

Hey, You, Get Onto My Cloud!

How Cloud Computing & Web-Based Technologies
Can Benefit School Districts



September | 2010

Have you ever checked your bank balance online? Ordered a book from Amazon.com? Paid bills on your electric company's website? Played a video on YouTube?

If so, then you have used cloud computing.

You are not alone. Billions of people and thousands of businesses around the world use cloud computing every day. In simple terms, **cloud computing** means using the Internet – rather than software that has been loaded onto your own computer or local network – to store and retrieve files. In essence, the Internet becomes a personal computer, processor and data warehouse, accessible with any Internet-capable device – anytime, anywhere.

School districts are increasingly using cloud computing, too. And, chances are, they are finding it cheaper and more effective to use than the old, traditional ways of teaching students and communicating with the public.

The New York State School Boards Association (NYSSBA) and the New York State Association for Computers and Technologies in Education (NYSCATE) conducted a survey of school districts in New York State to find out how they are using cloud computing and other types of web-based technologies. We found that teachers in nearly all school districts – 99 percent – use the Internet in student instruction. In addition, teachers in nine of every 10 districts are using web-based educational software and tools.

That is similar to what is happening in the rest of the country. According to a national survey of school district technology directors, 96 percent of districts reported that at least some of their teachers used online learning games and simulations, while 95 percent of districts reported that at least some of their teachers used teacher-generated content on the web.

A number of factors appear to be driving the use of web-based technologies in New York. In a digital age when kids are communicating via [Facebook](#) and [Twitter](#), school districts understand that one way to make instruction relevant is to employ the same types of technologies in the classroom. Web-based technologies can help students learn at their own pace and knowledge level by tailoring instruction to their individual needs, giving them access to instructional content and resources 24 hours a day, and preparing them for careers in a global economy.

This report examines how cloud computing and other web-based technologies can be used in schools to guide instruction, communicate with students and parents, and save school districts money. The information in the report is based on the results of the NYSSBA/NYSCATE survey and interviews with technology directors in several school districts.

Note about the survey

The NYSSBA/NYSCATE survey was conducted online. An e-mail was sent to employees in school districts and BOCES in the NYSCATE database with the title of "technology director." Of the school districts and BOCES in which the technology director contact information was unknown or there was no technology director, a link to the survey was sent via e-mail to all other educators in the district that were listed in the NYSCATE database. E-mail recipients were instructed to forward the e-mail to the director of technology to fill out. If the school district did not employ a director of technology, we asked for the staff person with the greatest knowledge of the district's web-based technology to complete the survey. We asked for only one response per district. Some 484 school districts responded to the survey, a response rate of about 66 percent.

Doing Business in the Clouds

Cloud computing is attractive for many reasons. But perhaps the most attractive is its ability to help school districts contain costs. Traditionally, school districts have had many expenses associated with technology. They had to buy customized software (such as word processors, e-mail, spreadsheets, and instructional programs), as well as computer hardware – called servers – with which to run them. When those software programs became out-of-date or obsolete, they had to update the software or replace it with something else. Districts also expended time and energy maintaining servers and managing the volumes of software.

With cloud computing, applications are delivered through the Internet. Instead of large investments in capital expenditures for expensive hardware, customized software, or other services that users might need, all that is required is an Internet connection. The only expense is for utility bills (electricity, etc.) or subscriptions if one of the numerous free web-based software programs is not adequate.

The term "cloud computing" is a metaphor for the Internet, based on how the Internet is usually depicted in computer network diagrams. The term also implies that computer programs on the Internet can be accessed from afar – by a laptop, personal computer, cell phone or other device.

There are different kinds of cloud computing (see "[Different Types of Cloud](#)"). In general, cloud computing customers do not own the physical infrastructure of computer hardware and software. Instead, they rent usage from a third-party provider (thus avoiding large capital expenditures associated with the purchase of computer technology), access computer programs when needed, and pay only for those resources they use.

