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Assessing the Assessments

Most students understand the need for testing and prefer to do it on a computer — but their parents still have issues.

WITH DISTRICTS in the 44 Common Core states field-testing new online assessments, plenty of critics have voiced their opinions. The most extreme are exhuming the twin bogeymen of Communism and Nazism to attack the standards themselves, while moderate opponents have shown reasonable concern about the impact of testing on teaching and learning.

A recent study brings a much-needed constituency to the conversation: students. The Northwest Evaluation Association’s “Make Assessment Matter: Students and Educators Want Tests that Support Learning” surveyed 1,042 students, 94 percent of whom agree that tests are “important for understanding what they are learning, getting into a good college and knowing whether they will move on to the next grade.”

You can read more about the study on page 3, but I think one more number merits mention: 78 percent of the students surveyed believe that taking tests on computers has a positive impact on their engagement during these assessments.

So in this sample, large majorities of students understand the purpose of the new tests and prefer to take them on computers — yet I still hear a steady chorus of parents who are unhappy about assessments. For example, I recently read the following on a college friend’s Facebook feed: “I had a child come out of standardized testing crying today because he thought he got his teacher in trouble with his score. Just UGH.”

I understand this. No mother wants her child to come home from school in tears. Fortunately, though, that was not the end of the story. Later, my friend posted this: “We e-mailed his teacher and she is being super and understanding — this all has to do with how he interpreted something she said about growth targets in response to another student’s question about it…. I feel almost as bad for her as I do for him. This isn’t good for anyone, but we’ll get through it.”

My friend’s comments were a good reminder that the key to navigating this transition is simple: engaged parents and responsive teachers working together to do their best for students.
NWEA Releases Study of Students’ and Educators’ Attitudes Toward Assessments

By Christopher Piehler

The Northwest Evaluation Association (NWEA) has released the study "Make Assessment Matter: Students and Educators Want Tests that Support Learning." Conducted by Grunwald Associates, the study highlights the perceptions of students, 94 percent of whom agree that tests are important for understanding what they are learning, getting into a good college and knowing whether they will move on to the next grade. The study includes responses from 1,042 students, 1,004 teachers and 200 district administrators.

Matt Chapman, president and chief executive officer of the NWEA, said, “As a not-for-profit organization, NWEA strongly shares the belief — voiced by everyone in the survey — that assessments must be student-focused and should be used to improve teaching and learning. We are especially excited to bring the student into the conversation. Who better to help guide us toward a more student-centric educational system?” Some key highlights from the study include the following:

- 95 percent of students agree that tests are “very” or “somewhat” important for helping them and their teachers know if they are making progress in their learning during the year and for getting into a college;
- 55 percent of students believe they take state accountability tests to evaluate their schools;
- despite all the attention on assessments aligned to the Common Core State Standards, 80 percent of students say they have not heard of new state accountability tests;
- 58 percent of high school students believe college entrance exams accurately predict college success; and
- 81 percent of students think student test scores reflect how well teachers teach.

Also, 78 percent of students believe that taking tests on computers has a positive impact on their engagement during tests, while most district administrators (95 percent) and teachers (76 percent) agree that adaptive technology-based assessments are “extremely” or “very” valuable for engaging students in learning. Read the full story.
Google Developing Free LMS as Part of Google Apps for Education

Google is now taking applications for a limited preview of a new app called Google Classroom — a tool that brings learning management functionality to the Google Apps for Education suite.

According to Zach Yeskel, Google Apps for Education product manager, Google Classroom is designed “to give teachers more time to teach [and to] give students more time to learn” by helping them avoid “some of the busywork” that’s part of the process of teaching. Yeskel said Classroom has been piloted in about a dozen schools around the country so far, including institutions in New York, California and Illinois. Read the full story.

Learning Forward Launches Free Online Principal PD Resources

Learning Forward has launched a collection of free online professional development resources for principals and aspiring K-12 school leaders. The Principal Story Learning Guide, based on the PBS documentary The Principal Story, features Web-based lessons and activities and incorporates knowledge from 13 years of work with school districts and from research on education leadership funded by The Wallace Foundation.

The Learning Guide’s five units use scenes from the film for demonstration purposes and as jumping-off points for exploration. The units include more than 25 activities designed for instructors and facilitators in principal preparation and professional development programs, but they can also be used by individuals or small teams. Units can be imported into existing lessons or used as the basis for stand-alone lessons or workshops. Read the full story.

South Carolina District Wins the Sylvia Charp Award

Richland School District Two (SC) is the winner of the 2014 Sylvia Charp Award for District Innovation in Technology. Presented by THE Journal and ISTE in honor of the magazine’s founding editor, this award recognizes a school system for innovation in the equitable and widespread application of educational technology.

Richland School District Two earned the award by having both 1-to-1 and BYOD programs. These programs were planned in conjunction with teachers, students and the community, and are being implemented alongside policies and procedures that are in place to make sure that any tech implementation supports teach and learning.

Technology integration coordinator Donna Teuber will accept the award on her district’s behalf at ISTE 2014, which will take place in Atlanta from June 28 to July 1. A profile of the winning district will appear in a future issue of THE Journal.
Product Roundup

Astronomy and Beyond

The latest hardware, software and services

Britannica Kids: Solar System ($4.99) is designed to help kids improve observation and memory skills with activities that cover the hot topics kids want to know about our solar system. Read the full review.

Using the free NASA App lets students watch rocket launches, view daily images of Earth from the International Space Station, find a distant solar system or learn about NASA's missions. Read the full review.

Mobile Observatory ($3.99), help kids locate planets, identify constellations or map stars. Charts and graphs offer info about eclipses, meteor showers, moon stages or planet visibility. Read the full review.

