tool within Inspiration that allows teachers and students to quickly and automatically create concept webs. In particular, teachers can show students how to use the Rapidfire feature to create a summary web. With a single click of a button, students can switch between concept web and outline views. This approach also reinforces nonlinguistic representation.