

VIRTUAL LEARNING STRATEGIES

Extending instructional reach and keeping up with student demand for technology-based learning are transformational drivers in education.

Executive Summary

Educators have long strived to erase the limitations of time and geography that shrink instructional opportunities for teachers and students. Today, the tools for virtual learning have become so flexible and rich that well-designed online learning is arguably equal to learning in the classroom.

Although a few organizations specialize entirely in virtual learning, for most higher education institutions and K-12 districts, virtual learning enhances traditional offerings.

The early days of digital learning were focused on technology, with a goal of delivering the same materials a student might see in a classroom. Today, the technology is ubiquitous and powerful enough that virtual learning professionals can focus on creating textbooks, presentations and demonstrations that fashion immersive and rich online experiences.

Good design and ease of use let the technology itself take a backseat to the content, the learning process and teachers' focus on student progress. As one online educator points out, "We don't teach computer courses, we teach students."

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Growth in Virtual Learning

Virtual learning is growing exponentially, taking in more students, age groups and subjects annually. It is also growing deeper and more sophisticated, challenging critics who say that virtual learning can never equal traditional teaching models. In addition, thanks to open-source tools, growth in broadband availability and the ever-lower cost of end-user devices, virtual learning technologies are less expensive and more effective.

K-12 Growth

As recently as 2000, by one estimate, fewer than 50,000 students in K-12 took any sort of online course. By last year, the number exceeded 4 million. This growth is partly driven by tight public-school budgets. Districts find that online learning can stretch the productivity of existing teaching staffs and offer a low-cost way to deliver niche or specialized classes.

Federal learning and testing standards also drive online growth in K-12 school districts. Augmenting classroom instruction with online and virtual learning is another method for a district to help its students achieve standards spelled out in the No Child Left Behind Act (NCLB) of 2001 and, more recently, the Race to the Top (R2T) initiative, with its emphasis on teacher effectiveness.

In large or diverse school districts, administrators focus on eliminating the achievement differentials among various socio-economic groups. They find virtual learning to be a useful tool in this effort. Virtual learning also lets schools offer niche instruction to rural students with special requirements, whether exceptionally gifted or learning impaired.

It can also serve as an important component of a school district's continuity of operations (COOP) plan. The H1N1 flu virus scare in 2009 was a wake-up call for schools, requiring them to find ways to remain operating even if 10 percent or more of the student and instructor population was absent. Now learning can be ongoing, even if the brick-and-mortar schools are closed by pandemic or severe weather.

The latest virtual learning techniques let mobility-impaired pupils have a full educational experience, including regular interaction with teachers and fellow students, without the ordeal of travel and the physical obstacles found in school buildings.

Students whose family situations take them to distant locations (for example, children of military service members or children whose parents take distant but

temporary work assignments) can stay enrolled in their home districts if virtual learning is offered.

School districts also find that access to digital resources is becoming less of an issue over time as broadband becomes more ubiquitous. Also, libraries and organizations such as the Boys & Girls Clubs of America offer broadband connections and access to computers for educational purposes.

Where to Learn More

Several nonprofit research organizations and associations track developments in virtual learning and are excellent resources for more information.

Virtual learning resources:

Educause: educause.edu

Florida Virtual School: flvs.net

Innosite Institute: innosightinstitute.org

Sloan Consortium: sloanconsortium.org

Southern Regional Education Board: sreb.org

U.S. Distance Learning Association: usdla.org

Open-source learning management systems:

Unicon: unicon.net/opensource/uportal

Advanced Distributed Learning: adlnet.gov

Moodle: moodle.org

Online Learning and Training: olat.org

Hi Ed Growth

At the higher education level, virtual learning is driven by both the institutions and the students themselves. Colleges and universities are extending their reach – and their enrollments – by offering full degree programs online. They also offer students on campus much greater flexibility by providing the option to take classes online. Sometimes demand for a class is too large, so online delivery offers a way to expand capacity.

The second driver, student demand, reflects the reality that the current generation of students is the first to grow up with the Internet. These students simply expect resources (classes, professors and materials) to be available online, anywhere, anytime. Today, a powerful notebook computer, accompanied by a smartphone and maybe a tablet, are basic requirements for higher education.