Steve Andrus, assistant director for technology infrastructure service at the Broome-Tioga BOCES, points to the considerable cost savings due to the low overhead of using web-based technology. The software is free, or costs – as with some subscription services – only a nominal fee. There are no servers to buy, and no or limited technical support is necessary. Plus, web-based services can be accessed from anywhere, at any time.

"Cloud computing is the direction technology is going," says Mac Carlton, director of technology for the Bethlehem school district in Albany County. "The office applications on the Internet such as word processing and spreadsheets aren't as sophisticated as what you might get in Microsoft Word or Excel, but they are getting better, and they don't cost anything to access."

There are, however, some drawbacks, including concerns about security and privacy, loss of data, slow Internet connections, and archiving (see "Pros and Cons" sidebar beginning on page 5). Another issue – beyond the scope of this report – is whether existing state confidentiality laws allow school districts to place student data, such as test scores and grades, on the Internet. Placing data online, beyond the reach of internal firewalls and other protections, is risky, even if it's encrypted or password-protected.



Cloud Computing: "Manna from Heaven?"

The following Q&A provides an overview of cloud computing and other web-based technologies, along with a discussion of advantages and disadvantages, as well as how districts have overcome obstacles to implementing these technologies.

How are schools using the Internet in student instruction?

According to the results of the NYSSBA/NYSCATE survey, technology directors in nearly all school districts (99%) said teachers in their district use the Internet in student instruction. Two other web-based technologies are also highly used in instruction: Web-based educational software and tools, such as applications that assist in student assessment and evaluation, curriculum planning, and professional development (91% of school districts); and online learning games and simulations, such as interactive video games that help children learn new concepts or computer programs that allow students to “dissect” an animal (76%).

The use of virtual learning environments – such as virtual field trips – was reported in only about a third of districts (35%). Online social networking used as part of instruction was even less common, cited by only 22 percent of technology directors.

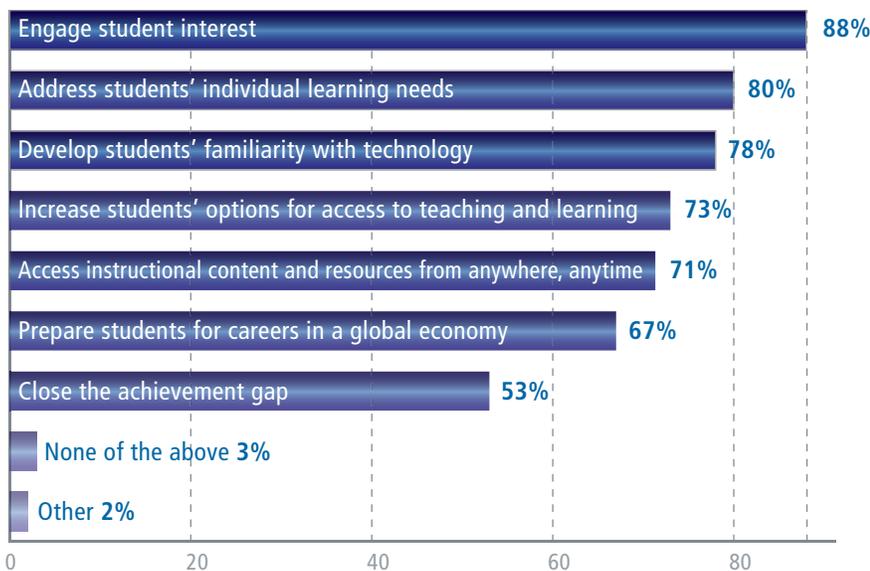
What district instructional goals and priorities are driving the use of web-based technologies in schools?

School districts adopt web-based technologies for a variety of reasons. But the number one reason is to engage student interest, which was cited by 88 percent of school districts. Addressing students’ individual learning needs (80%) and developing students’ familiarity with technology (78%) were a close second and third (see Figure 1 below).



Questions and Answers about Cloud Computing & Other Web-Based Technologies

Figure 1. How Districts Are Using Technology



Source: NYSSBA/NYSCATE survey

Who is driving the adoption of web-based technology in schools?

