SREB | High Schools That Work

Best Practices Newsletter

Technology Plays a Key Role in Preparing Students for the World Beyond Graduation

Many teachers use the Internet and other electronic and web-based resources to engage students in meaningful assignments for independent learning, greater ownership of learning and better preparation for college and careers. The technology practices should align with the new college- and career-readiness standards (CCRS). They also should enhance knowledge of STEM (science, technology, engineering and mathematics) fields of study that give students a solid foundation for work and learning.

School leaders and teachers are happy to share approaches that give students opportunities to complete challenging, hands-on projects and assignments via modern technology. Students will benefit now and in the future as they keep pace with rapidly changing education and workplace environments.

Technology in the English Classroom: Successes and Cautions

The plethora of apps, programs and devices available to students and teachers today is a double-edged sword: The technology can be a tremendous help in teaching, but it also can present problems. Two instructional coaches at **Holmes High School** in Covington, Kentucky, are helping English teachers learn to use technology to communicate with parents and students, support students' research efforts and develop students' writing skills.

Instructional coaches **Renee Murray** and **Angie Turnick** align their methods with the CCRS for literacy. The standards call for students to use technology, including the Internet, to produce and publish written pieces; to integrate and evaluate multiple sources of information; and to conduct research projects that demonstrate subject matter understanding.

The two instructional coaches present the good and the bad as they help English teachers focus on three activities designed to raise students' literacy achievement through technology:

- **Communicate with parents and students more effectively.** Turnick uses Remind 101 in her English classroom to send text messages to parents and students. "This free website provides a safe way for teachers to set up groups, send text messages and stay in touch with parents," she said. Some negatives are students and parents may be unable to respond, and texts must be sent to groups rather than individual students. Teachers and students never see each other's phone numbers. Find this website at https://www.remind101.com/.
- **Support students to conduct research that is valid and reliable.** "Teachers need to help students distinguish between looking something up and doing research," Turnick said. "Students have access to devices for doing simple searches to find answers to simple questions, but teachers must learn to give assignments requiring students do longer types of research." One way is through use of websites such as Purdue Owl, the online writing lab at http://owl.english.purdue.edu/owl/, which shows students how to search the Internet. Turnick also guides students' use of search engines such as www.sweetsearch.com and http://scholar.google.com. Another Internet site is www.livebinders.com that helps students organize research materials needed for their written work.

  "Teach students to evaluate a website for reliability — whether the information can be trusted — and validity — whether the source is truthful and accurate," Turnick said. Another tool is CARS: Credibility, Accuracy, Reasonableness and Support. It is helpful in evaluating an Internet resource.
- **Show students how to use technology to produce and publish writing.** "Blogging can help English students meet the expectations of the CCRS," Turnick said. She uses http://edublogs.org to facilitate discussions; replace classroom newsletters; post videos, podcasts and documents; and create classroom publications. "Be careful to manage students' posts by using features that allow teachers to review the posts before they are made public," Turnick said. Teachers should set expectations for blog entries by using a rubric (rating blogs on characteristics ranging from exceptional to no credit) and explaining their policies on text language to ensure quality postings by students. "The use of Google Docs and SkyDrive allow students to create, store, share and collaborate on longer writing pieces," Murray said. Students also use SkyDrive to store electronic portfolios.

"Virtually every day, I get messages about new apps or technology-based programs," Murray said. "The critical factor is for teachers to evaluate each option carefully to ensure that it will help students improve their literacy skills. Not every technology application works for every teacher or meets the rigor necessary for the college- and career-readiness standards."

All Holmes High School students are technology literate, Murray continued, and technology is enhancing their learning. "The key is to link their technology skills with quality reading, writing and learning experiences," she said.

Renee Murray:
renee.murray@covington.kyschools.us

Angie Turnick:
angela.turnick@covington.kyschools.us

Merging Mathematics Design Collaborative (MDC) Lessons With Nspirational Technology

How does technology give mathematics students ownership of learning in rigorous and meaningful assignments for college and career readiness? **Highland High School** (HHS) in Albuquerque, New Mexico, answered this question by implementing two new ideas in mathematics classrooms in 2012-13.

