CLOUD-BASED TECHNOLOGIES: FACULTY DEVELOPMENT, SUPPORT, AND IMPLEMENTATION

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ABSTRACT

The number of instructional offerings in higher education that are online, blended, or web-enhanced, including courses and programs, continues to grow exponentially. Alongside the growth of e-learning, higher education has witnessed the explosion of cloud-based or Web 2.0 technologies, a term that refers to the vast array of socially oriented, free or nearly free, web-based tools, has represented a transition from institutionally-provided to freely available technology tools. This paper addresses the numerous teaching and learning opportunities and challenges that institutions face in adopting and implementing cloud-based technologies into their eLearning programs and provides a guide for forming implementation decisions.

KEYWORDS

Cloud-based, Web 2.0 technologies, implementation

I. INTRODUCTION

The number of instructional offerings in higher education that are online, blended, or web-enhanced, including courses and programs, continues to grow exponentially. According to a recent Sloan report on online education in the U.S., over 5.6 million students were taking at least one online course during the fall 2009 term; an increase of nearly one million students over the number reported the previous year [1]. The report also shows that the twenty-one percent growth rate for online enrollments far exceeds the less than two percent growth of the overall higher education student population and nearly thirty percent of higher education students now take at least one course online. Institutions are becoming more focused and experienced with e-learning delivery options and are learning how to more effectively support learners and faculty members in these environments.

Alongside the growth of e-learning, higher education has witnessed the explosion of cloud-based or Web 2.0 technologies [2], a term that refers to the vast array of socially oriented, free or nearly free, web-based tools, has represented a transition from institutionally-provided to freely available technology tools. For instance, in the past, institutions may have offered enrolled students server space to host a personal website or store instructional content. Now, students can use Google™ for those purposes and others, before, during, and after they are affiliated with any institution. Although offering many instructional opportunities, the emergence and proliferation of cloud-based tools has widened the gap between faculty member and student use of technology and has also presented some support and faculty development difficulties. This paper addresses the numerous teaching and learning opportunities and challenges that institutions face in adopting and implementing cloud-based technologies into their eLearning programs.

II. WHAT ARE WEB 2.O OR WEB-BASED TECHNOLOGIES?

Web 2.0 and other emerging technologies such as blogs, wikis, social networking sites, photo- and video-sharing sites, and folksonomies enhance e-learning programs. A recent study [2] of undergraduate student use of information technology found that about 25% of learners across all institutional types were engaged in the use of Web 2.0 tools including wikis, blogs, and social bookmarking, among others (see Table 1). Some students chose these tools for themselves, while instructors assigned others to them. Some learners reported using the tools for entertainment or socializing, an increasing number reported use connected with instructional activities, especially collaboration.

Web-Based Technology Use in Courses	Percentage Using Technology	Percentage of Users Using the Technology to Collaborate in Courses
Web-based word processor, spreadsheet, presentation, and form applications (Google Docs, iWork, Microsoft Office Live Workspace, Zoho, etc.)	36.2%	53.0
Wikis (Wikipedia, course wiki, etc.)	33.1%	30.7
Social networking websites (Facebook, MySpace, Bebo, LinkedIn, etc.)	29.4%	49.4
College textbook resource websites (Pearson, PrenticeHall, McGraw-Hill)	26.1	23.2
Video-sharing websites (YouTube, etc.)	24.3%	33.4
Web-based calendars (Google Calendar, etc.)	17.4%	NA
Web-based citation/bibliography tools (CiteULike, OttoBib, etc.)	17.2%	16.9
Blogs	11.6%	37.6
College study support (Cramster, Turnitin, Essay Checker, ShareNotes, etc.)	10.9%	NA
Photo-sharing websites (Flickr, Snapfish, Picasa, etc.)	5.4%	32.9
Micro-blogs (Twitter, etc.)	4.3%	40.2
Online virtual worlds (Second Life, Forterra, etc.)	1.4%	29.4
Social bookmarking/tagging (Delicious, Digg, Newsvine)	2.8	30.5

Table 1. Students Using Web-Based Technologies in Courses the Quarter/Semester of the Survey [2]

Web-based tools, in many ways, further support a trend that began with the emergence of the Internet: a shift away from large organizational control of the instructional function toward the individual user, both faculty member and learner. These emerging technologies, not necessarily created for higher education consumption, support and require individual creativity and autonomy and foster the growing trend toward user-generated content and knowledge in a way that many institutionally developed products do not. Part of the rapid proliferation of these tools in higher education can be attributed to their ease of use and the opportunity they present for low or no cost instructional innovation in a time of shrinking budgets. Faculty members and learners no longer need to wait for a learning/course management system to develop and implement a tool, for an institution to purchase a license to use images, or for a streaming media server because many of these needs can now be met externally through a variety of Web 2.0 tools.