Overall, growth in virtual learning is accelerating on campus. One recent survey showed that the number of online students at colleges and universities grew by 1 million in 2010, the largest year-to-year growth ever.

That 21 percent rise occurred as onsite enrollments grew only by 2 percent. In all, the latest full-year figures showed that 5.6 million college and university students were engaged in some form of online learning, according to the Sloan Consortium.

Trends Affecting Virtual Learning

Two important technology trends revolutionizing computing in general are also causing rapid improvement in virtual learning. The first is mobility, which is growing and evolving rapidly.

The smartphone is the 21st century's transistor radio; many students have them, and they're never more than arm's length from the device. In fact, a growing number of colleges and universities are adding smartphone and smart tablet displays to their virtual learning options. Similarly, nearly every webinar provider is developing or already offering a mobile solution.

Thanks to the growth of mobile devices, specifying particular computers with particular configurations is giving way to accommodating whatever device a student wants to use. This is called the "bring your own technology" (BYOT) approach. In some elementary school districts, IT staffs are even accommodating popular online-game consoles for student access. (Consoles have different process architectures than either PCs or mobile 3G and 4G devices.)

However, course developers must work to avoid a potential trap: making apps that are proprietary to specific operating systems. There's a difference between tailoring a virtual learning course so that it displays on a mobile device's web browser and deploying the same material as a mobile app. For example, Android apps may work on several devices, but only those with the Android OS.

A second trend is the adoption of social media as a virtual learning platform. New iterations of learning management and web conferencing systems offer instructors and students a variety of social media functions that more closely model the on-campus experience, incorporating peer-to-peer as well as teacher-to-student interaction and learning.

Social media transforms communication into a horizontal event rather than a hub-and-spoke setup with the instructor in the middle managing everything. For example, several applications on the market offer real-time, multiparty text conversations as a feature. And many platforms are integrating multipoint video such as Skype to increase interactivity.

Virtual Learning Technologies

Virtual learning synthesizes several technologies. The course design team should choose the combination that best serves the learning objectives of the class.

Course designers should not incorporate technology for its own sake, as this can lead to needless complexity. But neither should they shy away from any component needed to keep students motivated, or one that improves collaboration.

Educators are having great success with video, simulation and other web-based tools that appeal to today's visually oriented students.

Lecture Capture

When 16-millimeter movies were the dominant audio-visual platform in educational settings, few formats were less compelling than a lecture conducted in front of a camera.

Yet such approaches had an important virtue: Teachers (or students) could start, stop and rewind them at will. They also offered a way to present material from a distant subject matter expert. Given the expense of film copies and the need for fussy, mechanical sound projectors, the captured lecture was only used for in-classroom viewing by a group.

To some extent, these limitations lasted until very recently, even as film gave way to videotape, which gave way to disks and then to digital video. Today's technologically sophisticated lecture capture systems have liberated the lecture from its stand-alone status.

Rendered as digital files, lectures become as versatile and easy to augment and distribute as any electronic file. The talking-head professor is now just one component in a rich, multimedia learning experience.

Put another way, with the right capture technique, the lecture becomes a learning-and-review resource that students can view at their own convenience. Lecturers are also broadcasters in one-to-many situations, either in real or offset time. And lecturers become always-available team members of subject-related instructors grouped by discipline or institutional subdivision.

In blended learning situations, when courses consist of both virtual and onsite sessions, captured lecture technology reverses the traditional education model. Listening to the captured lecture becomes the homework, while discussion and project work occur in class.

Lecture capture is becoming an increasingly important way of helping rural or economically disadvantaged K-12 school districts. It offers specialized instructors for subjects beyond what the district can afford to offer.

Captured lectures are used in a variety of ways. At their most basic, they can exist as YouTube files (or be housed

Tools of the Trade

Never forget, it's all about the students and the learning.

Well-designed and balanced virtual learning systems offer students choices. This applies equally to purely virtual learners, blended learners who use both onsite and online resources, and to those in synchronous classes where both onsite and online learners work simultaneously.

Students like lecture capture because it fits with their mobile lifestyle. Most students have either a smartphone or an MP3 player. As one educator put it, "It's like having the professor in your pocket." Students can play and replay selected sections until they understand.