With SkySafari ($2.99), students can point devices at the night sky and explore star clusters, comets, asteroids, planets or galaxies. Built-in compass and search tools help find specific objects. Read the full review.

3D printer manufacturer Solidoodle has released the Solidoodle 4 package ($899), which includes the Solidoodle 4 printer as well as two 2-pound spools of filament. Read the full story.

The Smart Board 6065 interactive flat panel ($4,499) supports up to four simultaneous touches and detects the difference between a finger, pen and eraser. Read the full story.

With a range of products from educational software to hardware, these new releases are sure to inspire both kids and adults alike.

AV & Presentation
- Microsoft Office Mix Turns PowerPoint Presentations into Online Interactive Lessons
- Crestron Intros New Room Scheduling Touchscreen
- Smart Technologies Intros Interactive Flat Panel for Education
- Extron Intros 12 TouchLink Pro Touchpanels

Enterprise Systems
- Yammer Enterprise Coming to Microsoft Office 365 Education Plans

Infrastructure & Facilities
- Ruckus Ships 3-Stream 802.11ac Access Point

Mobile Computing
- iGear Offers Customizable iPad Keyboard Case
- FileWave Releases Mobile Device Management Update
- OpenGL ES 3.1 Adds 3D Capabilities, Integrated GPU Computing
- Apple Updates Entry-Level iPad, Ditches iPad 2

Security
- LRAI Launches Mobile Long-Range PA System

Teaching & Learning
- Google Developing Free LMS as Part of Apps for Education
- Tutor.com Introduces Spanish Language Help
- Panopto Adds Video Content Search to Lecture Capture Platform
- Canvas Adds Learning Mastery Gradebook

Click here for new releases
CHANGING THEIR WORLD

The joke we always tell is that when I came here 10 years ago, the T1 line was being used as a doortop in the library and teachers had just started using e-mail. Since then our school has gone through a major renovation. Now we are a 1-to-1 BYOT school, the 30 percent of our kids who are on financial aid receive technology grants to buy their own technology and we’ve completely revamped how we do professional development. It’s a very different environment.

HANDS-ON PD

The traditional professional development model of an expert droning on in front of a bunch of teachers while they check their e-mail wasn’t effective, so we started doing a lot more one-on-one. We freed up our ed tech coordinator and me to go into classrooms, watch teachers teach and not only give them suggestions but also help alleviate some of their anxieties.

We created a teacher resource room that became the focal point of professional development and conversation. We also instituted 10-minute administrative drop-ins where we would address four questions: What is the objective of the lesson, what are the students doing, how is the teacher engaged with the students and what is the classroom environment. When those are the four questions that you ask, it’s amazing how often technology becomes a piece of that conversation.

LEFT TO THEIR OWN DEVICES

When we reflected on our technology plan we decided that any device you pick is going to be a device you’re embarrassed by three years later. The device is going to change, but what wasn’t changing was the way you think about using the device. What it boiled down to is we wanted the kids to be able to assess the technology they had available to them, evaluate their learning needs and effectively use the technology they chose. That’s what led us to embrace BYOT.

Now we’ll see a student on a MacBook typing a lab report, his lab partner using his phone to take pictures of the chemical being mixed and another student recording the teacher giving notes — all three of them working together to accomplish their objective.

MODEL CITIZENS

For a number of years we had a required computer applications course, and it became clear to us that we needed to teach less how to make a PowerPoint — our kids were coming in with those skills, or they could quickly catch on to it just by button-pushing — and more about how to effectively incorporate multimedia, or to make a really good presentation using a PowerPoint.

We told students we were no longer teaching how to type a Word document; we were teaching how to do effective research and avoid social-media confirmation bias, for example. We added a digital distraction unit last summer to help students keep track of the number of times they found themselves being pulled off task by the technology, which gives them opportunities to reflect on what habits of mind they need to develop.

On May 27 at 4 PM ET, learn more about Ferries-Rowe’s innovative use of technology in an edWeb.net webinar hosted by THE Journal’s Christopher Piehler.

JD FERRIES-ROWE, CHIEF INFORMATION OFFICER, BREBEUF JESUIT PREPARATORY SCHOOL, INDIANAPOLIS

MY TOP 3

Ferries-Rowe shares how he uses technology to make connections.

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6 | the | MAY 2014
How to Survive a Cyberattack
Here’s how a North Carolina district responded to a denial-of-service attack that came from one of its own schools.

At 7:45 a.m. on Monday, April 8, 2013, 23,000 network users in the Rowan-Salisbury School System’s 35 schools were accessing their Web-based curriculum resources and administrative applications when suddenly all Internet connectivity stopped. The outage lasted for about an hour. Teachers had to quickly switch their lessons to a Plan B, since most had components that required Internet access.

Internet connectivity returned briefly, but suddenly went down again for another hour. The Internet would go down for a third time before school ended.

The Internet outages weren’t due to hardware failures, Internet provider outages or network maintenance. The school district was under attack — specifically, we were experiencing a distributed denial-of-service attack, or DDoS. DDoS attacks, one of the most common forms of cyberattack, are designed to overwhelm a targeted IP address with numerous network requests in order to interrupt or suspend network service.

Each morning for the next four days, the district lost Internet connectivity around 7:45 a.m. The Internet would remain down for about an hour and would go down two more times each day.

During the next three weeks, the school system was attacked multiple times a day on eight different days. Each attack caused a loss of Internet connectivity. A great frustration among students and staff ensued. Teaching and learning was being significantly impacted.

