Video: How Interactivity and Rich Media Change Teaching and Learning

New Opportunities Through Video

Armed with laptops, smartphones, and tablets and connecting through Facebook, Twitter, and YouTube, a media-savvy generation of students is driving unprecedented change in teaching and learning. With the explosion of social media and its effect on communication, there is growing evidence that video and multimedia content, tools, and streaming capabilities are successfully engaging students in new forms of learning. This paper reviews research findings and demonstrates how video is helping schools around the world overcome distance and financial barriers to expand curriculum options, maximize scarce resources, increase student engagement, improve outcomes and deliver the type of education required for 21st-century global citizens.

The Impact of Technology in Education

Educational environments are changing quickly as a generation of students grows up with applications such as Twitter and Facebook, and technologies such as smartphones, tablets, and other devices. Although schools have been broadly adopting laptop computing and wireless technology for the past decade, students increasingly, and perhaps unwittingly, are accelerating change in teaching and learning. New social media applications and a proliferation of new devices must be integrated into teaching to engage students. In a 2008 article, Rosen and Nelson describe a generation of students “who are comfortable with and enthusiastic about using collaborative technologies to participate in the World Wide Web as creators rather than consumers. These students gravitate toward group activity, seeking interaction within thriving online communities of generative individuals.”

In addition to enabling content creation, collaborative technologies, such as video, extend reach beyond the classroom walls. Interactive video can support new learning and teaching experiences across cities, states, and even countries. One example is the Kids Creating Community Content, or KC3, Contest (http://kc3.cilc.org/). The competition challenges students to design, deliver and share live interactive content programs for peers and younger students. The contest takes students out of their classrooms and around the world, using Telepresence technology to share their lessons, teach living history and gain proficiency in 21st century skills.

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The Evolution of Technology
The definition of “education technologies” changes almost as fast as technology itself. However, when a critical mass of schools implemented broadband access, it opened the door to widespread adoption of Internet-based and multimedia teaching and learning resources.

As broadband access became widespread and more affordable, schools around the world began investing in laptop and 1:1 computing programs as part of their initiatives to raise test scores and increase graduation rates. In a recent study conducted by the Public Broadcasting System (PBS) and Grunwald Associates LLC., K-12 teachers in the United States believe that laptop computers hold the greatest education potential among popular portable technologies, with 81 percent of teachers saying laptops would enhance education. In addition, 53 percent of teachers in the same study believe that devices such as iPads, Kindles, Sony Readers, iPods, and MP3 players can also be useful.

One of the most widely adopted technologies is interactive white boards (IWBs), which have become standard equipment in many schools. Their popularity seems to substantiate the Internet’s importance as a platform for technology-based instruction since they provide access to online instructional and professional development resources. IWBs also function as a bridge from the traditional teacher in the front of the class to a more collaborative learning style required by study groups and other learning environments that need real-time interaction to share ideas. Research seems to bear this out:

- 68 percent of K-12 teachers report that they value IWBs
- 40 percent of K-12 teachers report that they use IWBs to supplement or support teaching
- 59 percent of teachers say that IWBs are available in their school
- 36 percent say that IWBs are available in their classrooms

The Trend Toward Video
Today’s students are visually sophisticated and accustomed to digital media. In fact, many prefer to work digitally. Wide access to personal learning devices gives students and teachers greater control over access to content and collaborations. Educators and students use these devices daily to record videos, access digital media, and connect to friends, colleagues, and families in real time. As personal acceptance grows, access to digital media content becomes a classroom expectation. The next wave of videoconferencing adoption is expected to consist of increased student collaborative projects and student creation and delivery of content, which will include a shift to desktop videoconferencing and other collaborative technologies over time. Students will help drive Wave III as a result of their rapid adoption of Internet-based tools like YouTube.

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2 Deepening Connections, PBS annual teacher survey on media and technology, with Grunwald Associates LLC, 2010
3 IBID
4 The 2009 Update: Taking the Wraps off Videoconferencing in the U.S. Classroom, Wainhouse Research, April 2009
According to the PBS and Grunwald study, 97 percent of K-12 teachers use digital media for classroom instruction, and 62 percent report that they use digital media frequently for classroom instruction. Almost one in four teachers (24 percent) report that they use digital media every day\(^5\).

Teachers primarily turn to the Internet to find, download, and manage digital media. The types of media used include interactive games, activities, lesson plans, and simulations. Increasingly, teachers are downloading video content, second only to video resources delivered on DVD. The percentage of teachers reporting that they stream or download video content increased from 55 percent in 2007 to 76 percent in 2010\(^6\). There is also a growing trend towards student-teacher collaboration using live videoconferencing and telepresence technologies. This growth has been fueled by the obvious benefit of personal, face-to-face communications that increase student and teacher participation. In addition, these technologies reduce travel costs and allow districts to spread scarce resources among more students.