Specialized guest lecturers and webinars also go hand in hand, in part because they accommodate remote speakers. They let the host and guest instructors interact online. Recorded webinars offer the same benefits as lecture capture: they're portable and repeatable.

Fully interactive web sessions benefit from free tools such as Skype, a video conferencing and telephony platform. Students can immerse themselves in the class, in part because they can hear and see others online as well as those who are in the classroom.

By blending onsite and virtual learning, interactive tools create fusion, eliminating artificial barriers that limit who can learn and where. In short, such tools foster a new way of thinking about education: Learning is what students do and what teachers facilitate – where they do it is irrelevant.

on a campus video server), with links simply supplied to students. This can serve the one-to-many, time-offset model when, for example, classroom time is reserved for activities other than listening to a lecture.

If the instructor wants more integration with other course elements, a recorded lecture can be embedded into a webinar. The lecture video can also display tags with topics on a timeline, and it can include "scene selection" throughout. (Indexing is a common feature on dedicated lecture capture systems.) As part of a webinar, a captured lecture can also include links to documents, charts and other visuals.

The embedded approach can present a rich audio-visual environment in which to learn. Students in remote areas with limited bandwidth may turn off the video component to reduce bandwidth use (and after all, the audio is the most important part of the lecture).

Educators can create lecture capture systems as easily as setting up a smartphone or video camera in front of an instructor; or the instructor can sit down in front of a camera-equipped computer using native programs.

But dedicated lecture capture software or consoles can yield a great deal of flexibility and versatility. Systems may include a variety of features, including:

- Agent software for student PCs to remotely capture lectures
- Whiteboard capability to annotate lectures once captured (or, in some systems, during a lecture if the instructor is equipped with a drawing pad and stylus)
- Automatic distribution to a streaming server via the enterprise network
- Integration with the campus learning management system
- Scheduling for the automatic future release of a lecture
- High-definition resolution
- Interactivity via text messaging while live, and capturing messages for later playback

Coupled with one or more cameras installed in the classroom, lecture capture systems let educators easily record themselves live while speaking to a class, resulting in a more natural and animated presentation.

Webinars

Webinars are a proven technology for delivering educational content over the Internet. In a typical webinar session, visual material is presented online and with audio via telephone. Participants log on to a web session and dial in to a conference line.

Webinars are particularly effective in one-to-many situations. But because they facilitate two-way interaction and enable presentations and annotation, webinars are equally effective in one-to-one (or one-to-few) virtual learning sessions.

Most webinars are presented as live events. Of course, only during live mode are their interactive features available to teachers and students. Strong competition exists among several major webinar software providers. The available capabilities increase every year and may include the following features:

- **Q & A:** Participants can type questions and comments into a queue. These remarks are visible to all participants. Participants can't, however, interact with one another.
- **VIDEO:** Some webinar packages have video capability so that participants can see the instructor or the instructor can present video material.
- **VOICE OVER IP (VOIP):** This feature allows two-way speaking so that participants can speak to the presenter.

As a practical matter, enterprise-grade packages allow selective unmuting of class members, one at a time.

Several products have a "hand up" signal activated by class members, visible to the instructor, who will then know who wants to speak.

▪ **WHITEBOARDS AND ANNOTATION:** Instructors can emphasize certain parts of a presentation and also draw diagrams or equations in a whiteboard window. In some products, the instructor can "hand" the drawing tools over to another presenter. This allows for the use of guest lecturers or even student presentations of projects (if that student has been granted presenter or panelist privileges).

▪ **REMOTE DESKTOP VIEWING:** Students can see the instructor's desktop along with applications that are relevant to the class.

Both educational and commercial webinar products can record live sessions. In many ways, the recording of webinars increases their value.

Integrated into the learning management system, they become available as review resources for students who participated live, or as an initial viewing program for self-pacing students. Either way, recorded webinars, like captured lectures, become their own educational asset, useful for flexible time/flexible place virtual learning.

Enterprise-class webinar software is not difficult to use, but it does require some operator training. Experts advise rehearsing the presentation if it involves multiple elements. For example, the polling feature, in which the entire class is asked a question, requires active screen management.