Identifying the Problem
The school system’s Internet connection was a 1 Gb connection. It was provided by the state of North Carolina as part of the North Carolina Research and Education Network (NCREN). This network serves all the state’s public education facilities, as well as many private colleges and universities and the NC Office of Information Technology. The NCREN system is managed by MCNC, a nonprofit organization. During the three weeks of
Internet outages, numerous conversations took place between the MCNC staff and the district’s technology department. It wasn’t until the third day of Internet outages that MCNC identified DDoS attacks as the cause of the outages. Data analysis showed that the district’s network was being attacked with as much as 6.4 Gb per second. The attack was focused on the public IP of the district’s firewall. The purpose of the attack was to disrupt Internet connectivity to and from the school district.

Unfortunately, MCNC wasn’t able to stop the DDoS attack at the perimeter of the NCREN Internet connection. Stopping the DDoS attack at the perimeter is essential to mitigate its effect on a network. Instead, MCNC implemented several measures to try to mitigate the attacks. These helped preserve connectivity for the other organizations sharing the network connection line with Rowan-Salisbury, but Internet connectivity for the district continued to be disrupted.

The district got some help from a retired 3Com/HP network engineer, Larry Tolbert. He had more than 30 years of network engineering experience and was very familiar with Rowan-Salisbury’s network. After the district leveraged several of its infrastructure components to obtain additional information about the DDoS attack and to block the attack at the perimeter of the district’s network, Tolbert configured the district’s TippingPoint Intrusion Protection System (IPS) to capture packet data of future attacks for analysis. He also configured the IPS to prevent future attacks from reaching the district’s firewall and to send alerts to the technology department at the start of any future attack.

As we discovered, the DDoS attacks were coming from hundreds of malware-infected, remotely controlled computers located all over the world. This made it difficult to determine the responsible person, but the district needed to try.

Calling the Cops
The next step was to get help from local law enforcement. Sgt. Detective Roger Hosey, who worked with the FBI’s Cyber Taskforce and had previously worked as a school district technology technician, knew the system and its network, so he was well-suited to respond to the situation.

The attacks continued for a fourth week, and on that Wednesday, Sgt. Detective Hosey and another officer visited each of the district’s six high schools to interview staff members. They suspected a student might be responsible for launching the DDoS attacks. The staff interviews didn’t reveal any specific leads, but they did raise awareness within the schools that law enforcement was investigating the Internet issues.

Sgt. Detective Hosey suggested assigning each high school a specific public IP and changing the firewall’s public IP again. The changes were designed to limit the impact on the system’s Internet connectivity if an attack was focused on an individual high school’s public IP. Also, giving each school its own IP might help make a connection between the person responsible for the attack and the high school being attacked.

After law enforcement visited the high schools, DDoS attacks stopped for the next 15 days. On May 16, though, an attack was made on one of the high schools.
Sgt. Detective Hosey believed the person responsible for the attack was using an online resource to determine the new public IP assigned to the high school.

**An Attack From Within**

The district’s Palo Alto Networks firewall contained extensive reporting data, which showed that two computers in a career and technical education (CTE) computer lab at a high school had accessed the website IP Chicken to find the public IP of the attacked high school. A four-hour review of the firewall’s logs also showed that the same two computers accessed a website, xboot.net, that allows individuals to buy, schedule and launch DDoS attacks on any public IP address that the user designates. Sgt. Detective Hosey, the assistant superintendent of administration, and I met with the CTE computer lab teacher to try to determine which students had been using the two identified computers.

Unfortunately, the teacher had not used good classroom management and technology supervision practices on the day when the attack had been launched, and was only able to suggest a couple of students she believed “may” have been using the two computers. We asked the teacher to make sure she employed good classroom management and technology supervision practices in the future, and we asked her to keep the meeting confidential.

Somehow, though, that meeting information was leaked at the school, and students in the class were made aware of the situation.

We configured the district’s IPS system to send alerts if anyone accessed IP Chicken or xboot.net, and waited for the next attack. None came until November 2013, when an alert indicated that someone had visited xboot.net. Firewall and IPS logs showed that a personal iOS device had been used to access xboot.net via the wireless network at the same high school that was linked to the previous school year’s DDoS attack.

Aerohive access points provided wireless connectivity in the schools. These devices provide detailed reporting, and the district was able to determine that the user accessing the DDoS attack website was in the high school’s gym. Calls to the high school’s administration and school resource officer resulted in the user being located in the gym. The browser history on the device, an iPod touch, confirmed that it had accessed the DDoS website — but no attack had been initiated. The student was one of the two that the CTE computer lab teacher had suspected. The school’s administration and local law enforcement took charge of the situation.

Since the initial DDoS attack, MCNC has installed a chief security officer and is looking at solutions that will safeguard the network against events like this at the edge in order to keep such attacks outside the main network. The school district’s IPS alerts remain in place, waiting for the next attack to occur.

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**Phil Hardin** is the recently retired executive director of technology at Rowan-Salisbury School System.
Whether you call it project- or problem-based learning, these technologies will help your students get authentic experience in a blended environment — and help your teachers to track their progress.

BY DIAN SCHAEFFHAUSER

“When Will I ever use this?” This cringeworthy comment slipping from a teenager’s lips can crush the sense of accomplishment that a teacher feels after spending a week crafting a lesson that she thought would have staying power. If you cringe too, it may be time to lock onto the practice of PBL, which is variously referred to as project- and problem-based learning. Where blended learning gives students some flexibility as to where and when they do their work, PBL offers them a choice of what they do. And when students pick the activities they’re going to work on (within parameters established by the teacher, of course), how many of them will openly criticize their own choices? In PBL classrooms, students aren’t learning simply to pass a test; job one is applying creativity and taking ownership of their own education. As a reworking of the old saying goes, teach a student to add, and he’ll get through a quiz for the day; show him how to calculate profit and loss, and he’ll be pitching his next new idea for a lifetime. Here are 10 technologies to help you implement PBL in your classroom.
FEATURE  blended learning

Web-Based Career Readiness System

“Here in Navasota we want our students to be ‘life ready,’” said Navasota Independent School District (TX) Superintendent Rory Gesch. That means preparing students for careers to which they are well-suited. Navasota received its first real dose of PBL magic in 2012 when an AP statistics teacher, Josh Wilkerson, set his students to work on a project that hit close to home. In the summer of 2012, Grimes County, where Navasota is located, suffered through devastating wildfires that destroyed 32 homes. The stats class undertook a student-led comparison of the use of volunteer versus service fire personnel to understand where the community felt the biggest impact.