A team of HHS mathematics teachers received training in the Mathematics Design Collaborative (MDC) and on the Texas Instruments (TI) Nspire graphing calculator with the navigator system. "The team quickly realized that MDC was all about Formative Assessment Lessons (FALs) and the Nspire graphing calculator was the ultimate formative assessment tool," said mathematics coach **Ronda Davis**. "Team members immediately went to work on how to combine the two approaches."

Fortunately, the school schedule made it possible for the team to work together with its coach during common planning time. Davis had experience using calculators in daily instruction and had attended MDC training. The team merged the technology with FALs on the MDC website at http://map.mathshell.org/materials/lessons.php.

Involving Students

"Teachers inserted materials from the FALs into the calculators, enabling students to give immediate feedback as the lesson progressed," Davis said. "The technology transforms classrooms so that every student, whether low- or high-achieving, is actively involved in the learning process."

One example is a "drinking glass" project that helps students solve problems involving measurement. It is part of the FAL "Calculating the Volume of Compound Objects." The lesson relates to two standards for mathematical content in the college- and career-readiness standards for mathematics.

The drinking glass unit helps students persevere through problem solving. It is designed to identify and help students who have difficulty computing measurements using formulas, decomposing compound shapes into simpler ones, and using right triangles and their properties to solve real-world problems.

Classroom Discussion

Students are asked to 1) calculate the volume of the glass and explain how they got their answers, 2) find the height of liquid when the glass is half full and explain how to figure it out, and 3) read about work other students have done. The entire class participates in discussion.

Geometry teachers **RuthieAnn Trujillo** and **Sarah Schmitz** said their students instantly became interested in completing the assignment. "Students couldn't offer excuses for not doing the math, because enough calculators were available for every student to have one," Trujillo said.

Teachers are able to gather class data and know immediately which students understand the concepts and which ones need further instruction. They send additional questions to the students' calculators as part of the follow-up.

"This lesson holds all students accountable," Trujillo said. "I can display the calculator screens of specific students or use entire class results to lead a classroom discussion. I can ask a question again after the discussion and compare the results with the first time."

Trujillo gave an example of how to use the Nspire graphing calculator to study triangles in Algebra I or geometry. In discussing an SSA (side side angle) triangle, she collected responses from 33 students on whether two triangles were similar. The results were 13 students answering "yes" and 20 answering "no." The class did not reach consensus, so Trujillo sent the same quick poll again and allowed students to change their minds. She encouraged students to try to convince others in the class to change their answers. One additional student joined the poll, which resulted in three students answering "yes" and 31 answering "no."

"The focus of the activity was to promote mathematical discourse in the classroom in addition to cooperative learning," Trujillo said. "It was a success."

Ronda Davis: davis_r@aps.edu

RuthieAnn Trujillo: ruthieann.trujillo@aps.edu

Ten Reasons to Flip a Classroom: Technology Makes It Possible

Jennifer Green and a teacher team at **Byron High School** in Byron, Minnesota, implemented a bookless 24/7 mathematics curriculum and "flipped" classrooms to improve student performance. Their work was featured in journal articles written by **Kathleen Fulton**, an author whose book, *Time for Learning: Top Ten Reasons Why Flipping the Classroom Can Change Education*, is scheduled for publication in June 2014.

With flipping, students read texts, watch videos and gain knowledge from direct instruction at home after school. When they enter the classroom, they apply, evaluate and synthesize information by participating in group discussions, labs, small-group work and demonstrations.

"I do more teaching now than I ever did in a traditional classroom," Green said. She debunked four misconceptions commonly associated with flipping:

- Teachers do not sit at their desks while students do the work.
- The purpose of flipping is not to work teachers out of a job.
- Flipping does not replace solid teaching and well-designed assessments.
- The method is not a "silver bullet" for ensuring student achievement.