From a technical standpoint, K-12 school districts should look carefully at the bandwidth requirements of webinar software if some students are using a dial-up connection. Some packages are optimized for limited bandwidth. Most collegiate campus settings today offer high-speed Ethernet connections in classrooms and dormitories, but off-campus class participants may have lower-speed connections.

Webinar products come in two or three sizes, depending on the anticipated capacity of the class. Less expensive and relatively simple in terms of features, the smaller products tap out at 15 or 20 participants. More elaborate and expensive products can handle up to 1,500 live users.

A simpler product is more than adequate for, say, offering a course in speaking Mandarin Chinese to a handful of rural students whose local district doesn't offer that language option. On the other hand, for a first-year economics section, look for a product that can handle large groups.

Pricing options vary greatly. Many organizations use webinar software as a service (SaaS), hosted by the provider, with users paying per session or per month. Educators may find it advantageous to purchase the software and host it on their own infrastructure where it can be customized.

An emerging third option is third-party cloud hosting of purchased, licensed copies. Providers offering this option point out that within the cloud provider's infrastructure, the educational institution can have dedicated "tenancy," meaning that the software is physically located in a specific data center within the provider's cloud.

The geographic location or locations may be chosen to optimize delivery speed. Cloud hosting preserves the customizing capability because the institution owns the software license.

Interactive Web Conferencing

Virtual learning skeptics often say that nothing can ever replace face-to-face teaching. Interactive web conferencing is addressing that argument by incorporating a variety of technologies that dramatically increase the sense of presence and group interaction in virtual learning.

In effect, each class becomes an event in which participants can hear and, increasingly, see one another. If the webinar is the basic foundation of virtual learning, rooted in the standard, one-to-many teaching technique, then interactive web conferencing is the architecture of the 21st century collaborative classroom layered on top of that foundation.

Several functions characterize this mode of virtual learning. Full interactivity heads the list. While webinar approaches are oriented toward the presenter, full interactive web conferencing opens up a session to both student-to-student interaction and more open communication between students and instructor. That's why web conferencing software is also called virtual meeting or immersive software.

Web-interactive learning systems incorporate multiple modes of communicating: text/chat, voice or full multipoint video. In combination, they can create environments that appeal to a generation of learners for whom social interaction comes naturally.

More important, when deployed skillfully, web-interactive platforms remove much of the "distance" from virtual learning so that teachers and professors can teach, and not merely deliver material. In live sessions, interactive web conferencing can raise the level of engagement and ultimately improve learning.

What this means is that once the technology is in place, interactive web conferencing can deliver the types of learning experiences that were once available only to onsite students. For example, it can support short, intensive one-on-one sessions between teacher and student, or among students themselves.

It makes possible regular meetings outside of online classroom times, such as professors offering office sessions, or teachers in K–12 districts being able to not only talk to parents, but also show them materials without the need for travel.

Web interactivity also can blend virtual and in-class learners in the same session in a more integrated fashion than can webinars or classes conducted while the lecture capture system is running. Assuming that in-class students bring notebook computers or smartphones, it's possible for them to see the virtual learning participants and vice versa.

Besides integration, interactive web conferencing encourages collaboration. Some packages let participants contribute materials of their own that they've found through online searches. As one expert put it, a group of virtual students in a given class could collaborate under the teacher's guidance to build a rich, multimedia custom textbook. That resource then becomes available to subsequent classes, who can in turn edit and update it.

Students who have an impairment of some sort (such as limited mobility or sight) also can avoid the difficulties and expenses of daily travel, yet enjoy a sufficiently rich online experience to avoid, or at least mitigate, a sense of isolation.

Many interactive web conferencing platforms vie for market share, in part because online events are becoming a preferred mode of communication by the business marketing field. Some packages are optimized only for business or for tradeshow functionality. It's important to find one with a track record in online and virtual learning. The most up-to-date packages include these features:

- **MULTIMEDIA:** Available web conference packages (also called virtual event platforms) incorporate audio, video, downloads, text and even specialized tools such as 3D modeling.
- **INTERACTIVITY:** This feature is especially useful for letting students collaborate with and ask questions of one another, either during live classes or later in review sessions. Packages often borrow the features of popular social media sites to let students see who else is online,

post questions, or send links and other materials to one another.

