Failure Is NOT an Option

Collecting, Reviewing, and Acting on Evidence for Using Technology to Enhance Academic Performance

By Dave L. Edyburn

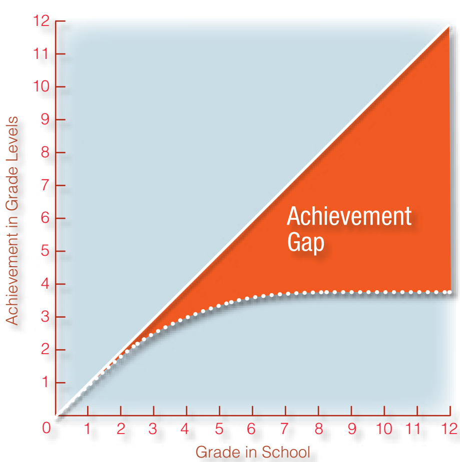


Figure 1. A graph of the achievement gap illustrates the difference between expected outcomes and student performance among under-performing populations.

The "achievement gap" is a well-documented problem in schools. In practical terms, the problem can be illustrated in a graph (Figure 1). The diagonal line illustrates the intended learning outcome: one year of academic achievement for each year in school. However, the dotted line illustrates the pattern of achievement of many under-performing students, including students of color, those with disabilities, those living in poverty, and those whose first language is not English. The area between the dotted line of performance by low achievers and the diagonal line of expected grade-level performance is known as the achievement gap. Concern about chronic underachievement is one of the core tenets of the federal education reform law known as No Child Left Behind (NCLB), as shown in the law's emphasis on measuring adequate yearly progress.

Lessons Learned

The lessons of the achievement gap are clear:

- Contemporary schooling practices are not effective for some groups of students.
- Continuing to do what we have always done will perpetuate rather than eliminate the gap.
- Repeated failure over time creates an achievement gap that is exceedingly difficult to erase.

How long do we allow students to fail at a given task before we provide them with appropriate performance support tools? When students are unable to experience success in a learning activity, there is still a learning outcome: Students learn that they don't like the subject matter and internalize the failure in ways that reflect the idea that they are "no good" in the subject. Indeed, the emotional scarring of this process is so powerful that these negative outcomes are transmitted generationally. What teacher has not had the experience at parent-teacher conferences where the first explanation a parent provides for his son's or daughter's academic failure is, "Well, I was never very good at that in school."

It appears that academic failure has a lifelong effect in closing doors to learning and opportunity. The lessons of the achievement gap suggest that our historical decisions about when to intervene with performance supports are seriously flawed. In short, performance support interventions must be provided much sooner than they have ever been considered in the past.

An Academic Performance Problem

Schools routinely evaluate academic performance. Every classroom has extensive systems in place to identify inadequate, adequate, and exceptional performance. Figure 2 illustrates the daily algebra homework scores of four ninth grade students. Which graph illustrates:

- a student who is successfully achieving?
- a student who is non-engaged?
- a student with inconsistent performance?
- a consistently low performing student?

Rather than addressing the issues of poor performance, educators often search for reasons to explain poor performance, become sidetracked, and fail to intervene with appropriate supports. However, without knowing all the reasons, perhaps we can agree that the performance profile of three of the four students provides clear evidence of a performance problem.

Unfortunately, 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 who are not benefiting from the current models of one-size-fits-all instruction? If a child has repeatedly failed, how much failure data do we need before we have enough evidence that the child can't perform the task? When do we intervene? And, what do we do?

Evidence of an academic performance problem requires that we respond quickly and differently to signs of academic failure. Research on human performance technology illustrates the palette of interventions for overcoming performance problems.

Components of Performance

In 1996, David Wiley studied five common models of human performance technology and produced a synthesis of the key factors that have been identified in the performance support literature (Figure 3). Wiley's analysis suggests that performance is affected by seven variables:

1. Organizational systems
2. Incentives
3. Cognitive support
4. Tools
5. Physical environment
6. Skills/knowledge
7. Inherent ability.