Although thousands of these tools exist in the virtual world, several issues exist in actually implementing them in an instructional environment. Although implementation is not without its challenges, some important reasons may justify doing so. A recent report on 21st century skills identifies several areas relevant and critical to a service economy: creativity and innovation skills, critical thinking and problem-solving skills, communication and collaboration skills [3]. Over the last several decades, our industrial economy based on manufacturing has shifted to a service economy driven by information, knowledge and innovation. Further, to be effective in the 21st century, citizens and workers must be able to exhibit a range of functional and critical thinking skills, such as information literacy, media literacy, and information, communications and technology (ICT) literacy. The demand for these new skills can be connected to some of the affordances of Web 2.0 tools: active engagement, knowledge creation, independent learning, reflection, and innovation.

Many faculty members correctly assert that while today's students do in fact enter our institutions having had some exposure to Web 2.0 tools such as Facebook,™ they lack an awareness of how those tools can be used for learning. On the other hand, faculty members may have noticed that entering students have a heightened comfort level in existing in the type of digital environment that has the potential to be connected with learning. For instance, students tend to have a greater tolerance for figuring out, troubleshooting or experimenting with technology. They can deal with a trial and error approach to tool use and change in general and often have had a broad exposure to a variety of different web based software and hardware tools. All these affordances translate into several valuable skills and abilities that can be leveraged in the learning experience: problem solving, critical thinking and the ability to use a menu of learning options. And lastly, the burden to support students in the use of new technologies is reduced, making it possible to have experimentation and innovation in learning. Not unlike other skills that students bring to the learning experience, developing the skill to use emerging technologies for instruction merits the effort that is required to repurpose or harness them to advance learning.

One challenge is the sheer volume of tools that exist with no simple way to narrow the search process for a faculty member looking to select and implement one. This is especially true for the novice user who may not be familiar with the Web 2.0 vernacular. Generally, Web 2.0 tools can be classified into a few categories: communicative, collaborative, documentative, generative and interactive. The table below can serve as a preliminary organizer of the instructional purpose that these tools may serve.

Web 2.0 Tool Type	Instructional Purpose	Examples
Communicative	To share ideas, information, and creations	Blogs Audio blogs Video blogs IM-type tools Podcasts Video chat
Collaborative	To work with others for a specific purpose in a shared work area	Editing/writing tools Virtual communities of practice Wikis
Documentative	To collect and/or present evidence of experiences, thinking over time, productions, etc.	Blogs Videoblogs E-portfolios Wikis
Generative	To create something new that can be seen and/or used by others	Mashups Virtual communities of practice

		Virtual Learning Worlds
Interactive	To exchange information, ideas, resources, materials	Learning objectives Social bookmarking Virtual communities of practice Virtual worlds

Table 2. Web 2.0 Tool Classifications

As mentioned earlier, Web 2.0 tools were not primarily designed for higher education and certainly not as learning/course management systems (LCMSs), but some faculty members have identified tools that can address many of the commercial LMS functions and serve as portals to other tools otherwise not available. For instance, netvibes™ is a free web service that aggregates various media sources and online services such as blogs, news, weather, videos, photos, social networks, email and others. Another similar tool is Ning™, which allows for the integration of various social networking tools including a forum, blog and calendaring. In the past few years, higher education has experienced many changes in course management systems. Some systems have been acquired by other vendors as is the case with WebCT™ and Angel™. The increasing cost of commercial products has prompted many institutions to consider open source systems, which are usually implemented with the assistance of third party software development entities that support the development and modification of such systems. In recent years, the LMS landscape has become more diverse in response to the growing number of tools and systems available. Not only do each of these options have very different associated cost structures, but perhaps more importantly, they each have a broad range of control options. Table 3 below illustrates ways in which the three most common systems vary in their ability to be modified from their original configuration or setup, and the degree of support that the tool itself as well as users, both faculty members and students, need.

