

WHITEPAPER

Venkat Srinivasan

WEB 2.0/3.0:

Emerging Widgets and the Next Generation
of Higher Education Applications





ABSTRACT

The emerging generation of students is reared on unprecedented forms of collaboration that have redefined the way students retrieve, capture, and exchange information. Businesses have already seized opportunities to leverage this powerful transformation in innovative ways, and their expectations of students' abilities to perform in technology-based environments are increasing. This puts enormous pressure on colleges and universities to integrate new and evolving technologies into their academic programs that will improve student learning and prepare them for a dynamic, collaborative, and digitally-mediated world. With the tools and insights presented in this white paper, colleges and universities will be able to tap into Web 2.0 and evolving widgets in revolutionary ways.

This paper will help administrators:

- Understand the fundamentals of Web 2.0
- See how Web 2.0 is taking shape in institutions of higher learning today and the implications of future development
- Explore ways to implement Web 2.0 technologies into current academic applications
- Leverage Web 2.0 and rich media tools to attract, retain and prepare students for employment
- Position institutions as leaders in the higher education sphere by cultivating revolutionary learning environments

Administrators will learn how to harness the power of Web 2.0 and learn transformative ways to boost enrollment, increase retention, attract positive attention from the brightest minds and professional organizations, and give students quality, hands-on experiences that improve learning— all amidst shrinking budgets and rising economic concerns.

Download this whitepaper now to see how your institution can integrate critical technologies that will cut costs, boost retention and ROI, and become a powerful force in the field of higher education.



INTRODUCTION

The past decade has transformed the way we view and interact with technology. The numbers alone are staggering: 160 million people use MySpace,¹ membership on Facebook surpasses 250 million people,² more than 10 million users contribute to Wikipedia,³ and 175,000 blogs erupt daily.¹ Clearly, information sharing and collaboration via rich media is reshaping the lives and behaviors of millions of people—and in no demographic is this more evident than today’s youth. In fact, nine out of ten students will be regular users of social networking sites prior to entering college,⁴ and 99.7 percent of current university students use a mobile communications device.⁵ The shift is undeniable: student demands for learning experiences based on interactive medias are rising almost exponentially. In other words, the communication paradigm has changed, and in order to remain viable and effectively reach the next generation of learners, it is imperative that institutions of higher learning evolve along with it.

The shift is undeniable: student demands for learning experiences based on interactive medias are rising almost exponentially.

By integrating Web 2.0 applications into standard curricula, colleges and universities can harness and capitalize off the power of today’s technologies. Several have already tapped into the early incarnation of these trends, including distance-based learning and Web-based classroom instruction, and still others are implementing social networking, wikis, and blogs into a variety of learning experiences—with advantageous results.⁴

This whitepaper demonstrates the enormous value of applying Web 2.0-based technologies and emerging widgets to academic program development. Colleges and universities that integrate these tools into course content will flourish in today’s knowledge-based economy by attracting and retaining more students, engaging with them in revolutionary new ways, and preparing them for success in an increasingly digitized workplace.

Web 2.0 is a *mindset*. It is the understanding that innovation is predicated on leveraging collaborative technologies where people can build, exchange, and improve information and ideas. In essence, Web 2.0 is more than the sum of its parts.

WHAT IS WEB 2.0?

Coined by O'Reilly and MediaLive International in 2003,⁶ the phrase Web 2.0 essentially encapsulates a set of collective intelligence comprising interactive media experiences that allow people to create, share, modify, build, collaborate on, and disseminate information. *Active* user participation is really the nexus of Web 2.0, which is differentiated from the "read-only" medium of "Web 1.0."¹

This image provides a conceptual illustration of Web 1.0 versus Web 2.0:

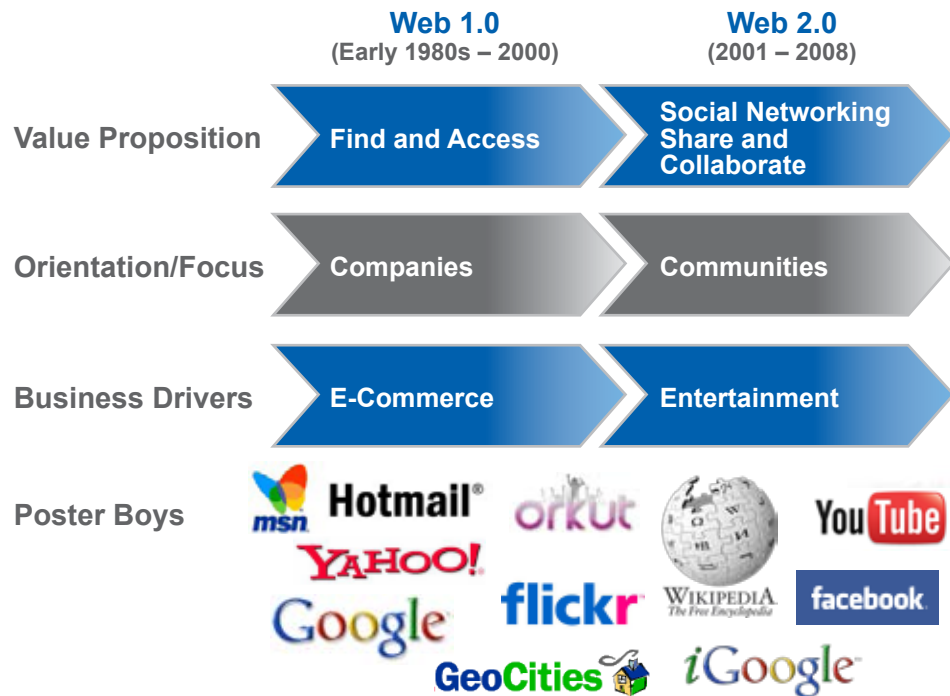
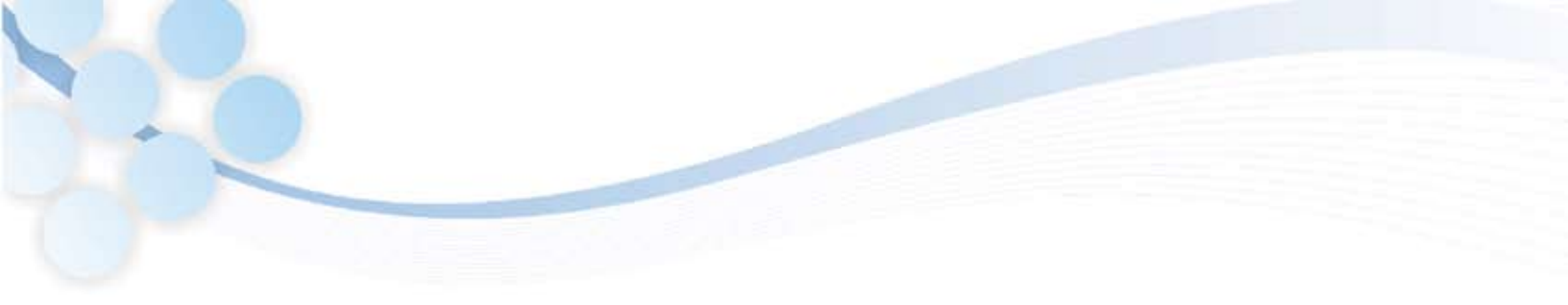


Figure 1



Regardless of this explosive growth in the business sector, students are found to lack adequate technology-based skills—at least those that meet employer expectations.

There is, however, a more apt way of looking at Web 2.0, namely: Web 2.0 is a *mindset*. It is the understanding that innovation is predicated on leveraging collaborative technologies where people can build, exchange, and improve information and ideas. In essence, Web 2.0 is more than the sum of its parts. And it's growing—fast. According to one McKinsey study, "Spending on [these technologies] is now a relatively modest \$1 billion, but the level of investment is expected to grow by more than 15 percent annually over the next five years, despite the current recession."⁷ Another source suggests that "The mushrooming of Web 2.0 technologies coupled with employers' heightened understanding of how to use these tools to find and hire attractive employees promises to radically reshape the recruiting landscape."⁸

Regardless of this explosive growth in the business sector, students are found to lack adequate technology-based skills—at least those that meet employer expectations. Of the 217 employer respondents in the 2006 *Ready to Work* survey, 75 percent reported that they have a high need for training in *Leadership, IT Application and Teamwork/Collaboration* skills, and 67 percent expressed a high need for *Creativity and Innovation* skills.⁹ According to the more recent 2008 *Workforce Readiness Training* survey, 22 percent of employers report that two-year college graduates are deficient in these areas, and 17 percent cite graduates of four-year institutions as deficiently prepared.⁹

"Web 2.0 applications will continue to evolve, making the process of change much more complicated," and, "not changing to meet student needs can result in students going elsewhere."

Clearly, employers expect students to come equipped with real-world knowledge that leverages the power of these technologies. Thus, the onus is on institutions of higher learning to not only grasp the power of Web 2.0, but to begin implementing these technologies into regular curricula—and quickly. As John Thompson, assistant professor in and the coordinator of the educational computing graduate program at Buffalo State College so aptly puts it, "Web 2.0 applications will continue to evolve, making the process of change much more complicated," and, "not changing to meet student needs can result in students going elsewhere." By integrating Web 2.0 now, colleges and universities can attract, retain and produce more qualified students that meet next-generation demands.

TEACHING AND LEARNING IN WEB 2.0 TODAY

According to the U.S. Department of Education, students who have engaged in Web-based instruction formats have higher test scores than those who have been taught via traditional academic vehicles.¹⁰ Granted, this study focused on K-12 education, but the implication that Web 2.0 technology integration boosts knowledge retention—or at the very least, performance on exams—cannot be easily dismissed.