Teachers appear to be driving adoption of web-based technologies in the classroom. More specifically, 79 percent of technology directors in the NYSSBA/NYSCATE survey said teachers are one of the most prominent groups pushing adoption of these technologies.

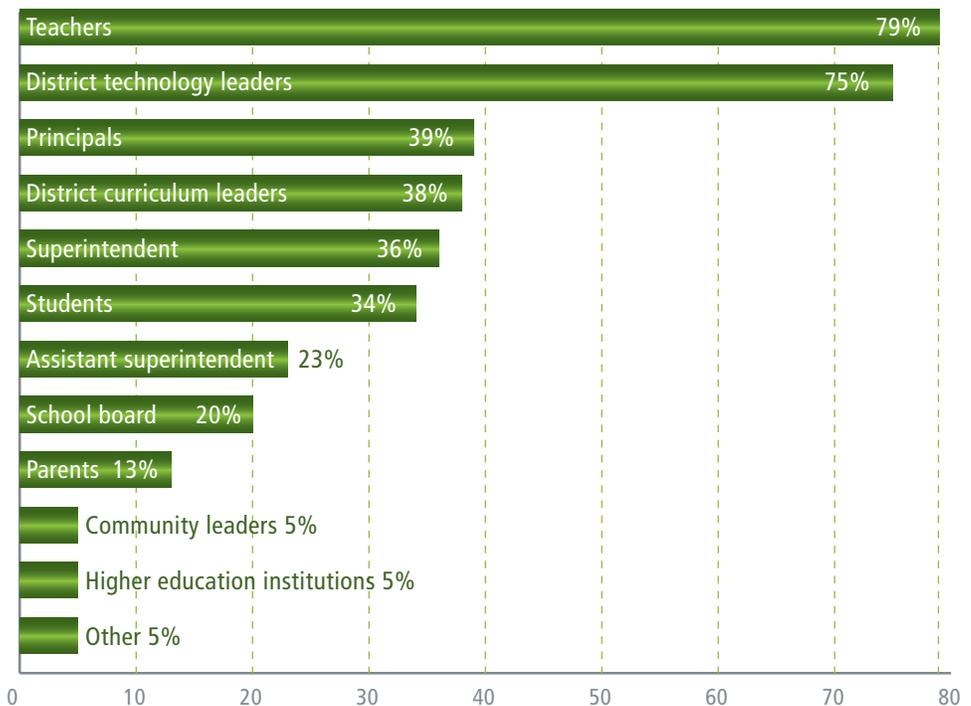
Not surprisingly, district technology leaders (75%) were also cited by the vast majority of districts as a prominent group driving the adoption of web-based technologies (see Figure 2 on page 5).

Cloud Computing

Pros

1. Computer applications are available on the web at little or no cost.
2. No need for capital expenditures on IT infrastructure (i.e., hardware, servers).
3. Decreased reliance on school-based technical support staff.
4. Can be accessed at anytime, from anywhere.
5. May eliminate need to archive. Cloud computing programs may do the archiving for you.
6. No need to worry about managing spam e-mail.
7. Vast amounts of storage space or memory-consuming software are not necessary.

Figure 2. Technology Drivers in Schools



Source: NYSSBA/NYSSTATE survey

What are the challenges/dangers of using web-based technology?

According to the NYSSBA/NYSSTATE survey of school technology directors, protecting students from inappropriate content was the most common challenge for school districts, cited by 41 percent of respondents. Just behind that were controlling access to restricted websites (39%) and preventing students from bypassing the web content filter (36%).

Districts are also concerned with protecting against threats to computer hardware and software, e.g., viruses, spyware (33%) and managing content downloads and access, e.g., music downloads (34%). Cyberbullying was cited by 32 percent as a problem for their districts, as was students posting personal data.

Questions persist about whether sensitive information placed on the Internet – such as student contact data, employee payroll or individualized education plans – is safe from theft or manipulation. Placing data online, beyond the reach of internal firewalls and other protections, may present security concerns, even if the data is encrypted or password-protected.