In Wiley's estimation, the variables are sequenced in their ease of remediation. That is, performance problems related to organizational systems are easier to modify than problems associated with intrinsic abilities.

When a student encounters difficulties in the academic environment, Wiley's model illustrates why educators have had limited success in closing the achievement gap by focusing all their efforts on instructional strategies and inherent abilities. The model also suggests other interventions for teachers to explore: changes in the organizational structure (e.g., change course sections), as well as changes in settings, or various incentive/motivational strategies. If all of these interventions fail to produce the desired level of student performance, two additional variables deserve further investigation: cognitive support and tools.

Technology as Performance Support

The nature of most learning activities our children complete is indistinguishable from the way previous generations completed the same tasks. However, outside of schools, technology has fundamentally altered how some tasks are completed—the mortgage underwriter uses a spreadsheet, the mechanic uses an engine diagnostic system, and so on. Further, why is it that I have many choices of how to view a movie—by watching it on broadcast, cable, or satellite television; renting a videotape or DVD; going to the theater or to a friend's house—but only one way to learn about American history—by reading a textbook?

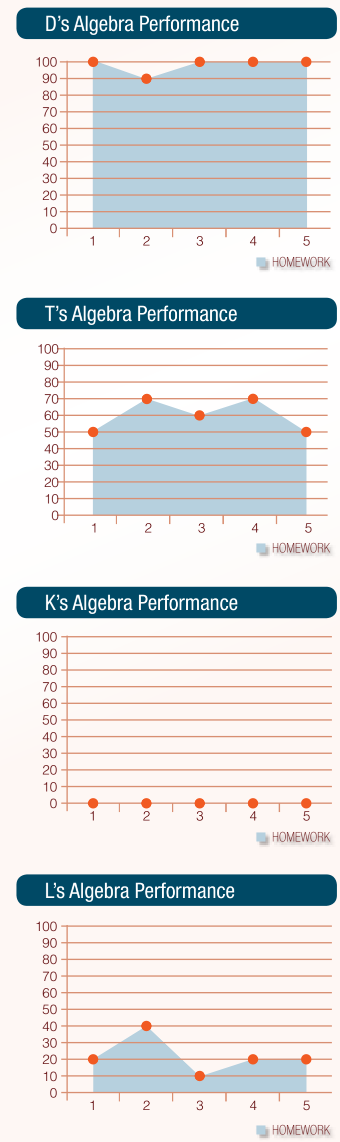


Figure 2. Ninth grade student performance data from algebra homework.

Recent educational innovations, such as differentiated instruction and universal design for learning, offer insights into proactively planning instruction that embraces academic diversity. Recognizing the need for both physical and cognitive access to learning provides a rationale for far-ranging searches of existing technologies that fundamentally alter the way specific tasks can be completed.

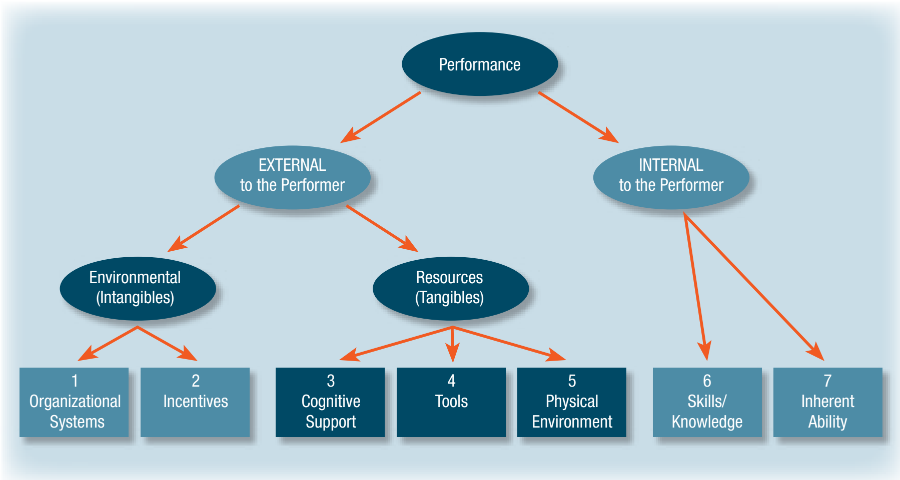


Figure 3. Wiley's model of human performance technology.