Consider the following illustration of using Web 2.0 tools in education:

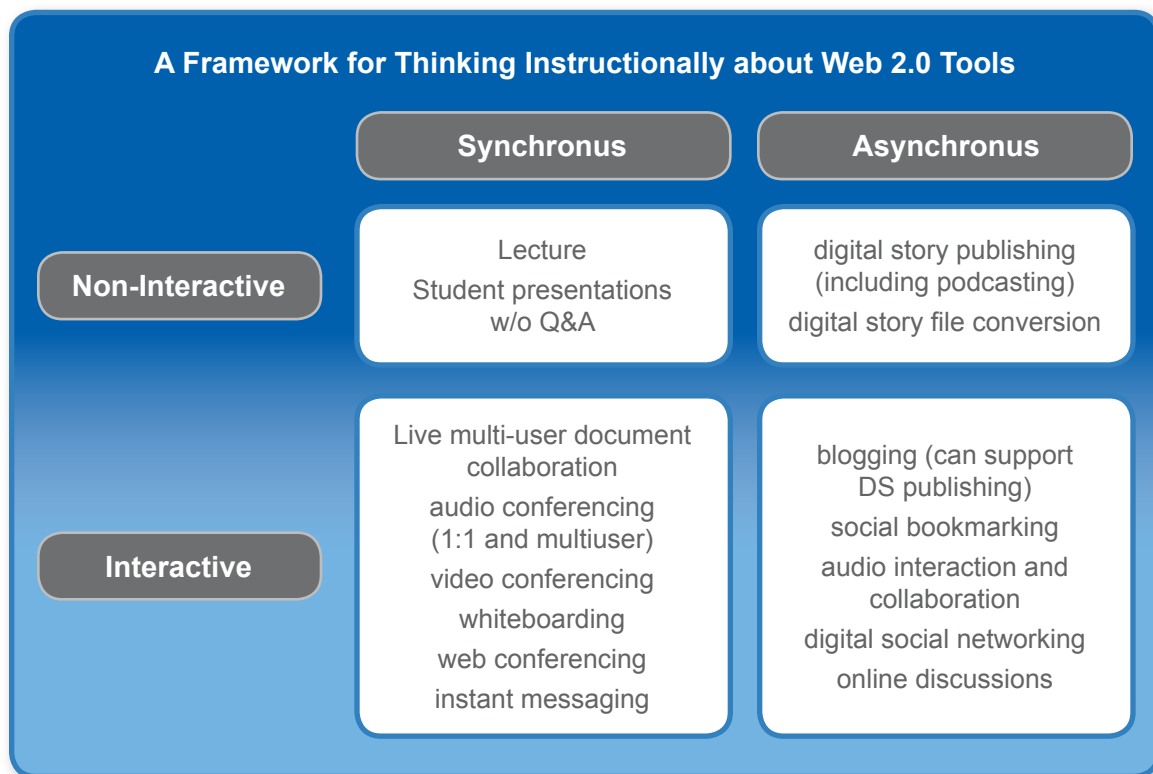


Figure 2

This image highlights the fact that Web 2.0 tools enable asynchronous, interactive learning experiences—which have been shown by studies to increase knowledge retention.¹¹



Below is an overview of the main benefits provided by these applications:

Sharing

Students and faculty can quickly share information, including lecture content, class updates, and other education-related content via:

- Social networking
- Discussion forums
- Blogs
- Interactive medias such as video-sharing tools

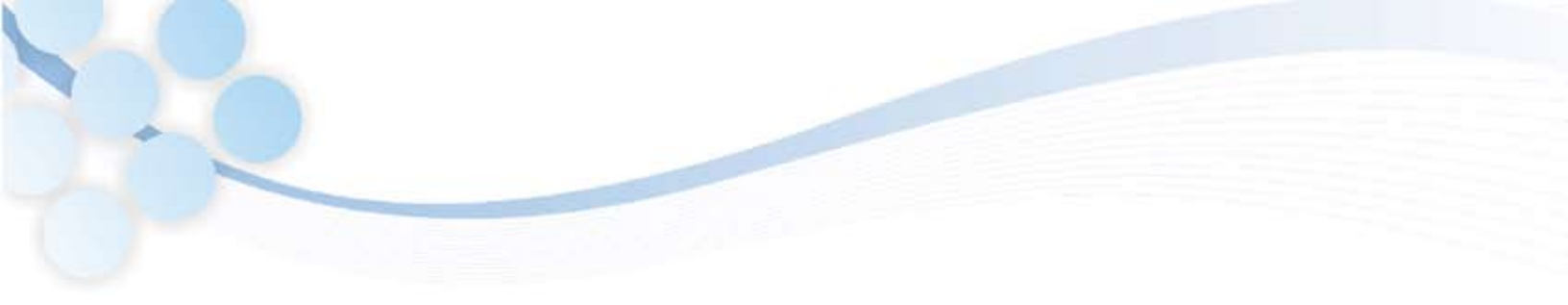
These tools facilitate increased conversation and participation, which, in turn, enhances creativity by allowing the best ideas to surface and continue to evolve as participants shape and refine them. One case in point involves a group students that have been able to write, film, edit and upload videos through Web 2.0 applications which are now seen by thousands of viewers—audiences in scale that rival some commercial films. “Ah,” an animated short created by students of the Supinfocom University in France, was uploaded to various video-sharing portals, including YouTube. This site alone garnered more than 323,000 hits.^{12,13}