In addition, web-based programs may not be as robust as other commercial software packages. The Internet may also lack the computing power and capacity schools need to process and store data, or slowdowns could occur due to the volume of users trying to access an application at the same time.

Storage and archiving of data in particular may pose a concern. Organizations typically back up data on a regular basis. Those that opt for cloud computing must determine whether the applications they intend to use provide for such archiving. Slowdowns could also be caused by the district’s Internet connection or outdated desktop computers.

Cloud Computing

Cons

1. Cloud computing may not provide all the necessary programs and computing power needed.
2. A slow or poor Internet connection affects efficiency and hinders productivity.
3. Cloud applications might not be as sophisticated as applications that can be run on and stored on a personal computer.
4. There's no guarantee that the cloud application you use will continue to exist.
5. Cloud computing may not promote aggregation of content. A number of separate applications are likely to be used to store information.
6. Cloud applications may not provide for archiving data – you may still need to back up data locally.

What are districts doing to avoid these dangers?

School districts are taking certain actions to assure student safety when using web-based technologies. Nearly all (96%) report having installed web content filters on school computers to block unwanted content. This is required by federal law in order to be eligible for federal E-rate funding.

Another way to control how web-based technology is used in schools is to have an acceptable user policy. Enforcement of acceptable user policies was cited by 29 percent of school district technology directors as being an issue in their districts.

Districts are also educating students, faculty and parents about the proper use of web-based technology. Eighty percent of technology directors say their district instructs students on Internet safety, 77 percent instruct faculty and staff on Internet safety, and 55 percent instruct parents on Internet safety for children.

The Queensbury school district, for example, requires all sixth-graders to participate in a 10-week course on digital citizenship and cyber safety. As part of the course, students are trained in the "grammar of the web"— understanding web addresses, deciphering valid sites from "bad" sites, learning appropriate web behavior, and how to choose appropriate/ safe user names. Sixth grade is targeted because that's the age at which students really start becoming immersed in the Internet.

Districts in the Broome-Tioga region certify certain staff members to be online safety experts." Their task is to train teachers on showing kids what to do/not to do. They also reach out to parents by offering evening Internet safety classes.

In Brighton, cyberbullying is the issue that presents the biggest problem. The district has adopted a cyberbullying character education program to combat the issue.

What other obstacles exist?

Cost concerns or time constraints may inhibit a school district's ability to use web-based technologies. Teacher time constraints are the most significant barrier to the use of web-based technologies in school districts, cited by 72 percent of technology directors. A lack of teacher knowledge about how to use a technology effectively was the second most common (68%).

Internet access does not appear to be a major problem in New York schools. Limited bandwidth was cited by 25 percent of technology directors as being a significant barrier, lack of computers with adequate operating systems and web browsers was identified by only 18 percent of respondents, and administrator perceptions about lack of instructional value by only 17 percent.

How are school districts training teachers to use web-based technology?

Schools are using a variety of methods to bring teachers up-to-speed on new technology. The Eastchester school district has two technology integration specialists, one at the elementary level and the other at the secondary level, to provide professional development to train teachers on how to use technology. They work with teachers in the classroom and hold workshops on teacher professional development days.

In Queensbury, training consists of three components: 1) after-school workshops (about 20 per year); 2) small-group learning, in which teachers work in groups of 3-6 on an ongoing

Going Halfway: Virtualization

For districts not yet ready to embrace cloud computing, the concept of “virtualization” may offer savings.

Virtualization is where a school district actually hosts its computer servers on premises, whereas the cloud is externally hosted on the Internet. However, similar to the cloud, the computing is all done at the server level, not at the PC level.