Consider a few examples of technology tools that our grandparents didn't have:

- For students unable to independently read their textbooks, digital text and text-to-speech software such as ReadPlease (http://www.readplease.com) or Kurzweil 3000 (http://www.kurzweiledu.com) exist so that the student can listen to the information as it is read by the computer.
- For students who struggle with the physical and mechanical tasks of generating a first draft of a paper, a dictation service such as iDictate (http://www.idictate.com) is available that will prepare documents based on dictation provided over the telephone.
- For students who experience difficulty in recalling facts, Ask Jeeves for Kids (http://www.ajkids.com) teaches students how to retrieve information they do not know or remember.
- For students with computational difficulties in math, there is WebMath (http://www.webmath.com). This Web-based tool provides calculating and instructional support for solving math problems from elementary through graduate school.

Data Illustrating Technology-enhanced Performance

Figure 4 illustrates Nick's performance using a research design for measuring performance (in this case, solving 20 algebra problems) with and without technology. To assess whether WebMath contributes to Nick's enhanced performance, every other day the teacher assigns the homework to be completed in the typical paper and pencil format. On the other days Nick completes his homework using WebMath. After reviewing the data, does the difference between the two lines provide convincing evidence of the boost in performance that Nick is able to achieve as a result of his use of appropriate technology tools? Indeed, this example of WebMath illustrates the potential value of cognitive supports and technology tools for enhancing academic performance. However, it also raises a number of provocative questions that reveal we have yet to learn the lessons of the achievement gap.

Bias: Naked Independence

Education places a premium on knowledge that is contained in one's head. Performance that is completed without the aid of external devices and resources is prized over performance that is dependent on tools or resources. While this may be a historical artifact of society's conception of the educated person, there is a clear bias here. As Samuel Johnson observed, "Knowledge is of two types: the kind you know and the kind you know how to find." Researchers in assistive technology outcomes have termed this form of bias "naked independence," as it exults the performance of able-bodied individuals and devalues the performance of others who must rely on external devices or tools.

Teachers and administrators often react strongly to the example of Nick and WebMath. They argue that allowing Nick to use such a tool amounts to endorsing cheating. They argue that Nick can't really perform the task like the other students (notice the not-so-subtle bias of naked independence?). They argue that he is dependent on the tool. They wonder how he will be able to solve algebra problems when he isn't connected to the Internet (he can't; the data show that). They argue that Nick can't possibly earn an A like other students who successfully complete problems without relying on a tool to help them. And, they argue that allowing Nick to use WebMath is not fair to the other students (e.g., high-achieving students who earn their A with sheer mental power, or other low-achieving students without access to technology). Finally, they argue that we should prevent Nick from ever using WebMath because this form of technology will not be allowed on the state's high-stakes test.

Notice how contentious the conversation about technology-enhanced performance has become? The notion that technology can be used to enhance performance challenges traditional roles (i.e., entitlement) held by those who can complete a task and claim their performance (naked independence) is superior to performance that is enhanced through technology. This subtle form of bias will be a powerful force to overcome in the quest to provide struggling students with appropriate tools that enhance their functional performance.

Grading

Despite the routine collection of performance data in schools, the primary purpose of grades is to classify and rank-order students. Notice the elements of entitlement that leak out of the naked independence bias: It's not fair that some students can earn an A by relying on technology while others have to devote significant mental energy to completing the algebra problems. Conventional thinking is that we cannot allow the two performances to be considered equivalent. As a result, we tend to ban technology tools under the guise that measuring naked independence is a better measure of performance, skill, and knowledge. Status quo maintained.