- **WIDE RANGE OF COMMUNICATION CHOICES:** Instructor, guest instructor and students can communicate with recorded video, standard presentations and live speech. Desktop video conferencing, which takes advantage of the camera found in nearly every notebook and mobile device, is becoming increasingly useful.

Some packages let the instructor switch from their own camera to that of a student speaker so that the class can see who is speaking. An accompanying push-to-talk button on class members' interfaces triggers a signal to the class leader. Platforms may also include voice authoring, voicemail, podcasts, embedded voice material within course pages, and even group discussion and debate.

The Vital LMS

Every school is a candidate for a learning management system (LMS). In school districts and at colleges and universities, the LMS is equivalent to the enterprise resource planning (ERP) system in a manufacturing or other commercial organization. It ties many administrative functions together into a single environment, and it also can house and serve up virtual learning course components.

Some learning management systems are built using open-source tools. The market also supports several proprietary products that, because of their widespread use, constitute a kind of standard. Some industry consolidation has occurred in the past year, strengthening the market position of the acquiring companies.

In any case, the LMS, as the central piece of virtual learning plumbing, should scale to accommodate current and expected users. Most systems on the market can support 80,000 or more user accounts. The LMS has links to the administrative end of school operations, letting instructors track student progress and create groups.

It can also house collaboration services, such as video conferencing and live rooms for one-on-one teaching or mentoring. LMSs are also capable of serving up calendars, notices and announcements, and offer students access to their own progress reports and grades.

Properly configured and populated, the LMS can help an institution move toward a student- and learning-centered model and away from the traditional administration- and teacher-oriented setup.

Learning management systems are site-licensed, and hosted either by the school or by a third-party cloud. Some LMS providers also offer their own hosting in a software as a service (SaaS) model.

- **CUSTOMIZING BY INDIVIDUAL USERS:** The latest platforms are highly flexible and let students import their own content into the session. With some packages, the look and feel of the framework in which the meeting takes place is customizable.
- **CUSTOMIZING BY THE INSTITUTION:** A school can replace the generic appearance of a web conference with one that reflects its own physical presence or colors. The platforms let educators simulate a range of venues such as a large auditorium or a small lounge.
- **INTEGRATION WITH OTHER CAMPUS OR SCHOOL RESOURCES:** Look for integration with the learning management, enrollment and student management systems. The face-to-face quality of the online interactions can extend to sessions beyond the class. Many professors and teachers post and hold virtual office hours for which students can schedule appointments.

Developing Courses

If it takes a village to raise a child, then it takes a team to develop an online course. For some classes, loading a series of captured lectures, handouts and a list of assignments into the learning management system will suffice.

But that approach can fail on two counts. One, it's unlikely to provide an engaging experience for students (boredom online is no better than boredom in a classroom). And two, it ignores the range of possibilities inherent in the medium, including immersive multimedia, collaboration and social media, and the chance to fuse a variety of source materials into a unique and engaging textbook.

Using out-of-the-box learning management systems, with their standard templates, is another limiting factor to an educator's thinking. Course development becomes an exercise in filling out the template.

Ideally, course development requires a structured methodology. The best outcomes result from a step-by-step approach as opposed to an overly complex or fussy process. In general, successful course development will follow the following five steps.

1. DETERMINE THE OBJECTIVE. What is the goal of the course? What are the takeaways you want for students? This step includes developing the syllabus, weekly (or daily) objectives and outlining what content is required to fulfill the goals.

Even before this step occurs, the school must decide exactly what courses to create or render online. It might build its virtual learning curriculum around resources it

does not have but can obtain remotely, such as specialized instructors. Or it may choose courses for which demand exceeds seats or physical schedule limitations. It may also concentrate on courses common to more than one academic major.

Another challenge is dealing with the leadership of traditional departments who may want to add virtual learning or blended learning courses to their curricula, but may react negatively to the longer lead time required to develop online courses. Knowing what courses to develop and then developing them on time will depend on healthy internal lines of communication.

2. CONCEPTUALIZE THE COURSE. This often requires collaboration among professors and teachers, other subject matter experts, writers and editors, and programmers and instructional design experts. During this stage the team considers technology, such as whether to incorporate remote video teleconferencing, and how all the elements will fit together from an experiential or usability standpoint.