The growing trend toward video seems to substantiate teachers’ beliefs that technology devices and web-based systems help them engage students in learning and enable them to do their jobs better. Schools and administrators can also use video technologies for building professional development programs. Teachers often join online professional communities to collaborate and share resources with other teachers and take advantage of professional development opportunities.

### Table 1. U.S. States Ranked by Numbers of Schools with Videoconferencing
The 2009 Update: Taking the Wraps off Videoconferencing in the U.S. Classroom, Wainhouse Research, April 2009

<table>
<thead>
<tr>
<th>State</th>
<th># of schools</th>
<th>VC-enabled classrooms</th>
<th>State</th>
<th># of schools</th>
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\(^5\) IBID
\(^6\) IBID
The Research on Multimedia in Education

Although video and other multimedia materials are increasingly popular, critics question whether they actually improve teaching and learning. To date, much of the research on the use of information and communication technology (ICT) in schools has focused on small samples, lacked rigorous controls, and has not been generalized to address larger student populations. However, from a review of the work that has been done, in general, multimodal learning seems to be more effective than traditional, unimodal learning:

- Adding visuals to verbal (text and/or auditory) learning can result in significant gains in basic and higher-order learning (Multimodal Learning Through Media: What the Research Says, Metiri Group, commissioned by Cisco, 2008).
- Use of a wide range of digital tools enhances reading comprehension and vocabulary development (Pearson et al., 2005).
- A study of 2500 sixth-graders and eighth-graders in Los Angeles showed a statistically significant increase in math achievement scores when students used united streaming digital video on demand (Boster, 2004).
- North Carolina’s Mooresville Graded School District has measured significant composite test score increases after district-wide adoption of 1:1 computing.
- Research on students in Apple Classrooms of Tomorrow (ACOT) found that students developed significant competencies not usually measured, such as social awareness, confidence, self-starting, and a positive orientation to their futures. Technology use in the classroom helped to decrease absenteeism, lower dropout rates, and motivate more students to continue on to college (Sandholtz et al., 1997).

What Do Teachers Think?
The more that teachers use video content, the more benefits they tend to see. Percentages of teachers finding value in multimedia and video content has increased each year since 2007. In the 2010 survey:

- 68 percent believe that video content stimulates discussions
- 66 percent believe video increases student motivation
- 62 percent believe video helps them be more effective
- 61 percent believe video is preferred by students
- 47 percent believe video directly increases student achievement

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How Schools Are Using Video

Uses of video are seemingly only limited by the imagination. Schools around the world rarely use a single video application. They tend to use numerous video and multimedia applications in multi-modal environments. In addition to providing learning materials and opportunities, they find that video enables them to expand access to more students, deliver more course options, and solve access problems arising from geographic and budget barriers.

Connecting Classrooms with the World and Each Other
Finding a sufficient number of accredited honors teachers is difficult, and staffing schools across an 840-square mile area creates significant time and distance barriers for delivering these courses to qualified students. South Carolina’s Georgetown County School District uses Cisco TelePresence® solutions to deliver foreign language, calculus, advanced placement, and other classes to students at all of its schools. A single teacher can now teach to two or three locations at the same time, regardless of distance, and scarce talent, such as a calculus honors teacher, can be shared among the district’s four high schools.

The district also uses Cisco TelePresence to provide virtual tours of France and virtual field trips to the Smithsonian. During summers, the systems are used for professional staff development. Teachers can receive training for little or no cost, avoid travel and the associated expense, and save time. The district is also using the systems for guidance counselor conferences and disaster preparedness. Cisco TelePresence solutions have generated enthusiasm among students while reducing travel mileage and improving quality of life for teachers.

Face-to-Face Learning Experiences
The rural Giddings Independent School District in Giddings, Texas, had a vision of delivering new learning opportunities based on connectivity and real-time interaction for lifelong learning and the opportunity to help its rural community thrive. Using Cisco Show and Share™ and Cisco TelePresence, students gain a virtual, face-to-face learning experience with their peers across the world when collaborating on projects or research. For example, one second-grade teacher is starting a project to connect her class with a second-grade class in St. Croix, U.S. Virgin Islands using online video conferencing. Students from Giddings can interact with students in St. Croix via webcam, providing cross-cultural experiences and learning opportunities never before available. As a tool for mentoring programs, enhanced video applications allow students to interact with business leaders, advisors, professors, and even student leaders at higher education institutions around the world.
Gaining a Professional Development Advantage
Teachers increasingly join online professional communities to connect, collaborate, and share resources with other teachers. The Anoka-Hennepin School District in Minnesota chose Cisco WebEx® to enable teachers to connect with professional learning communities across their district and with specialized instructors at other schools. Teachers now conduct regular teaching strategy sessions at multiple locations simultaneously, while reducing travel costs and improving efficiency. WebEx also helps IT staff support classroom websites with its screen-sharing capabilities. Using WebEx, the district can connect multiple classrooms to a single resource, such as an author, for unique, interactive learning opportunities.