Collaboration

Part of harnessing the power of the increased exchange of information provided by Web 2.0 requires giving users the ability to improve upon an “information cloud.” By using applications such as wikis, students will gain an unparalleled opportunity to build and participate in personal learning networks and communities of interest or practice—and will be able to take ideas to unprecedented heights.

Improved collaboration and participatory learning via technology gives students not only the advantage of hands-on learning that increases knowledge retention and prepares them for real-world applications, but also delivers the technological skills necessary to thrive in today’s workforce.

Improved collaboration and participatory learning via technology gives students not only the advantage of hands-on learning that increases knowledge retention and prepares them for real-world applications, but also delivers the technological skills necessary to thrive in today’s workforce. Some colleges and universities have taken note of these benefits and launched Web 2.0 applications and widgets into their curricula.



The University of Michigan employed mashups—a Web application hybrid that allows for various widgets and data technology to work harmoniously—to provide students with real-time maps and traffic information, including bus routes.¹⁴ While not directly integrated into curriculum-based applications, this example provides a preliminary view of ways which institutions can begin to harness Web 2.0 technology.

Several other examples are sprouting up all over the country: Penn State University uses text messaging services to inform students of education-related announcements; Berkeley College deployed Web-based kiosks to allow students to monitor meal plan balances and send dietary requests to the dining director; Buffalo State College uses RSS feeds directly on its homepage; and Columbia University began using wikis and blogs to help students craft and share research projects.¹

Perhaps one of the most well-known examples of academic-based Web 2.0 integration can be found in Duke University. In 2004, Duke deployed more than 1,600 iPods to first-years students as part of “a university initiative to encourage creative uses of technology in education and campus life.”¹⁵ These were used as tools for course content recording and dissemination, lecture and feedback recordings, and as study support aids, which facilitated flexibility and greater student engagement. Faculty reported that the use of the iPod “increased the level of energy in students’ weekly essays” and the university described a number of additional benefits associated with this endeavor, as outlined below:

Increased collaboration among campus technology and support groups Significant and unanticipated publicity ... that yielded many contacts, partnerships, and nascent collaborations with other higher education institutions, publishers, and hardware and software vendors Increased visibility for Duke’s institutional commitment to technology and greater engagement.¹⁵

The project proved so successful that Duke integrated this into a permanent part of its academic program, and launched the “Duke Digital Initiative” to research and implement more innovative, technology-based solutions.



THE FUTURE: EDUCATION 2.0—AND BEYOND

The future is teeming with opportunities to capture Web 2.0 tools that can dramatically refine, reshape, and revolutionize student learning. When integrated into standard curricula and academic programs, colleges and universities will realize enormous benefits, such as increased collaboration between and among students and faculty, inexpensive ways of employing experiential and hands-based learning that boost knowledge retention and prepare students for collaborative working environments, and position institutions of higher learning as leaders in innovation.

The following underscores the benefits that colleges and universities can realize by tapping into new and emerging Web 2.0 trends:

Improved LMS Functionality

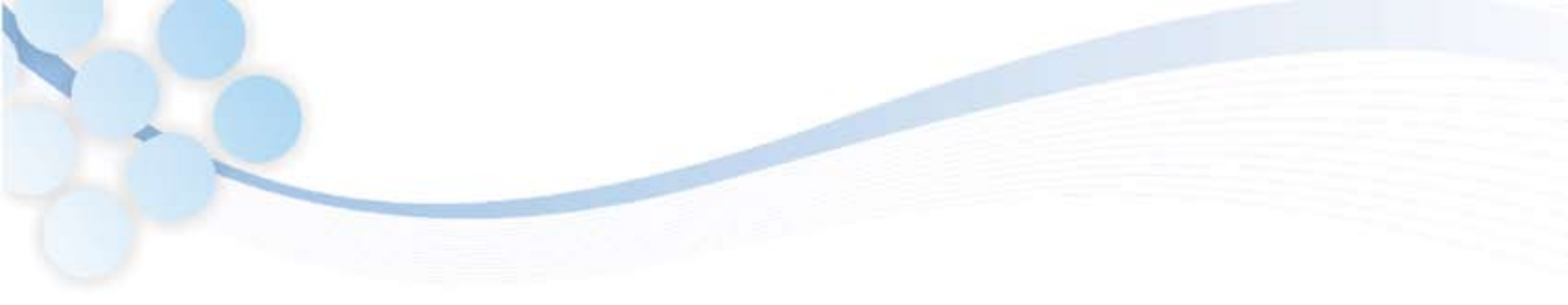
Colleges and universities can integrate cost-effective solutions that result in dramatic improvements to learning management systems. By increasing ease of access, institutions can promote greater participation, thereby increasing collaboration among students and faculty..This paper has already looked at ways which institutions have employed mashups, wikis and RSS feeds, but there are additional ways to leverage Web 2.0 technologies, including:

Widgets

Basically, widgets are portable sets of code that allow users to interact with information in a variety of ways. The iComb project, conceived by Leonidas de Oliveira Brandao and Alexandre Luis Kundrat Eisenmann at the University of Sao Paulo in March 2009, seeks to enrich and improve mathematical education via deployment of a family of math widgets.¹⁶ Acting like mini applications, these widgets will allow students to explore and digest math problems in conceptual formats, and enables teachers to evaluate and collaborate with students during online exercises.

Podcasting

Podcasting is a series of media-based audio files that can be accessed remotely. Jeffery Fray, Web Services Manager for Enterprise Applications in the Information Technology Department at Rice University, outlines the top five benefits that podcasting brings to colleges and universities as follows: disseminates important information to faculty to keep them in the loop; increases staff and student sense of community, thereby boosting moral; provides leadership and resume building opportunities for students; allows alumni to keep up with and participate in current events; provide visibility to and attract students considering application to a college or university, thus boosting enrollment.¹⁷



Many institutions of higher education have already deployed podcasting, and as one can surmise from Fray's analysis, there are myriad ways which colleges and universities can leverage this inexpensive technology to engage with students, faculty and the community as a whole.

3D Technologies

A striking example of leveraging Web 2.0 technologies into course-based applications centers on Second Life, which already emerging several leading institutions such as Harvard, Stanford, MIT, and UC Davis.¹⁸ Jean-Claude Bradley, coordinator of E-Learning at the College of Arts and Sciences at Drexel University, uses Second Life in Chemistry classes to help students conceptually understand molecular structures and interactions. He predicts that this virtual-learning vehicle will continue to amass interest in colleges and universities, suggesting that "On this platform—where anything is possible—the Library gets to explore new ways of supporting academic programs, research and student learning, limited only by the scope of the imagination."¹⁹

The Second Life in Education wiki presents a number of ways to employ Second Life in education, including architectural design modeling, language immersion, photography, criminal justice, vocational training, and business and commerce modeling. As the site suggests, "The unique qualities of a 3D virtual worlds can provide opportunities for rich sensory immersive experiences, authentic contexts and activities for experiential learning, simulation and role-play, modeling of complex scenarios, a platform for data visualization and opportunities for collaboration and co-creation that cannot be easily experienced using other platforms."¹⁸

Medical schools such as the Imperial College in London are currently testing out Second Life uses in student training.²⁰ One paper suggests that the "dry labs" used in education present exciting opportunities that can help colleges and universities improve student learning experiences without incurring the high costs of hands-on training: "What if online learners could go offline into a real science lab to perform the correct experiment and see how it works. High level scientific experiments could be conducted, and expert technical training could be obtained, in ways that a university or school could not afford (imagine splitting atoms, conducting surgery...flying a plane or exploring inhospitable environments.)"²¹

The image below depicts a Second Life virtual medical training lab:



Figure 3

Enhanced Content Management and Content Publishing

Trent Batson, an IT leader and former Chair of the Board of the Open Source Portfolio Initiative, may have said it best when he stated that, "some technologies take us away from ourselves (think cars and rush hour and road rage) and others bring us back. Web 2.0 is helping us rediscover our naturally cooperative, creative, and gregarious nature."²² That very spirit is what allows students to engage in more collaborative learning, and with vehicles such as content management and publishing sites, students can work together on research projects, photo essays, or group writing efforts in transformational ways.



ROADMAP: 6 WAYS TO INCORPORATE WEB 2.0 INTO COURSE DEVELOPMENT

Over the last decade, the learning paradigm has seen a shift from the behaviorist approach to constructivism, discovery and collaborative learning. Web 2.0 features provide the technological basis to implement these approaches.

While it's clear that colleges and universities must tap into these new and emerging technologies, it's important that they maintain a balance between freedom and control. The trick is in finding the right combination of Web 2.0 tools that underscore the educational initiatives of each college or university. To accomplish this, institutions will need to consider all of these solutions:

1. Blogs
2. Podcasts
3. RSS
4. Widgets
5. Wikis
6. Video Sharing
7. Mashups

1. Blogs

With the increased popularity of blogging, the trend toward using blogs in e-Learning is also growing. Blogging can be harnessed to impart learning in a variety of ways, particularly useful in the higher education sector where adult learners form the core of the learning community. In Web 2.0 course development initiatives, NIIT implements blogs to provide a unique space where a learner gets the benefit of both individual and collaborative learning. In a nutshell, blogs can be used as:

- **A collaborative learning environment.**
Blogs provide personalized web environments in which students can join discussion forums with their class or group, giving them greater flexibility of study. By allowing users to share and exchange ideas, or work together on a problem solving task, on a topic by posting comments, blogging helps to enhance learning and critical thinking skills.