Fairness

Research on fairness indicates that most adults' notions of fairness are arrested at the kindergarten level (e.g., "He got a blue M&M, and I didn't!"). That is, fairness means everyone gets the same thing. However, the functional definition of fairness is that everyone gets what they need. Much work remains to be done to provide every struggling student with the appropriate technology and tools he or she needs to be academically successful.

Concluding Thoughts

Despite the current educational reform rhetoric about high academic standards, educational practice prefers to hold time constant rather than performance. That is, if all students are to achieve a given educational standard, then time and tools should vary to allow for differences in learning. However, we prefer to hold time constant (e.g., one-day lessons, two-week units), moving on to the next topic despite the extreme variance in performance by the students within a class. If time is to be held constant, and traditional instruction has generally failed to produce acceptable levels of academic performance, then the only other viable options for enhancing performance are to provide cognitive supports and appropriate technology tools.

When time is held constant and a single form of instruction or instructional material is used, it is impossible to make claims that all students will achieve high standards. The historical lessons of the achievement gap have already taught us this. The use of technology tools and cognitive supports represent essential and underutilized interventions for enhancing the academic performance of struggling students. The long-term consequences of academic failure must motivate the profession to intervene with carefully designed learning activities that ensure success from the outset.

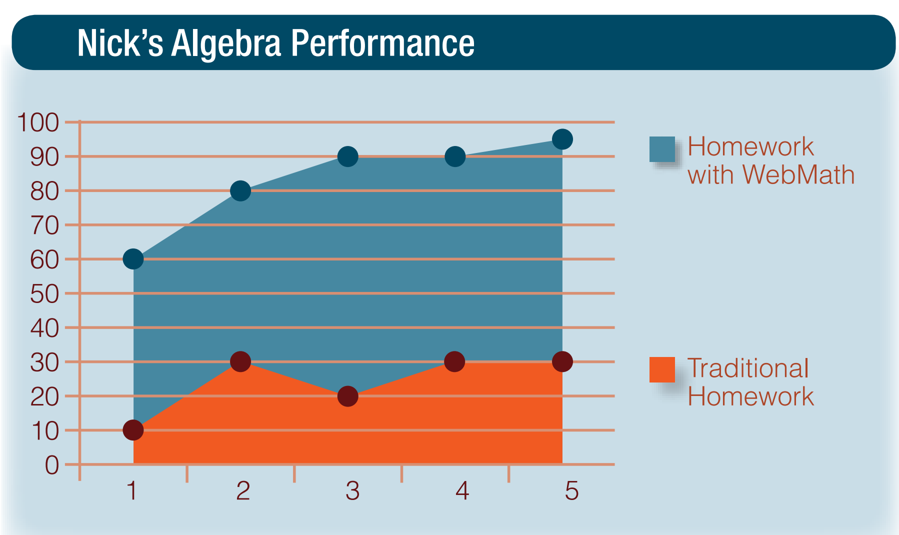


Figure 4. Nick's algebra homework performance with and without WebMath visually demonstrates the contribution, or boost, that technology provides to his functional academic performance.

Resources

Boswell, J. (1887). *Life of Johnson*. New York: Harper and Row.

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

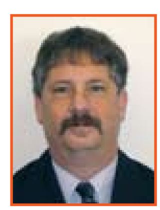
Rose, D., & Meyer, A. (2002). *Teaching every student in the digital age*. Alexandria, VA: ASCD.

Stanovich, K. E. (1986). Matthew effects on reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*, 360–407.

Tomlinson, C. A. (1999). *The differentiated classroom: Responding to the needs of all learners*. Alexandria, VA: ASCD.

Welch, A. B. (2000). Responding to student concerns about fairness. *Teaching Exceptional Children, 33*(2), 36–40.

Wiley, D. (1996). Why doers do. *Performance and Instruction, 35*(2), 30–35.



Dave L. Edyburn, PhD, is a professor in the Department of Exceptional Education at the University of Wisconsin-Milwaukee. His teaching and research interests focus on the use of technology to enhance teaching, learning, and performance. He has authored more than 100 articles and book chapters on assistive and instructional technology, and is a past president of the ISTE Special Education Technology Special Interest Group (SETSIG).