Working with experts from Texas A&M University, students interviewed fire victims, workers and community service people to create a presentation that they shared with the school board and city council. Along with regional planning among superintendents and the logo are available upon request for monthly data buy-up svc charges for Framily plan. Not available with no-credit-check offers or Mobile Hotspot add-on.

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Happy Connecting

SM Plan with your activities!

VIDEO: A teacher and his students from Navasota ISD share their engagement in a wildfire project.

See all this month’s videos.
specifically for at-risk students in the district, that project sparked another kind of fire: a desire among Navasota administrators and teachers to move into PBL. Spurred by the desire to meet the needs of the community and align those needs with Texas standards, the district purchased the Web-based WIN Learning Personalized Career Readiness System.

That set of applications includes WIN Strategic Compass, which allows students to explore potential career paths, identify interests and put together a career plan based on employment trends for the next five to 10 years. An initial review measures a student’s “career readiness” and identifies gaps in skills such as reading for information and applied math.

The goal is to help the student see the relevance of his or her own education. The software also has lessons for soft skills such as communication, teamwork and critical thinking.

Mobile Devices
Does putting computing devices into a list like this seem obvious? According to Ronnie Gonzalez, chief administrative officer and director of technology and communications at Navasota, choosing a mobile device isn’t about the tool. It’s more about enabling “kids to create and have access to information.” His district is attempting to implement a plan by which each classroom has multiple types of devices so students can choose the right one for the job.

The core classrooms where PBL is in full swing are outfitted with a three-students-per-device ratio. Students can choose from six to eight Chromebooks and two to three iPads, and they have access to mobile carts. To fill out the inventory of devices, several schools within the district also have bring-your-own-device programs, and PBL classrooms are put at the head of the line for upgrades to ample wireless connectivity. Navasota, which has a 74 percent free and reduced lunch population, found that more than 80 percent of its families have access to Internet at home. To promote hybrid and flipped activities, the school has a computer-lending program that allows students to check out devices.

To help with the proliferation of technology, the schools hired tech teachers to work alongside the classroom teachers. And to prepare middle schoolers
Collaboration and Course Management Tools

The Science Leadership Academy has adopted Google Apps for Education to enable its students to collaborate on papers and presentations. For course management the school has chosen Canvas by Instructure, where teachers can put up assignments and students can access them. Baird has used the online service’s asynchronous discussion forum and he’s testing out the wiki feature; but since this is the first year it has been in use, “we are still exploring its capabilities,” he said.

The school is also trying SLATE, which promises to integrate applications such as Canvas, Google Apps and plenty of others through single-sign-on as well as APIs and dashboards that enable the sharing and reporting of data across programs.

All of these online services ultimately are intended to facilitate communications among teachers and students and among teachers themselves to track student progress. Taking a lead from the math department at the Academy, the history department is creating scaffolded standards that it
wants its students to be good at — the use of primary sources, the ability to present information clearly or to make a connection between an historical event and something in their current lives. Then each quarter, the students undertake projects that call on those standards. The systems form a feedback loop to help the teachers monitor progress and expose gaps where they need to pay additional attention in the classroom.

Feedback on the Run
What’s a behavioral management application like ClassDojo doing on a list of useful tools for PBL? As Alfred Solis, director of innovation for the Buck Institute for Education, explained, teachers are using the Web-based program to give students points or stars for certain behaviors. “What if those behaviors happen to be aligned with good collaboration, critical thinking or communication — and those are being assessed live by the teacher as they’re being observed while [the students] are working in teams? That could be a great project tool to give that student or that team instant feedback from the teacher.”

Grading “Essential Questions”
Tenth-graders studying world history at Benton High School (MO) under Robert Nash may create iBooks on their school-issued MacBooks to synthesize the American and French revolutions and life under dictators into a format appropriate to a children’s story. They may create documentaries to explore how technology affects relationships among people. These are not forms of learning that fit well into a standard gradebook application. When the district social studies department, led by Nash, moved to PBL for grades 7 through 12, he had to jerry-rig a previous application better suited to multiple choice tests.

Acuity, adopted about two years ago from CTB/McGraw-Hill, was the first program Nash had come across that was suited to capturing achievements in the open-ended types of activities that students undertook as they moved through PBL units. Now Acuity has been updated to work with performance-based tasks, comparable to the ones showing up on the Common Core online assessments. “It’s been a long journey,” Nash said, but Acuity is “going to lend itself to what we want to do.” The benchmarks developed by the district ask the student to respond to “essential questions,” which Nash says cover “real-world situations, issues, questions that the normal person should have some knowledge of, some experience with, and be able to solve in their daily lives.” To answer these questions, the student needs to apply real-world skills and knowledge gained through PBL. The goal, says Nash, is to transform the district’s assessment tasks to look more like the ones being introduced by Smarter Balanced.

The Acuity platform includes close to 500 performance tasks across all grades, as well as thousands of item tasks that can be compiled into formative assessments; but the district may end up weaving together teacher-developed tasks with ones provided by the software. That work will begin at the middle school level and move up to the high schools after changes in end-of-course and advanced placement exams are subsumed into the social studies program.