3. CREATE THE COURSE. In this stage, the elements are written, assembled, programmed (whatever is required by the medium of delivery) and plans are completed for how all the elements of the course will work together, and how students and faculty will interact with the finished product. Lecture notes, slides, study guides, assignments, quizzes and textbook elements are all built in at this stage.

The type of development and the style of the course that results also depend on how teachers and students will use it. Virtual learning encompasses a wide range of delivery models, ranging from canned, downloadable courses that are taken at the student's own pace to real-time, synchronous classes where everyone is learning simultaneously.

In the middle are shades of mentored learning, where teacher involvement ranges from occasional check-ins via e-mail to intensive and frequent interaction using voice or video. The desired level of interactivity is an important component in determining the complexity and cost of the development.

4. RUN A TEST. When assembled, does the course hang together? Is it sufficiently user-friendly, and does it work logically? Often, testing requires volunteer students and the faculty who will deliver the live course. This is the stage when instructors can become proficient at delivery, and where help desk people are notified, if applicable, so they are ready.

Instructor training is necessary at this point, even if, as the

subject matter expert, the instructor was involved in the course development. Online content delivery, managing the class and even lecturing itself are different for an online course compared to teaching before a live class. To augment training available to the campus staff, find a low-cost, online course to familiarize faculty with the operation of up-to-date interactive web conferencing systems.

5. GO LIVE AND GATHER FEEDBACK. Measure usability metrics, navigation patterns and time spent on various features to see how they map to the original class goals and to find clues for any modifications that may be required.

Who does the work? Course development teams typically consist of the subject matter expert (usually the teacher or professor), multimedia and programming people, and writers and editors. Instructional design professionals will tie all of the elements together.

Some organizations possess all of the talent they need in-house. But many, either because of limited resources or for the flexibility and expertise that a third-party can offer, choose professional services firms to help with course development.

Consultancies offer a range of services, including course design, writing and editing, programming, and production. Their services may be purchased on an a la carte basis, and may include onsite staff augmentation.

Consultants may also offer specialized skills in developing courses using authoring environments such as the Sharable Content Object Reference Model, or any of several proprietary authoring tools (see *Authoring Tools: Where the Magic Happens* sidebar) tailored for e-learning applications. Keep in mind that reusability of course components depends on how they are initially developed.

Finally, organizations should consider outside help for emerging technology trends in virtual learning. One of the biggest trends today is mobility, especially deploying textbooks and other materials to e-readers. Manufacturers can help, as can peers who have had experience deploying the new technology.

Ultimately, virtual learning both reflects and advances how people eventually will work in the world. In the near

term, expect delivery systems to reflect many of today's important work trends.

People are establishing meaningful, collaborative relationships via social media with others they may rarely, if ever, see in person. They increasingly expect to learn, work and interact from anywhere using portable devices. And they are active participants in their own learning, receiving information from teachers, but also creating their own learning materials and working with colleagues in peer-to-peer relationships. This means instructors are increasingly mentors and facilitators as opposed to lecturers at the center of the classroom.

Authoring Tools: Where the Magic Happens

Virtual learning courses are often a compendium of many elements: text, slides, video, audio and graphics. If the organization wants to reuse components from course to course, it will need to make sure that all of the components work with one another.

Some content developers turn to authoring packages based on the Sharable Content Object Reference Model (SCORM). The model is a set of specifications for developing educational objects. Its goal is to produce objects that are interoperable with one another and with learning management systems. The SCORM specifications aren't true standards in themselves, but they reference existing industry standards.

The SCORM interfaces and standards are maintained by the Advanced Distributed Learning (ADL) initiative, part of the office of the Under Secretary of Defense for Personnel and Readiness. But the ADL has numerous partners in government, academia and the private sector.

Several software manufacturers offer SCORM-compliant tools in value-added products that ensure content developed will work in web browsers, are described by metadata, and are structured for sharing and use by a learning management system set to accept SCORM objects.

Also on the market are several proprietary content-authoring tools tailored to turn certain types of content (for example, PowerPoint slides or video, or Adobe PDF files) into e-learning modules.