To get a sense of the savings that can be achieved through virtualization, consider the Queensbury school district, which maintained about 40 computer servers. When the district “virtualized,” it was able to scale that number back to 11 servers, plus three servers to manage the virtual environment. That’s a net of 26 servers that no longer need to be replaced at approximately \$5000 per server. While there are software costs (about \$1,500 per year) to maintain the new virtual system, the district determined that the reduction of 26 servers had saved approximately \$12,000 per year in electricity costs. That’s in addition to the savings associated with the fewer number of servers.

basis; and 3) summer courses, which consist of two weeks of training before the beginning of the school year, usually two or three times per day.

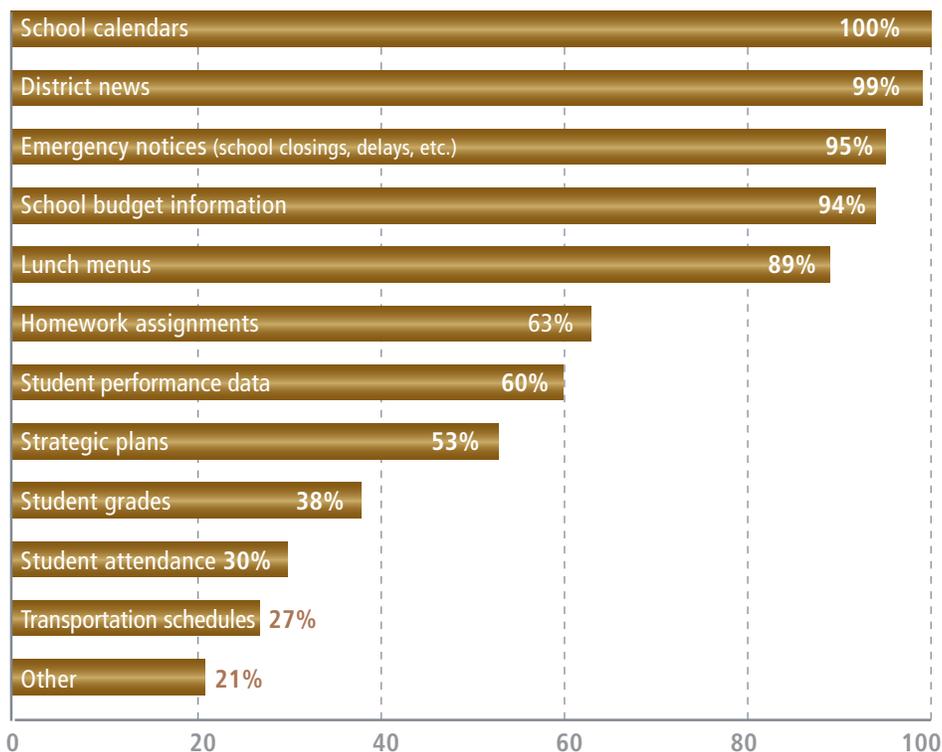
Plattsburgh holds workshops after school for staff on an on-going basis on as many as 75-80 different topics. They also have in-house mentoring in which they use “tech coaches” – people in the district with expertise in certain areas – who can train other teachers/staff on how to use technology. Also, there are free materials available on the web for teachers to access, such as lesson plans, teaching ideas, etc.

How are schools using web-based technology to communicate with the public?

NYSSBA conducted a survey of 81 school districts in conjunction with the New York Schools Public Relations Association (NYSPRA) to see how some districts are using web-based technology to communicate with the public (Figure 3 on below).

Every school district sampled in the survey reported having a website to relay information to the public, such as school closings, lunch menus, transportation schedules, and school contact information. One-third of districts said they have private web portals, which are secure locations within a website that can be accessed only by certain people, such as students or parents. These may be used to post confidential information, such as student grades.

Figure 3. Using Web-Based Technology to Inform the Public



Source: NYSSBA/New York State School Public Relations Association survey

The survey also found that about 12 percent of districts had superintendent blogs, while only 6 percent of school districts had a presence on social networking sites such as Facebook and Twitter.

A blog – short for “web blog” – is a part of a website that contains regular entries of commentary, descriptions of events, or other material such as photos or video. They

typically allow readers to interact with the blog’s author by leaving comments or questions. Dobbs Ferry Superintendent Debra Kaplan maintains a blog called “[School Ties](#)” on her district’s website.