Virtual Labs and Probeware
It makes sense for the chemistry students in Cara Hale-Hanes’ classes at Long Beach Polytechnic High School to study water. As residents of a beachside city in Southern California, they have the ocean as a neighbor; and they’re currently living in a drought situation. She runs a three-week blended project, “Water, Water Everywhere and Not a Drop to Spare,” to help students put into action the theories they’ve been studying in previous weeks. Rather than sticking to a chemistry book, Hale-Hanes uses virtual labs and scientific equipment to help the students go deeper in their understanding of the concepts.
As a precursor, students use a virtual lab developed for Carnegie Mellon University’s ChemCollective to perform experiments that help them learn how to identify acids and bases and also detect and figure out how to remove substances that dissolve in water and become contaminants. Then they work through a virtual lab, “Our Acidifying Ocean,” put together by Stanford University, to explore the chemistry of ocean acidification and its impacts on sea creatures using interactive models, a virtual lab bench and a microscope measurement tool.

Although device and bandwidth equity issues prevent Hale-Hanes from completely flipping her classroom, she blends online activities done before and after school with in-class discussions as much as possible to fill gaps created by student absences or other needs.

The unit culminates in students designing a water system for a community that has almost no water. Hale-Hanes said that she poses students this problem: “How are they going to get the water that’s dirty to be potable so they can supply water for this population?” That requires testing the local water and then sharing the results with the larger scientific community. To work on this unit, students use scientific tools from Vernier, such as pH sensors and LabQuest, an interface that can stand alone or display data generated by the sensors on a computer. Students also use kits from the World Water Monitoring Challenge project to test their buffers for pH, dissolved oxygen, temperature and turbidity.

But technology doesn’t replace a nimble teacher. Recently, bemoaned Hale-Hanes, the district had no Internet access for a day, putting the kibosh on virtual labs. The following week, her PowerPoint of pKa testing results didn’t work. And recently, her students broke probes and she had to create larger than usual teams to get through the day. “You have to be very adept,” she said. “You really have to be on top of your planning and your game.”

Still, she insisted, the benefits outweigh the hardships. “When students have gotten inspired, it has usually been something that has been more in-depth like this. It’s not usually a unit that we took a test on. It inspires students to pursue science, because they see how it’s relevant. They see how it ties to the world — and how it ties to their world.”

Dian Schaffhauser is a senior contributing editor in Nevada City, CA.
Teaching the Brain to Learn

Here’s how educators can use the latest neurological research to help improve math and science instruction.

Many educators have heard the old maxim, “If all learning is 0 to 10, then 0 to 1 is the most important.” Brain research backs up this nugget of wisdom, and neuroscientists such as Bruce E. Wexler, a professor of psychiatry at Yale University School of Medicine in New Haven, CT, believes nurture may play a larger role than nature when the test scores are tallied.

Wexler makes it his business to keep up on the latest brain research, and his analysis suggests that the right kind of early interventions and techniques can change a child’s educational future. Properly influencing the brain’s “distributed neuro functional systems” matters, because these systems form the foundations of cognitive ability. According to Wexler, “These systems are not wired at birth, and they’re not determined by our genetics. They’re profoundly influenced by the type of stimulation and activity that children receive while growing up. This neuroscience brain research point of view is consistent with the need to emphasize early developmental experiences in preschool, kindergarten, first grade and second grade.”

This supports the idea that kids who come to school without healthy cognitive stimulation may not learn as much as they could. “And that means there is an opportunity to intervene and improve these neuro systems and functioning abilities,” he said. “We can influence their abilities to learn, as well as provide material to help them learn better.”

Steve Miller agreed that early intervention is key to preparing the brain to learn, but the chief science advisor for Nervanix (a company that uses brain wave monitoring technology to measure a learner’s attention level) added that neuroscience research shows that educational intervention can benefit students across all grades. “Intervention for struggling high school students can provide significant benefits,” he said. “The adolescent brain undergoes enormous changes, and we’re only beginning to understand how to harness these changes to benefit the education of high school students.”

Miller added that the area of neuroscience called “brain plasticity” continues to “fundamentally change the way we think about learning, intervention, and the impact of...
the choices we make in our diet and physical and cognitive exercise that impacts the onset and severity of age-related neurological diseases. Physical and cognitive exercises are good for the health of our brains.”

**Emotion and Learning**

The idea that the brain must be prepared to learn also applies to emotional states, because emotions influence cognitive abilities. Lori Desautels, an associate professor at Marian University’s School of Education, said, “Current brain research tells us that emotions are intimately tied to learning. When we look at math, science and all academic subjects, we cannot neglect that emotions and cognition are intimately connected. … When we connect highly emotional relevant and meaningful daily life experiences when teaching math and science, we have created a state of mind that is more at ease.”

Desautels referred to the work of neurologist and educator Judy Willis, who pointed out that, “Research has shown us the positive and negative effects that students’ emotional states can have on the affective filter in their amygdala (a part of the limbic system connected to the temporal lobe). Additional evidence now demonstrates the multiple benefits of the dopamine release that accompanies students’ expectation of intrinsic reward.”

Creating anticipation, curiosity and even some short-term acute confusion releases dopamine in the brain and “brings about more pleasurable feelings toward learning, and the effort needed to produce math and science results in a safe learning environment,” said Desautels.

Operating under the understanding that the brain is neurobiologically wired to survive, Desautels concluded that if students feel or experience a threat in the process of learning, their attention to the task is disrupted because they pay attention to the threat “and the prefrontal cortex, the seat of our problem-solving and higher level thought processes, shuts down.”
Walking the Axis

Neuroscientists have long told educators that true learning actually builds neurological connections, and that building process usually occurs during active lessons. To this end, Betsy Hill, president and COO of the Chicago-based BrainWare, said, “We must find ways to engage students and create opportunities to interact with the material. If the teacher is the only one talking, the teacher is the only one learning. After students learn something, they can practice teaching it to other students.”