Fulton observed teachers and students at Byron High School and other schools implementing the flip approach. She developed a list of 10 reasons why flipping a classroom makes good educational sense and is catching on with educators around the nation:

1. **Maximize active learning in class time:** A flipped classroom maximizes class time by moving lectures and direct instruction out of the school day and into students' individual learning space. It frees up class time for more creative, engaging work. "Students need the most help during application, practice, discussion and remediation, not during the delivery of information," Fulton said. According to Green, it puts students "back in our hands when they are struggling." The teacher has more time to work with students to master concepts.

2. **Individualize instruction:** Flipped classrooms often are designed to maximize small-group instruction. Students work on problems with their groups while the teacher works with individual students. This setup allows teachers to facilitate more in the classroom. It also provides opportunities for peer instruction to help students master the content.

3. **Learning theory:** Flipped instruction provides "… opportunities for creating learning environments that are learner-centered, knowledge-based, assessment-centered and community-centered," Fulton said. "Other elements supported by learning theory that can be incorporated in flipped instruction include peer instruction, chunking and priming of information, pre-training and applications of inquiry instruction." Byron High School adopted the peer instruction model, which has six elements: direct instruction, concept quizzes, convincing peers, practice, application and assessment.

4. **Effectiveness:** Fulton described marked improvement in performance and behavior at **Clintondale High School** in Clinton Township, Michigan. The school began flipping in 2010. Before that, more than 50 percent of freshmen failed English, and 44 percent failed mathematics. In addition to the failure rate, the school had 736 discipline cases in one semester. After the first semester of flipping, 67 percent of freshmen passed English, and 69 percent passed mathematics. Discipline referrals declined 66 percent after flipping. **Green cited success at Byron High School, where geometry failure rates dropped from l3 percent to 6 percent after flipping.**

5. **Impact on teachers:** Teachers in flipped classrooms have the same goals and vision as other teachers, but they can take "safe risks" to experiment with new types of instruction and technologies.

Flipping does not have to look exactly alike in every discipline. What Green does in her English classroom is different to what she does in flipping a mathematics class.

6. **Impact on students:** With flipping, students never need to miss a lesson. The use of technology ensures that they receive all instructional materials. Students interact with teachers in ways they cannot in a traditional classroom. They have ongoing access to videos and other information, allowing them to "rewind the teacher" and work at their own pace. Green said the most rewarding part of flipping is that students are empowered to leverage their own learning.

7. **Communication with parents:** Parental support for flipping is important. Teachers must reach out in a variety of ways to ensure parents are comfortable with the new teaching model. "Once they know what to expect and how to help their children become successful with flipped learning, parents are usually enthusiastic about being able to see what their children are learning," Fulton said. "They appreciate not having to be content experts when students struggle with homework." Green and her team sent a letter home with students to prepare parents for the transition from a traditional to a flipped classroom. After participating in email exchanges and conferences to answer questions, she had a better response from parents to the new method.

8. **Resources and costs:** The textbook budget at Byron High School had been cut, so teachers decided to create their own curricular materials. With these savings, they could invest more in technology and professional development. The school adopted a bring your own device policy but provided technology for students lacking their own. Green and the other teachers use Moodle as the classroom learning management system. They use YouTube, Smartboard and Screencast-O-Matic to create instructional videos for lessons. They can access pre-recorded videos created by other teachers by using TeacherTube and Khan Academy.

9. **Twenty-first-century skills:** Such skills as collaboration, creation and comfort with technology have been identified as necessary for students to succeed in work and life. "Many of these skills are a natural part of teaching and learning in a flipped classroom," Fulton said.

10. **Future of education:** Comparing the zebra pants of the 1990s with fashion's essential little black dress, Fulton said teachers must decide if flipping will be a passing fad or a classic piece of instruction.

Useful resources are the Flipped Learning Network at http://flippedlearning.org/FLN or the Clintondale High School website at http://flippedhighschool.com/. The website for the Byron High School mathematics department is tinyurl.com/bhsmath. A helpful visual showing how technology apps apply to Bloom's Taxonomy is available at http://www.schrockguide.net/bloomin-apps.html.