Facebook enables individuals to interact with one another by posting messages, photos, videos and other content. Twitter is a “microblogging” website through which users – in this case, school districts – send quick, short (140 characters or less) messages to the public. [Queensbury uses Twitter](#) to share news on events, snow days, and other crucial information. The district announced through Twitter: “Congratulations! Field Hockey 2-1 vs. Scotia.” The same content is also posted on the district website. A link on the district website brings people to its Twitter page.

What kind of cost savings can be generated through cloud computing?

The table below provides a cost analysis of Google Apps and Microsoft Office. Google Apps is a cloud computing service from Google that features several Web applications with similar functionality to traditional office suite applications, such as e-mail, word processing and spreadsheets. The Standard Edition is free, but offers employers limited ability to monitor content. Google Apps Enterprise is available for an annual fee but allows more control over user content by synching Google’s versions of e-mail, contacts, and calendars with Microsoft’s Outlook. Microsoft Office is the traditional office suite version hosted in-house.

The table below illustrates how cloud computing may offer cost savings to school districts compared with Microsoft Office. The amount of savings increases with the size of the district.

Up, Up and Away: Cost Savings in the Cloud

Total # of users in district (staff and students)	Google Apps (Cloud)				Google Apps Enterprise (Cloud)				MS Office (In-house)			
	Server hardware	Server software	Workstation software	Total cost	Server hardware	Server software	Workstation software ¹	Total cost	Server hardware ²	Server software ⁴	Workstation software ⁵	Total cost
1,000	\$0	\$0	\$0	\$0	\$0	\$0	\$25,000	\$25,000	\$3,600	\$32,000	\$18,000	\$53,600
2,500	\$0	\$0	\$0	\$0	\$0	\$0	\$62,500	\$62,500	\$9,000	\$80,000	\$45,000	\$134,000
5,000	\$0	\$0	\$0	\$0	\$0	\$0	\$125,000	\$125,000	\$18,000	\$160,000	\$90,000	\$268,000
10,000	\$0	\$0	\$0	\$0	\$0	\$0	\$250,000	\$250,000	\$36,000	\$320,000	\$180,000	\$536,000

Note: In addition, factor in staff hours of about 12 hours per year for both Google Apps estimates and 52 hours per year for the MS Office estimate

¹ Cost per user equals \$25

² One hardware server costs approximately \$1,800 on an annual basis.

³ One hardware server can accommodate approximately 500 users; thus, the cost of the hardware server (\$1,800) is multiplied by every 500 users.

⁴ Cost per user equals \$32

⁵ Cost per user equals \$18

Below are examples of how some school districts in New York State are using cloud computing to enhance learning.



The Eastchester school district in Westchester County takes advantage of a free web-based instructional program called [Moodle](#). In the 2008-09 school year, Eastchester conducted a pilot program – with the assistance of the B.E.P.T. (Bringing Educational Professionals Together) Teacher Center in Pelham, N.Y. – to introduce Moodle into the classroom. It was fully implemented in the 2009-10 school year.

Middle and high school teachers use Moodle to create websites for their courses where they can put resources for students to access, create chat rooms and discussion groups, and post links to other websites. For example, a teacher might put an article (or a textbook chapter) on her Moodle site for students to read, then set up a forum where students can discuss the material. Teachers may post online review quizzes for students to take, and see where students are having difficulties. Students create their own Moodle accounts so they can access the websites.

“It complements what teachers do in the classroom,” says John Blaser, technology integration specialist for the district. He estimates that roughly half the teachers in the district use the application.



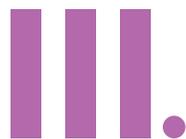
A school that opened in the fall of 2009 in New York City is focused on game-based learning. The grade 6-12 public school, named [Quest to Learn](#), was created by the Institute of Play, an organization that promotes “gaming literacy” – the “play, analysis, and creation of games as a foundation for learning, innovation, and change in the 21st century.” The school is a collaboration with New Visions for Public Schools, a not-for-profit organization that works in partnership with the New York City Department of Education.