- **A platform to share subject information.**

Teachers can use blogs to provide up-to-date information and commentary on subject areas, in addition to posting thought-provoking questions, assignments, supplemental coursework, and links to relevant news stories and websites.

Students from all fields will benefit from this kind of interaction. For example, journalism students can use photo-sharing to capture and exchange breaking news and events on the go.

- **An information center.**

Blogs are an ideal place for students and faculty to exchange questions and answers. Students can post queries that can be addressed by faculty and viewed by other students, and information can be archived online for easy accessibility.

Regular maintenance and updates foster an engaging and evolving open learning environment.

2. Podcasts

A podcast is a multimedia file (an audio or video file) that can be easily distributed over the Web and played on a computer or a portable digital audio device. This portability makes podcasts the perfect candidate for asynchronous delivery of information—*whenever* and *wherever*. Learners can subscribe to a podcast that gets downloaded to their devices and listen to them when it's convenient for them.

NIIT can help Schools and universities harness the benefits of podcasting in several ways:

- **Deliver short capsules on a topic.**

Because they focus on specific topics, podcasts can supplement defined coursework areas and reinforce learning in conjunction with traditional learning tools. Especially helpful in language classes, podcasts can give audible pronunciation cues. And video podcasts can deliver "how-to" instruction, such as ways to assemble a computer or construct architectural models.

- **Broadcast expert interviews.**

NIIT helps schools develop podcasts featuring guest experts that can be shared across the course or campus. The "anytime, anywhere" flexibility of podcasts not only provides more access to more students, but also gives schools a monetary advantage with a one-time investment versus conducting traditional interviews.

- **Post updates and announcements.**

Podcasts work on “push” strategy, which means that users do not need to go anywhere to access the podcast; the podcast instead makes itself available to the users. This feature can be used effectively by the schools and faculty members to post announcements, reminders, schedule changes, and updates to students—especially useful for and attractive to students who are busy working professionals.

- **Develop student presentations.**

NIIT provides strategies that help students produce visual and audio presentations. They can capture their fieldwork and assignments in podcasts and share it with other students and faculty members in dynamic new ways.

3. RSS

RSS (Really Simple Syndication) is a format for publishing frequently updated web-based content. It works by bringing together information from multiple Web sites on to a single page via an application called feed collector. This, in turn, regularly checks Web sites to which you have subscribed for new content, pulls it all together, and displays it on your page. Educators can harness this technology to provide holistic learning to students. As an example, educators teaching a course called “Emerging Technologies in Healthcare” can integrate several Websites and online resources to give student relevant and regularly updated content that fleshes out their knowledgebase. In addition, rather than having to evaluate separate online entries from students as part of their coursework, faculty can instead scan the posts of all the students on a single page, eliminating the need to visit each blog individually.

RSS feeds can also be effectively used by schools to send students:

- Important announcements
- Reminders
- Calendar events
- Coursework updates



4. Widgets

Widgets are self-contained applications used for displaying and updating remote data, which can be seamlessly integrated with and run on your Web page or desktop computer. Several Websites such as Britannica and Wikipedia provide a range of widgets that you can choose from to include on your page and the TeacherVision® Web widgets feature different content each day. Faculty can determine which widgets best suit the grade level and course needs for maximum effect.

Schools can also create their own widgets to share with students which can be used to:

- Share statistical data
- Relay updates on events
- Provide simple tools such as calculators, small image-editing applications, language translators, subject-specific dictionaries and glossaries, and more

5. Wikis

A wiki is an open-access Web site that allows multiple users to create, edit, and organize content collaboratively. Unlike blogs, Wikis enable you to edit information shared by other participants. Because of the voluntary participation in these open environments, these applications should be monitored by faculty to ensure quality and integrity of the content.

In traditional web environments, monitoring can be a daunting task as faculty needs to track and collate disparate information from several students. Wikis offer an ideal platform to facilitate collaborative work among students in a centralized location while maintaining faculty oversight.