New experiences can structurally and functionally change the brain by building connections only when educators use teaching strategies that are most aligned with how the brain learns. Deanna M. Nibarger, a fifth-grade teacher at Crooked Creek Elementary in the Metropolitan School District of Washington Township in Indianapolis, has literally had her students walk the x and y axis of a graph to cement a mathematical concept.

Nibarger’s effort to introduce linear equations on the coordinate plane began with a story about a garden, along with a 20-foot by 20-foot x and y axis made of tape stuck to the classroom floor. Students observed Nibarger as she talked about preparing the garden. “At that moment, I moved to the origin,” explained Nibarger, now in her seventh year of teaching. “I continued my story, explaining that we had to make a schedule of who was going to water those plants, and I walked down the x axis — where the plants would grow taller. And then I moved up in the coordinate plane in the first quadrant to represent the y-axis movement. Then I retold my story two more times and I asked them to give me feedback.”

With the conversation started, the students divided into small groups and invented their own stories. “This was all before we ever introduced the vocabulary, such as the coordinate plane, ordered pairs, origin, x axis, y axis,” mused Nibarger. “They understood the concept of where we move on the coordinate plane before we began the lesson. I used that as a pre-assessment of what they knew, and then throughout the week we would go back. What we saw at the end of that lesson was that students mastered it through just a ‘story chunking’ example of how to introduce math.”

Tape on the ground may be a relatively low-tech solution, but it has worked in Nibarger’s classroom and elsewhere. Betsy Hill and other experts believe the axis-walking techniques are effective because they engage
students in visual and conceptual understanding — as all good teaching aids should. “What we do [at BrainWare] has a lot to do with developing cognitive capacity and strength in areas we know are necessary for reading and math,” said Hill, whose company develops software designed to exercise cognitive skills essential for learning. “There is a lot of overlap, because that’s just the way our brains work.”

Nikki Woodson, the superintendent of the Metropolitan School District of Washington Township, commented, “Improving writing skills will improve most other content areas as well. We embed math and science into other content areas. It’s not a stand-alone curriculum.”

**IT’S ALL IN YOUR HEAD**

**VIDEO:** Lori Desautels talks about how one school is helping students overcome stress and focus in class. See all this month’s videos.

**Brain Research Meets Classroom Research**

Michael Baum, principal of Wisconsin-based Sophia Consulting, observed that, “There is a fair amount of research indicating that discovery learning, or learning by doing, can be very powerful if it is rigorously structured,” but that, “There is research comparing discovery learning models to more directed models, and the conclusion is that unless you have a really rigorous discovery learning model, you are better off doing direct instruction.”

Some things are better learned by rote, Baum contended; others are better learned experientially. “There is a huge amount of research showing that the left brain and right brain dichotomy is not true,” he said.

Baum said that brain research has shown that concrete learning styles (using manipulatives) are important in the realm of math and science. “And that argues for more of a combination of math and science, because you learn math by applying it to concrete situations, which tend to be scientific,” he said. “Although you could also learn math by applying it to concrete social studies situations. That’s one thing we know, not just from brain research, but from classroom research.”

And though the idea of memorizing math facts is largely out of favor, pure memorization has a role in preparing a child’s brain to learn. Baum pointed out that “even in the federal research on math it was determined that one of the essential building blocks of getting kids ready for higher math is that they need to memorize math facts, because you are easing the pressure on that part of the brain that processes mathematical reasoning by offloading that on the part that just recalls memorized facts.”

BrainWare’s Hill added that beyond the brain function that leads to memorization, “There are other kinds of skills that are often now referred to as ‘executive functions.’ This includes things like working memory — the ability to hold information in your mind and manipulate it.” A strong working memory leads students to “not jumping to an answer, but thinking through various options.”

Ultimately, choosing math and science teaching techniques based on brain research is no easy task, primarily because all the subjects are so intertwined in today’s educational environment. “We’re trying to get the brain to be able to perform better before we teach students math and science,” mused Bruce Wexler. “And yes, it will also help other subject matters as well, which also can help math and science. Taken as a whole, it might enrich creativity with students starting novels and writing poetry, because where do great scientists get their creativity? It’s not only from studying math and science.”

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Greg Thompson is a freelance writer based in Fort Collins, CO.
How Mobile Devices Are Saving IWBs

Three schools tell how they’re combining tablets and clickers with interactive whiteboards to engage students on multiple levels.

If your school has invested in interactive whiteboards, only to have them quickly overshadowed by digital and mobile presentation options, you’re not alone. In K-12 districts nationwide, educators are seeking ways to make IWBs a flexible and engaging part of a 21st century classroom environment.

At McAdory Middle School in McCalla, AL, Promethean IWBs grace the walls of every classroom. According to Amanda Dykes, a sixth-grade technology and science teacher and technology representative, “When they built our school three years ago, they put whiteboards in all of the classrooms.” This well-intentioned move actually created some immediate challenges for teachers who suddenly found themselves having to meld those IWBs with the school’s bring your own device (BYOD) initiative.

“It wasn’t an easy transition,” said Dykes, “but teachers were accustomed to using whiteboards and students love mobile technology. We knew we had to come up with a way to combine the two.” According to Dykes, the middle school’s students bring an array of tablets and mobile phones to class every day. To complement the BYOD program, teachers also have access to netbooks and laptop computers. Exactly where the IWBs and the mobile devices intersect depends on the specific lesson.