Kathleen Fulton: kathleenpfulton@gmail.com

Jennifer Green: jennifer.green@byron.k12.mn.us

LDC + Technology = Literacy Integration in the Business Classroom

"Using technology for technology's sake does not help students to master skills in the LDC. It is important to find technology tools that meet the needs of students in becoming college- and career-ready."

As a participant in the pilot phase of the Literacy Design Collaborative (LDC) in Arkansas, **Danielle Brewer** worked to incorporate literacy into her business education classroom at **Rogers Heritage High School** in Rogers, Arkansas. Although she claims her first module "crashed and burned," she continued to implement modules and began to see success with her students.

"My biggest epiphany was realizing that I needed to make technology a seamless piece of the LDC module, just as it had been in previous lessons," Brewer said. "Using technology in the reading and writing process of an LDC module allows common instructional strategies to become even more engaging and students to work even more closely together."

Brewer has identified technology tools for four LDC clusters. "Technology must be used deliberately in instruction," she said. **"Using technology for technology's sake does not help students to master skills in the LDC. It is important to find technology tools that meet the needs of students in becoming college- and career-ready."**

Noting that many technology tools are free and easy to use, Brewer listed some websites and mobile device applications (apps) by specific cluster:

Cluster 1 — Preparing for the Task

http://www.polleverywhere.com/ (live audience participation)

Quick Response (QR) Codes

- http://qrcode.kaywa.com/
- QR code reader app

Weave project management app

Cluster 2 — Reading Process

www.quizlet.com

Zite App

Flashcard [+] app

Evernote app and Evernote.com

http://padlet.com/ (Wallwisher)

www.livebinders.com

Edmodo.com and Edmodo app

Google Drive (Google Docs)

Venn Diagram app

Inspiration Maps app

Cluster 3 — Transition to Writing

http://infogr.am (Infographics)

http://prezi.com/ (Presentations)

http://todaysmeet.com/

Sock Puppets app

Cluster 4 — Writing Process

Microsoft Word electronic annotation

http://www.easybib.com/

Google Drive

DocAS app

http://www.duplichecker.com (Plagiarism detection)

Brewer continues to find tools through research, classroom visits and talking with teachers using technology successfully with their students.

"I look forward to meeting other teachers who use the LDC module to integrate literacy into their content areas," Brewer said. "I hope to pick their brains about the technology tools they have found to help students improve their reading and writing skills."

Harnessing the Power of Google in the 21st-Century Classroom

Michael Martin, administrator at **Pioneer Career and Technology Center** (PCTC) in Shelby, Ohio, encourages teachers to use the multitude of features from online search engine Google to make classes engaging, student-centered and inquiry-based.

"Google is the most frequently used search engine in the world," Martin said. "It has millions of visitors and handles billions of searches daily. I refer to it as 'device agnostic,' meaning that teachers and students can access Google no matter what type of device they use."

Martin described some Google features that enable teachers to be more efficient and effective in the classroom:

- **Google** allows an Internet user to shorten a web address, avoiding long series of letters and numbers that can cause errors. Copy and paste the URL and click on shorten.
- Choose **Google Forms** instead of a document or a spreadsheet to create surveys and quizzes that can be sent to students using email or a link.
- **Google Calendar** helps keep track of all events in the schedule. It provides a way to share the schedule with others, access the calendar on mobile devices and receive event reminders by email or text message.
- **Google Voice** allows teachers to create their own phone number to communicate with students and parents. It transcribes voice mail to text and allows the teacher to record and save conversations.
- Use **Google Plus** to create a circle of friends to share information in the form of documents, pictures and videos.
- **Google Search** allows users to search more effectively. It provides opportunities to narrow the search by reading level, file type, language and SafeSearch to eliminate explicit content.
- **Feedly** is a new version of Google Reader. It allows students to receive updates on current events; collect, annotate and share research; and read items from the teacher. Teachers can share relevant news articles with students and colleagues.
- **Google Books** makes it possible for students to read and write book reviews, search for a phrase within a book, and view popular passages and common terms or phrases. Teachers can familiarize students with books they are about to read by previewing different editions and cover art. They can find a list of related books, create an online classroom library and embed a book into a classroom blog.
- **Google Earth** can bring information alive for students at all grade levels. Students can explore topics such as the progress of human civilization, the growth of cities, the impact of civilization on the natural environment, or the impact of natural disasters such as Hurricane Katrina. Other topics are related to transportation, demographics and economics.
- **Google Chrome** is a browser created by Google. It includes a "Chrome Store" where teachers and students can find hundreds of apps for personal and school use.