The school’s curriculum is not made up of students playing commercial videogames, but rather uses the underlying design principles of games to create learning experiences. In essence, Quest to Learn uses “game design and game-inspired methods to teach critical 21st century skills and literacies,” since “games work as rule-based learning systems, creating worlds in which players actively participate, use strategic thinking to make choices, solve complex problems, seek content knowledge, receive constant feedback, and consider the point of view of others.”



The Queensbury school district in Warren County has three full-time “education technologists” that work with teachers to incorporate web-based technologies into lessons. Queensbury has two main objectives in its use of web-based technology: to take advantage of free web-based tools, and to make its use collaborative, both in its use among students in instruction and among teachers in professional development.

“Technology is viewed not as an extra, but as an embedded part of the culture,” explains Matt Hladun, Queensbury’s director of technology. “We want students to use technology like it’s second nature. It’s a tool just like the pencil is a tool.” Toward that end, the district is using a number of free web-based tools. One is [Animoto](#), a web application that automatically produces videos from user-selected photos, video clips and music. Another



Examples of Cloud Computing

is [Glogster](#), an online posting site where users can embed text, images, video and audio. And, like Eastchester, Queensbury uses [Moodle](#), which is used for creating online virtual classrooms.

The district has also used videoconferencing to conduct virtual field trips. However, that technology is not used much anymore, according to Hladun, because the cost of the virtual field trips is not much different than an actual field trip. "In tough budget times, when field trips get cut, so do the virtual ones," Hladun says.



The Bethlehem school district in Albany County has embraced a number of web-based technologies. Among them:

Wikis. Wikis are web pages that users can create and easily update. Users can go to one of a number of free websites to create their own wiki pages. [PB Works](#) and [Wiki Spaces](#) are the two that Bethlehem uses. Teachers often use wikis for classroom discussions. For example, a teacher that has created a wiki page may put a quote or passage from a book on the wiki page. Students can then log on and discuss their thoughts about it. Wiki pages can also be used to create links to meetings, videos, and other files. Wikis are monitored. The wiki cannot be accessed by anyone who has not been invited.

Adobe Connect. [Adobe Connect](#) is a video conferencing website that can connect the district to others anywhere else in the world for presentations and seminars. Bethlehem's "Global Coalition" group uses it to video conference with students in other countries, such as Belize and Azerbaijan. The district pays \$100 per year to subscribe.

Virtual field trips. The district has two high-definition videoconferencing stations where students can take virtual field trips. Students have taken trips to the Baseball Hall of Fame and the Cleveland Zoo.

Web portal. Bethlehem has a student portal on its website called "BC at Home." Students can log in and see their class schedules and homework assignments. Teachers can post reading assignments there for students to complete. Parents can log in to see homework assignments and report cards.

Clear Track. This website allows special education teachers to tailor instruction toward a student's education plan.

Study Island. A site built from the state's learning standards where students can prepare for standardized tests.

Generation Yes. Students train other students about technology.



Numerous sources of web-based technology are being used in the **Brighton school district in Monroe County**. Students at the elementary level use websites designed for skill reinforcement, such as math practice or grammar practice, while secondary students use more sophisticated tools, such as blog tools and wikis.

"Cloud computing gives students the ability to access content from any network through the Internet and to share and collaborate with one another," says Debby Baker, assistant superintendent for curriculum and instruction. "And they're all free. They're in the cloud."

Two programs Brighton uses that are “in the cloud” are Voice Thread and Ether Pad. [Voice Thread](#) is “like PowerPoint on steroids,” according to Baker. It allows the user to create visual images for presentations, but also allows audio and blogs to be added to them. [Ether Pad](#) allows for concurrent editing, in which two or more people can collaborate at the same time from different locations. Used in tandem, students can collaborate on writing/editing stories and reports using Ether Pad, then use Voice Thread to present them.