“I can put lesson materials on the whiteboards, show videos and send different slides right to my students’ tablets [using the free app ClassFlow Student],” said Dykes. When students are working on projects as a class or in teams, she distributes research links, quizzes, graphic organizers and other materials that show Dykes which students are “getting” the material and which ones need additional instruction. “I basically just push the material out and they respond back to me,” she said.

When those responses come back, Dykes puts them up on the whiteboard for further discussion. She says the method works much better than the chalkboards of old, where one student at a time
at the point where my students really want to respond because they have so many different ways to voice their answers and opinions,” Dykes said. “So where some still like getting up in front of the class and going to the whiteboard, many others prefer to stay out of the spotlight and use their own tablets and phones.”

IWBs are useful for displaying basic content, but tablets allow students to constantly participate in class.

Dykes. Students’ names are typically replaced with numbers, and Dykes uses a dual monitor to tell who submitted which answers.

The final piece of the puzzle is an ActivBoard that allows Dykes to project images onto the whiteboard. Students can respond out loud or by using their own phones and tablets. And despite the younger generation’s affinity for devices, Dykes said that many opt to use the IWB instead. She concluded that being able to offer up a variety of collaboration tools has helped improve student engagement in the classroom. “It’s in front of the class and going to the whiteboard, many others prefer to stay out of the spotlight and use their own tablets and phones.”

From Chalkboards to Smart Classrooms

Once Troy CCSD in Plainfield, IL, installed overlays that turned its chalkboards into IWBs, director of information services Ron Sarver began exploring how to combine the new additions with existing classroom technology. He found his answer at Mimio, which makes clickers that connect to teacher desktops and can approach the mammoth green board to work through a problem or answer a question. “With this system, everyone sends in their work at once and we can all look at it,” said

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be used in conjunction with IWBs. The underlying goal, said Sarver, was to begin turning Troy’s traditional classrooms into “smart classrooms.”

“Phase I involved converting chalkboards into IWBs, and Phase II centered on connecting students and teachers to those IWBs,” said Sarver. Using the system, teachers can bring up overlays, Web pages, slides and other materials that are in turn projected onto the whiteboards. On their laptops, teachers can annotate and illustrate the information, and students then interact with the materials using Mimio devices and widgets.

In a typical math class, for example, Sarver said pupils might be asked to solve problems by selecting a balloon or bubble that they click on to reveal their answers. To break down more complicated concepts — such as long division — teachers can save the process in steps, create Flash videos to illustrate those steps and then publish those videos to their websites.

“Students can go back and refer to the videos later and see how the long division is performed on a specific problem,” said Sarver, who sees improved student engagement as one of the biggest benefits of his school’s combination of IWBs and student devices. He added, “It’s also beneficial for teachers, who can throw lessons together pretty quickly up on the board as needed, rather than having to preplan and draw everything out.”

And while Troy CCSD isn’t currently using tablets and smartphones in conjunction with its whiteboards, Sarver envisions a time in the near future when classrooms are equipped with fewer wires and more mobile devices. Getting there would require a retrofit of the institution’s existing wired projectors, he noted, and the addition of either student-owned or school-owned devices. “Once that’s done, we’ll be able to go in the mobile/wireless direction,” he said.
**IWB + Tablet = Engagement**

At Mountain Park Elementary in Roswell, GA, fourth-grade teacher Ebony Flowers combines interactive whiteboards with mobile devices and laptops to not only display lesson content, but also to ensure that all students in her BYOT classroom are participating. Flowers said, “I prefer to take a hands-on approach to learning to ensure that the attention of every student in my classroom is captivated, and that each one has a meaningful experience that will last a lifetime instead of just for a week.”

She noted that while the traditional IWB is useful for displaying basic content, the devices allow all her students to constantly participate in classroom activities.

Recently, Flowers added a new element to her IWB and mobile device strategy when she started using Kuno tablets in her lessons. Designed for education, the tablets let her communicate and connect with all students in the class using a flipped learning approach.

When paired with programs provided by Promethean (such as ClassFlow), the Kuno tablets allow Flowers to gather real-time feedback and deliver lessons to her students who can, she said, “respond, react and relate to classroom content.”

According to Flowers, improved student engagement has been the biggest benefit of her school’s combination of interactive whiteboards and tablets. Instead of her having “to do backflips to keep my students engaged,” she noted, “they are willing and motivated to learn with the technological tools at their fingertips.”

**“Let’s Find Out if the Students Are Really Learning This”**

Looking ahead, Dykes sees a time when her school’s mobile-whiteboard connection plays a key role in formative assessments.

“We have a graphic organizer that allows students to input multiple choice or true/false answers,” she commented. “I’d like to start leveraging that capability. As teachers, sometimes we get so caught up in creating and teaching with slide shows that we overlook the ‘let’s find out if the students are really learning this’ aspect of teaching.”

Ultimately, Dykes said that being able to effectively blend mobile devices with IWBs helps schools make good use of technology that might otherwise become obsolete.

“In many middle schools, a disconnect exists between the devices and the whiteboards, with the latter basically becoming $3,000 projectors,” she pointed out. “With some preplanning and creativity, schools can close that gap and develop a process that not only leverages technology but also keeps students better engaged in class.”

Bridget McCrea is a business and technology writer in Clearwater, FL.
E-Rate Reform Picks up Speed
Spurred on by President Obama’s ConnectED initiative, the FCC is moving to prioritize WiFi over outdated technology, and there’s still time for districts to speak up about what they need.

Technology has changed; the needs of schools have changed; the E-rate program must reflect this change.” So said Tom Wheeler, chairman of the Federal Communications Commission (FCC), in a talk to a group assembled by the Council of Chief State School Officers in mid-March. His talk was but the latest in a flurry of activity around the E-rate in particular and the federal role in educational technology in general.