Google is useful if students are given challenging assignments. It motivates them to read complex documents, to synthesize their findings and to develop creative and innovative approaches to address assignments they have been given.

"Google is useful in the classroom to communicate and collaborate, promote creativity and innovation, and advance students' skills in critical thinking and problem solving," Martin said, "It is definitely part of the 21st-century classroom."

Michael Martin: martin.mike@pctc.k12.oh.us

Summer Camp Engages Young Women in STEM (Science, Technology, Engineering and Mathematics)

Fewer females than males show interest in technology in high school. In fact, less than 10 percent of computer science students are female, according to **Maureen Doyle**, associate professor in the College of Informatics at **Northern Kentucky University** (NKU) in Highland Heights, Kentucky. "Females seem to have the misconception that computer programming is a solitary, isolated area," Doyle said. "They prefer to work on projects that are socially relevant."

To inspire female high school students to understand the "cool" things about technology and to encourage them to explore professions in computer science, three greater Cincinnati area universities collaborated to create a summer camp called "Girls on the Go." The institutions are Northern Kentucky University (NKU), Miami University (MU) in Oxford and the University of Cincinnati (UC). The one-week camp was held on the Oxford campus in 2012 and 2013.

Twenty-four rising high school sophomores and juniors attended the first camp, while 20 participated the second year. They had opportunities to meet women professionals in the computer science field through a speed mentoring session as well as women from local companies who described their jobs and answered students' questions. The camp counselors were female computer science students from MU and NKU.

Camp Goals

The goals of the camp were to:

- show campers the breadth of things to do in computing;
- encourage campers to consider computer science as a career;
- increase campers' confidence in computing;
- expose campers to campus life; and
- provide information to help in applying to college.

The first camp featured a zoo-themed mobile application that demonstrated the vastness of computing in the form of mobile apps addressing an interesting topic. Campers visited a local zoo and were assigned to develop an ethogram app, a computer application to help zoologists study and record animal behavior.

Before writing the requirements of the app, campers met with zoo personnel and educators involved in Project Dragonfly, an inquiry-based venture that includes a website produced by Miami University professors in cooperation with the National Science Teachers Association. The meetings gave students insights into collecting ethograms and deciding what features to include in an ethogram app.

Many of the female students had no computer programming experience before the camp. Through lectures, YouTube and lab exercises, they learned how to program using the Appcelerator Titanium, a platform for developing mobile, tablet and desktop applications using web technologies.

Camp Strengths

The camp's strengths included:

- using counselors as role models;
- presenting an interdisciplinary focus;
- providing college experiences for the campers;
- encouraging collaboration among postsecondary institutions;
- engaging campers' enthusiasm for their projects; and
- empowering campers to write their own computer programs.

Pre- and post-camp surveys showed positive effects on female students in terms of feeling secure about attempting computer science, having a good understanding of what computer scientists do and

studying mathematics because of its importance "All but one student in the first camp chose "maybe" or "yes" when asked if they would consider majoring in computer science," Doyle said. Results the following year were similar.

Organizers of the camping experience received support through Janet Burge's National Science Foundation Career Award. Burge is an associate professor in the College of Engineering and Computing at Miami University. The award provided funding for campers, equipment, faculty and three of the four counselors. The universities paid for the other counselor, six i-Pods for a raffle, t-shirts, hats and thank you notes. Miami University provided funding for staff and catering, while the University of Cincinnati underwrote the zoo activity. Limousine Associates of Cincinnati provided transportation.

"The camp will continue as we seek sustainable funding," Doyle said.

Maureen Doyle: doylem3@nku.edu

Students Use Technology to Design Toys in a Hands-On Project to Prepare for College and Careers

"Students loved it. They came by to ask when we would do another project."