Establishing Best Practices
California’s Fresno Unified School District recently achieved historic gains in math achievement for grades K–6 through a unique collaboration with California’s Long Beach Unified School District using Cisco TelePresence®. The two district superintendents often shared ideas at conferences, but were too far away to easily hold strategic discussions. In 2009, math teachers from the two districts joined a Cisco TelePresence session to discuss a common assessment framework. In one day they completed a project that would have taken months otherwise. That year, 2000 more elementary school students in the Fresno Unified School District scored at a proficient or advanced level in mathematics than in the previous year and the Long Beach Unified School District also gained from the collaboration.

Achieving Measurable Improvements
The Mooresville Graded School District (MGSD) implemented a 1:1 computing initiative beginning in 2007. During the summers of 2008 and 2009, the district conducted summer institutes to help faculty and staff integrate technology in the classroom. Beginning in the 2009–2010 school year, more than 4500 laptops were issued to students in grades 4–12. Broadband wireless access is available at the schools, enabling students and teachers to access the most current information available over the Internet. During the 2008–2009 school year, Mooresville also hosted educators from 30 different educational institutions from across the nation to visit classrooms, collaborate with colleagues, and learn about the district’s Digital Conversion Initiative.

Results have been impressive. Between 2007 and 2010, MGSD increased its performance in state rankings by 13 percent. Performance increased across the district – in elementary, middle, and high schools. In the elementary schools, reading, math, and composite scores all increased. Fifth-grade science performance moved from 63 percent to 81 percent. Over the same period, its high school graduation rate increased from 79 percent to 86 percent, while drop-outs decreased from 72 to 55 students. Also in the high schools, attendance rate has been at or above 95 percent and the percentage of students going to college increased from 74 percent to 86 percent.
Learning That Goes the Distance
What began as a goal to connect students cost-effectively from three locations has taken the Paradise Valley Unified School District in Phoenix, Arizona to a connection with the world. The district initially used Cisco TelePresence to bring 15 students at three campuses together with one teacher for a course that would otherwise have not been available due to a lack of resources. From there, the school connected to National Lambda Rail (NLR), the advanced network platform for advanced research and public-private partnerships around the world. Today the district can easily connect students with teachers for tutoring, conferencing, and evaluation sessions with the immersive feeling of being in the same room. Teachers can easily access professional development resources. And through NLR, the district has connected with institutions such as a sister school in Beijing, China, Duke University, Harvard University, the University of Wisconsin-Whitewater, the Technical University of Košice in Slovakia, Indiana University, Rice University, Georgia Institute of Technology, and SUN YAT-SEN University. These connections are leading to recruitment efforts, guest lectures, joint assessments of student projects, professional development, collaborative team teaching, and more.

Reaching Beyond Borders
Video communication technologies also enable schools to reach beyond their own campuses and classrooms to provide content to other districts and institutions. For example, the Office of Distance Education (ODE) at the Arkansas School for Mathematics, Sciences and the Arts began as a residential program for gifted and talented high school juniors and seniors with high aptitudes for math and sciences. The program is free to students, and top students who are recruited from around the state are eager to participate. Losing their top students created concern among high schools that test scores would suffer and state funding would decrease. To give back to these schools, the ODE applied for – and won – grants that allowed them to implement Cisco TelePresence systems and begin offering a limited range of video-based courses.

By 2008, video enrollment had grown to 2500 students, and the program began accepting out-of-state students from Pennsylvania and Kentucky. Today the program serves 3700 students in more than 100 school districts. Schools that use the video-based courses pay tuition per seat, which allows them to add academically rigorous, high-quality instruction to their curricula. Schools can offer low-enrollment classes that they otherwise could not afford to staff, and students can take courses that would otherwise not be available. Tuition revenue allows ODE to deploy infrastructure that supports approximately 200 hours of video instruction per day, and hire outstanding instructors regardless of their locations. The school received an award for outstanding leadership in the field of distance education and several of its instructors received awards for instructional excellence from the U.S. Distance Learning Association.
The Value of Video to Students

- Establishes dialogue and idea exchange between students, educators, and subject matter experts regardless of locations.
- Lectures become homework and class time is used for collaborative student work, experiential exercises, debate, and lab work.
- Extends access to scarce resources, such as specialized teachers and courses, to more students, allowing them to learn from the best sources and maintain access to challenging curriculum.
- Enables students to access courses at higher-level institutions, allowing them to progress at their own pace.
- Prepares students for a future as global citizens. Allows them to meet students and teachers from around the world to experience their culture, language, ideas, and shared experiences.
- Allows students with multiple learning styles and abilities to learn at their own pace and through traditional models.