The positive flurry began in June 2013. In a speech at Mooresville Middle School (NC), President Obama announced his ConnectED initiative and directed the FCC “to begin a process that will connect 99 percent of America’s students to high-speed broadband Internet within five years.”

In February 2014, the President announced more than $750 million in private-sector commitments to deliver “cutting-edge technologies to classrooms, including devices, free software, teacher professional development and home wireless connectivity.” Seven companies answered the President’s call for donations and others followed in subsequent days. Thus far, no details are yet available about how those goods and services might be distributed, but the commitment from those companies remains. Obama also announced that the FCC had found an additional $2 billion in the E-rate program over the next two years. Finally, the President released his budget in March, including a new $200 million request for an educational technology program, ConnectEDucators, which “would provide funding to help educators leverage technology and data to provide high-quality college- and career-ready instruction that meets the needs of all students.”

Given the ongoing dysfunction in Congress, it is impossible to know whether the President’s budget request will go very far, but if we turn our eyes to the E-rate, there is no doubt that action is imminent.

Just three months after the President announced the ConnectED initiative in Mooresville, the FCC released a Notice of Proposed Rule-Making (NPRM) regarding the E-rate. Over the next few months, the FCC received more than 1,500 comments in response to
POLICY & ADVOCACY

The Three S’s of E-Rate

Commissioner Rosenworcel noted that E-rate reform should provide three S’s: speed, simplify and spending smart. She cited speed targets for high-speed broadband that SETDA established in our paper “The Broadband Imperative”: 100 Mbps per 1,000 students in the near term and 1 Gbps per 1,000 students by the end of the decade. (SETDA recommended the 1 Gbps by 2017).

Rosenworcel also wants to simplify the E-rate program, first by reducing its bureaucracy. To that end, she would like to see multiyear applications possible, along with incentives for consortia in the application process. Finally, the entire process, including the review process, should be more transparent.

As for “spending smart,” there is much interesting and good news. She noted that better accounting practices that the FCC has already identified will net some additional money over the NPRM. On March 6, the Wireline Competition Bureau of the FCC released a Public Notice seeking comment on a narrower set of E-rate issues. In addition, there have been a number of speeches by FCC commissioners, the most noteworthy being FCC Chairman Tom Wheeler’s speech and Commissioner Jessica Rosenworcel’s speech at SXSWedu.

While the Public Notice serves a very different purpose than the two speeches, it does address three overriding concerns: 1) How to best focus E-rate funds on high capacity broadband, especially within the school; 2) whether and how to phase out legacy programs such as voice; and 3) whether and how to create programs to maximize cost-effective purchasing.

Looking at the Public Notice and Commissioner Rosenworcel’s and Wheeler’s talks, we can see some solid hints about what will happen with the E-rate and what you might begin considering in your districts.

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INNOVATION RADIATES FROM FETC

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the next two years. This is the $2 billion that President Obama cited in his February 2014 speech. But part of Rosenworcel’s spending smart is also phasing out support for what she called “the estimated $600 million this program now spends annually on outdated services like paging.” This will free up funds to focus more on high-speed connectivity.

Commissioner Rosenworcel acknowledged the need for more funding. The program was originally sized at $2.25 billion in 1998. The demand for the program over the past two years has been double that. Rosenworcel and other commissioners have stated that they think streamlining the process, phasing out old legacy services and finding alternative ways within the system to be more efficient can save a good deal of money that can be directed toward more connectivity both to the district door and within the school to the desktop.

Even with that efficiency and modification, Rosenworcel noted that it is clear that districts need more money. She suggests as a starting point to restore the purchasing power of the program to what it was in 1998 by bringing back what inflation has taken away — approximately $1 billion annually. From there, we can identify what else is needed to meet the goal of 99 percent connectivity in five years.

Getting WiFi to the Desktop

Chairman Wheeler’s speech struck similar notes, but in some cases with more detail, and especially more emphasis on phasing out legacy systems. Like Commissioner Rosenworcel, Wheeler bemoaned how funds currently were being spent. While he mentioned the $600 million outlay on outdated services, he went farther. In this past funding year, less than half of the $2.4 billion was spent on providing 100 Mbps capacity and none on WiFi. In addition to pagers, he listed legacy PBX systems, $175 million spent on mobile phones and $260 million on services like e-mail, texting and Web hosting. While he has no doubt that these are important to some schools and libraries, “are they more important than paying for high-speed connectivity to the facility and WiFi access throughout?”

Wheeler acknowledges that the transition may be tough for some districts, and thus they need to “evolve” away from voice and these other services, but he emphasized that connectivity to the desktop is a higher priority. Once the FCC fixes efficiency issues and changes the focus to high-speed connectivity, then and only then will they look at putting additional money into the system. He acknowledged that the program needs to be sufficiently funded, but it must be fiscally responsible based on up-to-date information.

The takeaway is clear: A modernized E-rate will be focused on high-speed connectivity to the school and the desktop, be more efficient and possess a simpler application process, be more transparent in its application and review process, and be better funded. The proverbial devil is in the details of the hundreds of questions in last summer’s NPRM and 23 pages of March’s Public Notice.

So what can you do? Reply Comments to the Public Notice were due no later than April 21, but staffers at the FCC as well as Commissioner Rosenworcel have encouraged comments even after that. They need to hear what technology you have and what you need to support learning in a digital age. And they need to hear why you need those things. For example, it is helpful to say you need six times the capacity that you currently have because you are switching to all-digital content for learning, much of it is video, and students are creating video of their own that they are sharing with a partner school in India.

These are the two key points: Share your need, and get ready for changes to the E-rate program.

Geoffrey H. Fletcher is the deputy executive director of the State Educational Technology Directors Association (SETDA).