Students in digital media and early care and education programs at **Mid-Del Technology Center** in Midwest City, Oklahoma, did not play around when completing a hands-on learning assignment. An educational toy design project kept them interested, engaged and ready to learn. The project incorporated technical knowledge and 21st-century skills needed for postsecondary learning and the workplace.

Digital media instructor **Brandon Tucker** said the students were asked to answer this question: *How can we as innovative design and education students collaborate to create a toy that promotes the cognitive and/or physical development of pre-school children?*

Students from both programs met each Friday to work on the project. Each group of students consisted of two to three digital media students and two to three early care and education students.

Learned From Inventors

To get a sense of the magnitude of the project, students watched clips of toys from the television show "The American Inventor." They also heard from a local inventor who spoke about the process of designing, patenting and marketing products.

Teachers presented the students with this engagement scenario:

You are a group of young engineers and have just begun your career at Toys for Thoughts Company, which specializes in designing and producing learning toys for young children. The company prides itself on its innovation in the youth market. You and your team are part of a think tank that will design and develop a new child's toy to bring to market.

Each group of students was responsible for several deliverables:

- A written description of the toy
- Simple drawings or sketches
- A 3-D model of the toy
- A complete marketing report
- A short animated video and a PowerPoint presentation on how the toy works
- A final product to present to potential investors

Imaginative Toy Designs

The creative juices were flowing as students brainstormed toy ideas. They designed a bear that translated words into different languages; a "colorpillar," an electric caterpillar designed to help youngsters identify colors; and a numbug, a large plastic bug with numbers on the underside to help children learn to count.

The early care and education students had to ensure the toys were safe and actually helped in the cognitive development of pre-school children. **Glenda Crabtree** is the early care and education instructor.

As part of the project, students from the school's graphics communications program were "hired" to create packaging and marketing materials for the toys. Students in the project groups were responsible for communicating clearly what they needed to make their toys attractive to buyers.

Graphics Tasks

Craig Lewis, graphics communications instructor, asked his students to produce thumbnail sketches of their proposed toy boxes, create templates of the boxes and execute their designs using Adobe Illustrator 7.0. "All designs had to include a minimum of four colors, lines, geometric shapes and text," Lewis said.

Lewis also required students to fill out daily performance sheets with accurate records of completed work (daily activities, start and stop times, class time, lab time and total time). "Students learned the importance of completing projects on time and how long it takes to finish certain tasks," Lewis said. "The hardest thing for my students to learn was that they had to give the customers what they wanted. They were not supposed to decide what the outcome should be."

After completing their toys in five to six weeks, the student groups presented the final designs to a panel of "potential investors," including school board members, advisory committee members, the school superintendent and the district marketing director. The regional manager of a learning materials company was invited but was unable to attend. "We will target more business and industry representatives in the future and will provide them with examples of previous work so they will feel comfortable judging the presentations," Tucker said.

The toy-design project equipped students with an array of academic and technical skills, including production standards; modeling techniques; strategic thinking; reading, writing and mathematics; and habits for success such as collaboration, communication, problem solving and critical thinking.

"Students loved it," Tucker said. "They came by to ask when we would do another project."

In January 2014, students at Mid-Del Technology Center were preparing to repeat the toy design project. They planned to work with students at **Eastern Oklahoma County Technology Center** to create a website for new products with students in the web design program and to produce a video commercial for the products with students in the television production program. "Students will be required to communicate by email and Skype in completing the assignment," Tucker said.

Brandon Tucker: btucker@mid-del.net

Craig Lewis: clewis@mid-del.net

This newsletter describes best practices in implementing the High Schools that Work (HSTW), Making Middle Grades Work (MMGW) and Technology Centers That Work (TCTW) school improvement models based on presentations at the 27th Annual HSTW Staff Development Conference in Charlotte, North Carolina in summer 2013. For more information about the school improvement models offered by SREB, contact: Gene Bottoms, senior vice president, at gene.bottoms@sreb.org or call (404) 875-9211.