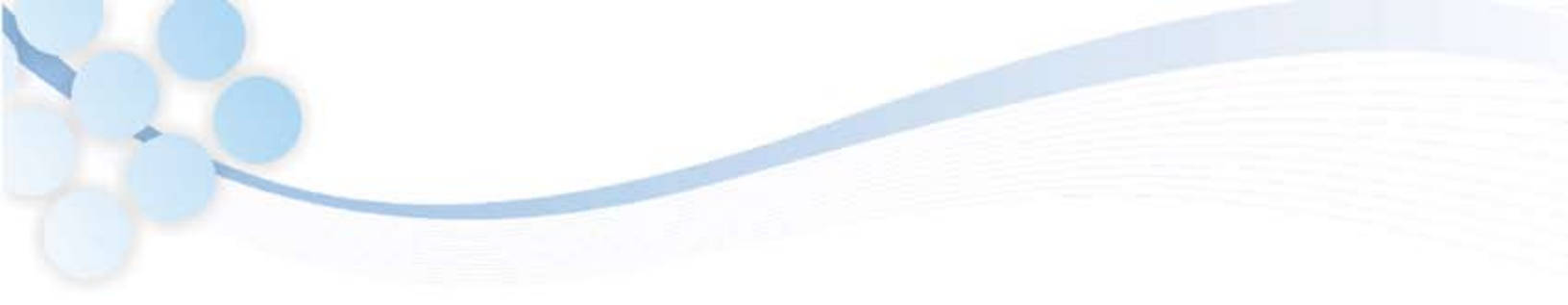
NIIT implements Wikis as a medium for students and faculty members to collaborate outside of the formal contact hours of a learning program. Faculty members can set up restricted-access wikis for students to carry out group assignments, develop a resource guide on a particular topic, or create a knowledgebase.



6. Video Sharing

Web 2.0 is witnessing an unprecedented surge in video creation, sharing and virtual campus integration. Video sharing sites, such YouTube and Microsoft's Soapbox, have opened new avenues for users to impart visual stories rather than textual ones. Academicians can also leverage this opportunity to augment existing content delivery strategies such as:

- **Creating "How-To" Videos:**
Audio-visuals can supplement and improve learning tools and knowledge retention. With a one-time investment, schools can reduce traditional expenses incurred by repeating lab exercises or demos by creating a repository of mini "how-to" demos, role plays, and "Do-It-Yourself" videos that can be easily accessed by and shared with students.
- **Recording Classroom Sessions:**
Several schools run both "on-ground" and "online" classes. Online students can benefit from the lectures delivered in an on-ground class if a video is recorded and shared. Videos of specific summaries of sessions can act as reinforcement for learners to review later.
- **Producing Guest Lectures:**
Special interviews by guest speakers and subject experts from far-off locations can be recorded in videos and shared with students at a convenient time. Similar to podcasts, the "anytime, anywhere" flexibility of video sharing provides access to a larger student base and the relative low-cost gives schools a monetary advantage.
- **Capturing Student Projects:**
Students can create their own videos with cell phones and digital cameras and share them with others through video sharing sites, wikis or blogs. Faculty can assign students video-related tasks for developing class projects that involve presentations or "How-To" demonstrations. Students can then participate in a discussion, and questions and comments from audience members can be captured by providing a review or comment space.
- **Distributing Content Automatically:**
Video sharing used in tandem with RSS feeds can enable users to regularly obtain videos to which they have subscribed.



All of these tools can be harnessed by institutions—but only if they are carefully selected and used in combination with each other based on stakeholders’ requirements. Each tool is unique and thus calls for a comprehensive, customized solution that not only extends the existing pedagogy and improves learners’ experience, but also offers a cost-effective business proposition.

CONCLUSION

The transformation to Web 2.0 integration won’t always be easy. Colleges and universities will have to take a good, hard look at current organizational structures and determine how hierarchical chains can be broken with carefully selected Web 2.0 tools that facilitate open, integrated channels of communication and learning. This will open the floodgates for innovation, allowing colleges and universities to tap into the power of Web 2.0 and harness it in ways that revolutionize the way they run, the way their students learn, and the way they are perceived by other institutions, businesses, and emerging generations. It’s not the technology, the tools, or even the content that defines what students will walk away with upon graduation. Ultimately, it is the way that they learn and how they are able to apply that knowledge that will redefine knowledge-based organizations, businesses, and the world in which we live. Web 2.0 is no longer a wave of the future; it is the regeneration of teaching and learning that’s central to our lives today—and it’s up to colleges and universities to seize its potential.

To learn more about Web 2.0 Learning Solutions for Higher Education, please visit:

- <http://niit.com/LearningSolutions/Learning%20SolutionforHigherEducationInsituations/Pages/SalesTraining.aspx>
- <http://niit.com/LearningSolutions/Learning%20SolutionforHigherEducationInsituations/Pages/PartnerEducationOutsourcing.aspx>



ABOUT NIIT

NIIT's Enterprise Learning Solutions Company delivers innovative strategies that help clients accelerate business impact. Our clients count on our Managed Training Services specifically in the areas of advisory and learning services, technology tools, and custom content to optimize their learning organizations and to improve time to performance for employees, customers and partners.

We use cutting-edge instructional design and our Critical Mistake Analysis method to deliver award-winning solutions, technology and services. Together with our subsidiaries, Cognitive Arts and Element K, our Global Talent Development programs help clients achieve real-world skills to better compete in today's market.