Educator Benefits

- Lectures can become homework and class time used for creative, teacher-based experiential exercises, debate, and lab work.
- Adds personal relationship to distance learning applications.
- Combats teacher isolation for remote and specialized educators.
- Enables convenient, cost-effective professional development.
- Increases interaction with colleagues to share instructional strategies and successes.
- Provides access to resources and information not traditionally available.

School District Benefits

- Supports educational equity for isolated schools and campuses.
- Extends scarce resources to more students.
- Expands curriculum offerings.
- Supports teacher training needs.
- Provides experiences, such as field trips, not otherwise possible
- Enables team teaching and collaboration between institutions
- Leverages an investment in video to benefits students, teachers, administrators, educational partners, and outside subject matter experts
Cisco Video Solutions

Cisco Connected Learning solutions are designed to help schools connect, engage and empower learners, educators, and leaders. Cisco video solutions include:

- **Cisco TelePresence**: Cisco TelePresence solutions create live, “face-to-face” experiences over the network, empowering collaboration. Two-way or multipoint interactive video facilitates teaching, learning, and administration. The “Teachers Training Teachers” program also helps you introduce and integrate interactive video technology into the classroom.

- **CiscoWebEx**: Cisco WebEx solutions provide flexible instruction with extended reach online. Interactive features include real-time testing and grading, instant feedback, assessment tracking, breakout sessions, and hands-on labs to deliver a variety of dynamic e-learning opportunities.

- **Cisco Media Experience Engine (MXE)**: Cisco MXE effectively captures and disseminates rich media information across multiple different endpoints and input formats.

- **Cisco Show and Share**: This webcasting and video sharing solution allows schools to create video libraries, with simple tagging, archiving, and retrieval of stored video assets.

- **Cisco Quad™**: This campus wide collaboration platform combines social networking with communications, teaching and operational information, and content management systems to create dynamic, secure professional learning communities.

- **Cisco Cius™**: The Cius tablet supports secure videoconferencing, mobility, and integration with Cisco Unified Communications solutions to empower teachers.

- **Cisco Virtual Desktop Infrastructure**: This solution enables schools to securely deliver a consistent desktop image to all user endpoints on its network from the data center. As a virtualized solution, it provides significant cost savings while simplifying management and control.

Cisco Services

Cisco Services works with learning institutions to implement cost-effective, well-planned, and robust network-based solutions for true 21st-century professional development environments. We help facilitate the rapid deployment of new applications with minimal disruption, while helping ensure a manageable migration path that protects and amplifies focus on academic achievement and budget requirements.

To prepare for deploying Cisco video solutions, Cisco has created the Medianet Readiness Assessment Service, which assesses customer network infrastructures and their ability to transport the media-rich applications that need to be deployed. Through information collecting and network profiling, infrastructure assessment, and application assessment, the service provides recommendations that help you prepare, plan, and design your network for successfully implementing video and other media-rich applications.

Summary

Today, school districts, teachers, and students benefit from video resources in many ways. Video is highly engaging, and with students who are sophisticated consumers, creators, and editors of video content, introducing video-based teaching and learning resources is much easier. Video also opens the world to students through face-to-face learning experiences, as they meet students in other school districts, or even in other countries. Schools are using video to bridge time and distance barriers as they expand access to specialized resources, such as honors classes, delivering these courses to qualified students. Teachers gain easier access to teaching strategy...
sessions and resources, without the cost and inconvenience of having to travel. Finally, schools are able to work together to create strategies for improving learning and graduation rates.

The use of video technology in education is only in the beginning stages, and it holds much promise for improving efficiency, teaching and learning effectiveness, and students’ educational outcomes. Cisco’s commitment to education began more than a decade ago with introduction of the Cisco Networking Academy. Today the Networking Academy program is active in more than 160 countries with approximately 700,000 students per year. It has administered more than 100 million assessments. Cisco remains focused on providing video and media solutions that change students’ futures for the better.

More Information
For more information about Cisco video solutions for education, contact your Cisco channel partner or Cisco account executive.