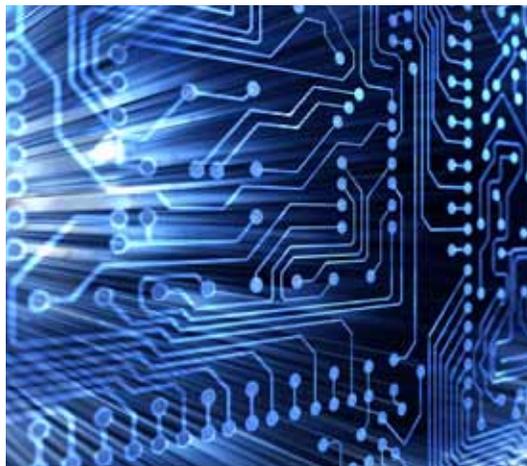
The **Plattsburgh school district in Clinton County** uses a number of web-based applications in instruction. Three of the most popular are: [Reading A-Z](#), for grades K-6, which offers thousands of printable materials to teach guided reading, phonemic awareness, reading comprehension, reading fluency, alphabet, and vocabulary. [Raz Kids](#) is also for grades K-6, but is more interactive. Students do interactive math problems, reading/vocabulary, etc., keeping track of their progress as they go along. They improve their reading skills by listening for modeled fluency, reading for practice, recording their reading, and checking comprehension with quizzes.

[Brain POP](#) creates animated, curriculum-based questions/quizzes that teachers use with K-8 students. All are supported by free lesson plans, video tutorials, professional development tools, graphic organizers, and best practices for teachers. Brain POP is used in numerous ways, from introducing a new lesson or topic to illustrating complex subject matter to reviewing before a test. Content is aligned to state standards and no downloading, installation, or special hardware is required.

According to John Haubner, the technology coordinator in the district, moving to web-based software has been a boon for the district. The district incurred substantial costs when it purchased its own software and hardware. In addition, programs were easily lost, requiring replacement, and purchasing all new products was necessary when a program became out-of-date.

“It was not easy to use technology in the classroom before using web-based technology, because teachers needed to be active in managing the software and all the updates, which could be unwieldy,” he says. “This is much more manageable for teachers.”

And it’s more cost-effective in the long-run, too, since there is less teacher time involved in keeping track and managing programs, and there’s no need to manage and pay for updates/upgrades.



IV.

Conclusion

The use of web-based technology in schools is attractive for many reasons. But perhaps the most compelling is its ability to help school districts contain costs. For school districts that are struggling to rein in expenses, web-based technology may be a viable cost-saving solution.

With cloud computing, applications are delivered through the Internet. Instead of large investments in capital expenditures for expensive hardware, customized installed software, or other services that users might need, all that is required is an Internet connection and a computer. The only expense is for utility bills (electricity, etc.) or subscriptions if one of the numerous free web-based software programs is not adequate.

There are some drawbacks, though. Web-based programs may not be as sophisticated as other commercial software packages. In addition, the Internet may lack the computing power and capacity schools may need to process and store data.

Local schools are in the best position to evaluate the pros and cons of cloud computing. But with schools facing ever-increasing financial pressures, the cost savings associated with cloud computing may outweigh any disadvantages. Public education leaders, including school boards, must embrace new ways of delivering educational programs and services to balance the needs of students with those of taxpayers.

References

NYSSBA/NYSSTATE survey of school district technology directors

Interactive Educational Systems Design (IESD), Inc., on behalf of Lightspeed Systems and Thinkronize/netTrekker; IESD Preliminary Research Summary: Key Findings from the Safe Schools in a Web 2.0 World National Online Survey and Online Discussion Groups; June 2009

"Don't Worry, Be Scrappy: Good, Cheap Tech for Schools, Cloud Computing and More;" By Jeffrey Hastings; School Library Journal, March 1, 2009

"Cloud computing;" Wikipedia, the free encyclopedia



24 Century Hill Drive, Suite 200, Latham, NY 12110-2125

www.nyssba.org