Established in 1981, NIIT is known globally as the number one choice for strategic learning solutions. We proudly partner with the world's leading education, technology, publishing and Fortune 500 companies. NIIT has won over 40 awards, including 12 Brandon Hall awards.

ABOUT VENKAT SRINIVASAN

Venkat Srinivasan has over 15-years experience in business strategy, new business development, strategic relationship management, and operations in the education and training industry. His insight into the business of higher education, and experience designing and developing learning and student retention solutions for institutions truly set him apart from others in his field. Venkat started out as part of the NIIT faculty, and went on to design and develop various new programs, including increasing student retention and reducing attrition rates by 50%. Venkat now works as Vice President for NIIT.

- Look out for his blog - <http://www.niit.com/highereducationblog/default.aspx>.



REFERENCES

1. Thompson, John. "Is Education 1.0 ready for Web 2.0 students?" Masternewmedia.org. 20 April 2007 http://www.masternewmedia.org/news/2007/04/20/web_20_takes_on_colleges.htm.
2. Arrington, Michael. "Facebook No Longer the Second Largest Network." TechCrunch. 12 June 2008. <http://www.techcrunch.com/2008/06/12/facebook-no-longer-the-second-largest-social-network/>.
3. Wikipedia. "Wikipedians." 21 August 2009. <http://en.wikipedia.org/wiki/Wikipedia:Wikipedians>.
4. Committee of Inquiry into the Changing Learning Experience. "Higher Education in a Web 2.0 World." May 2009. <http://jisc.ac.uk/media/documents/publications/heweb20rptv1.pdf>.
5. Ransford, Mark. "Survey finds smart phones transforming mobile lifestyles of college students." Ball State University. 25 March 2009. <http://www.bsu.edu/news/article/0,1370,-61565,00.html>.
6. O'Reilly, Tim. "What is Web 2.0." O'Reilly Media, Inc. 30 September 2005. <http://oreilly.com/web2/archive/what-is-web-20.html>.
7. Chui, Michael. "Six Ways to Make Web 2.0 Work." McKinsey Quarterly. February 2009. http://www.mckinseyquarterly.com/Six_ways_to_make_Web_20_work_2294.
8. Henricks, Mark. "Recruiting 2.0: How entrepreneurs are using social networking, blogging and other internet tools to hire the best employees." Entrepreneur.com. February 2009.
9. The Conference Board, Inc. "The Ill-Prepared U.S. Workforce." 2009. <http://www.conference-board.org/Publications/describe.cfm?id=1676>.
10. U.S. Department of Education. "Evaluation of Evidence-Based Practices in Online Learning." May 2009. <http://www.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf>.
11. Arnold, Julie. "Hands-on Learning for Freshman Engineering Students." Issues in Science and Technology Leadership. 2003. <http://www.istl.org/03-spring/article3.html>.
12. You Tube. "Ah, supinfocom student short." 7 October 2006. <http://www.youtube.com/watch?v=XnMOLZJnCt8>.
13. Ah le Film. "Ah." 2006. <http://www.ah-lefilm.com/site/>.
14. University of Michigan Parking and Transportation Services. "Magic Bus." The Regence of the University of Michigan. 2007. <http://mbus.pts.umich.edu/aboutus.php>.
15. Duke University. "Duke University iPod First Year Experience Final Evaluation Report. June 2005. http://cit.duke.edu/pdf/reports/ipod_initiative_04_05.pdf.
16. de Oliveira Brandao, Leonidas, & Kundrat Eisenmann, Alexandre Luis. "Work in Progress: iComb Project – a mathematical widget for teaching and learning combinatorics through exercises." IEEE. 16 March 2009. <http://fie-conference.org/fie2009/papers/1323.pdf>.

- 
17. Fray, Jeffrey Daniel. "Top 5 Podcasts at a University." 16 October 2006. <http://jdfrey.wordpress.com/2006/10/16/top-5-podcasts-at-a-university-5-faculty-information-dissemination/>
 18. Second Life in Education. "Educational Uses of Second Life." http://sleducation.wikispaces.com/educationaluses_page4#urban.
 19. Mesko, Bertalan. "How and Why to Use Second Life for Education." Science Roll. 19 September 2007. <http://sciencerooll.com/2007/09/19/how-and-why-to-use-second-life-for-education/>.
 20. Bradley, Jeremy. "Can Second Life help teach doctors to treat patients?" CNN. 30 March 2009. <http://www.cnn.com/2009/TECH/03/30/doctors.second.life/index.html>.
 21. Bidarra, Jose & Cardoso, Vitor. "The emergence of exciting new Web 3.0 and the future of Open Educational Resources." Universidade Aberta, Lisbon. 2007. <http://www.eadtu.nl/conference-2007/files/OER6.pdf>
 22. Batson, Trent. "Why is Web 2.0 Important to Higher Education?" Campus Technology. 15 April 2009. <http://www.campustechnology.com/Articles/2009/04/15/Why-Web-2.0-is-Important-to-Higher-Education.aspx>.