Product Type	Control/Modification Ability	Tool Support Level	User Support Level
Commercial Product (Desire2Learn, Blackboard)	Low/Low	Low	High
Open Source Product (Sakai, Moodle)	High/High	High	High
Web 2.0 Product (netvibes, Ning)	Low/High	Low	Low

Table 3. Learning/Course Management System: Adaptability and Support Considerations

As evidenced in the table above, there are significant pros and cons inherent in the more established course support options, perhaps shedding some light as to why web-based tools are becoming more popular in the higher education community. Despite their many benefits, however, web-based tools present some institutional challenges as well. In the past, faculty members and learners had few, if any, choices on how to create and manage a virtual learning environment. When the Internet first became available, early adopters created html web pages, but many others used nothing at all. Later, the emergence of the learning/course management system enabled less technologically savvy faculty members to create a virtual presence with little or no technology skills. Web-based tools, many of which are primarily used by experimenters and early adopters, place control of the learning environment with the individual user, both faculty member and learner. These tools present a diverse menu of teaching and learning options that are in the complete control of the individual who will be using them. Institutionally selected and developed products can sometimes alienate and confine the user to very limited instructional environments and possibilities.

Perhaps the most striking opportunity that web-based tools offer is for the learner, who has traditionally not participated in any decisions relating to their learning environment. Many tools empower and enable students to choose, virtually create, collaborate, share, network and publicize as they see fit, independently of an institution. For instance, by using the vast array of Google™ products students can work on documents collaboratively with other students, create personal websites, store content, and manage email and calendars. Another reason that students are increasingly exploring and using Web 2.0 tools and products is the portability that these options afford them. Over the course of an education a student will produce a significant amount of content, much of which they will likely want to reference while in their next educational course, program, institution, or place of employment. Many proprietary tools do allow content to be easily exported or removed, making the use of a non-affiliated or supported tool a desirable option.

III. FACULTY DEVELOPMENT AND CLOUD-BASED TECHNOLOGIES

A final, but critical consideration in selecting and supporting the use of Web 2.0 tools in any learning environment is to have a well-developed institutional faculty development program that includes some mechanism for quality assurance. Encouraging or requiring faculty members to complete some training before delivering a technology-mediated course, especially as it relates to the use and role of technology, is an important first step. If an instructor has taught in an online or hybrid environment for many years, she or he might be encouraged to participate in some form of course review process. An example of a widely used quality assurance process is Quality Matters. Quality Matters is a faculty-centered, peer review process designed to improve the quality of online courses and online components. This rubric as well as other similar locally-developed tools are designed to offer faculty members a systematic and comprehensive approach by which to review their courses and check for things such as the clarity of learning objectives, assessment and measurement tools, resources and materials used to support the learner, learner engagement, and technology used to support desired learning outcomes. Implementing quality assurance can be especially important in supporting faculty members to use Web 2.0 tools in a way that is aligned with their course objectives and closely connected to achieving student learning outcomes.

Locally hosting and implementing web 2.0 tools outside of a CMS is an option that provides the desired functionality with institutional support, privacy and control. Penn State's Educational Technology Services, for instance, support locally-hosted blogs, wikis, and podcasting services for teaching and learning. Arizona State University's implementation of Google Apps is another example where learners have access to iGoogle, Google's portal, in addition to applications including email, calendar, chat, sites, and docs.

Another possibility is to support learner use of Web 2.0 tools, while still using institutionally supported systems for course management. For instance, learners could be encouraged to use blogs to document their academic experience, study abroad trip, or reflect on coursework. Or, they could use wikis to support team-based learning, collaborative project work, or track and display their academic accomplishments as with an ePortfolio. Alternatively, social bookmarking and RSS feeds could be used to support student research.

IV. IMPLEMENTATION OF CLOUD-BASED TECHNOLOGIES: SUPPORTING INNOVATION

Before adopting any learning technology tool, Web 2.0 and others, institutions are well served to collect data about their students and students' use of technology. The EDUCAUSE Center for Applied Research Study of Undergraduate Students and Information Technology is a good example of a survey instrument that can be used or adapted to assess students' ownership of, use of, and skill level with information

technology, information technology and the learning/academic experience and their current use of web-based tools and other emerging technologies. Considering the increasingly greater budget portions that institutions are allocating to the support of learning and information technologies, it is critical to evaluate on an annual basis what existing tools and services, as well as future tools and services, need to be supported.

The rise of user-generated content and the ability to conduct teaching and learning functions outside of the institutional purview raises the importance of corresponding intellectual property issues that exist. Pre-eLearning intellectual property policies typically addressed ownership of traditionally copyrighted materials such as books, articles, and other conventional academic products. In an online environment, course materials take on a greater presence than in a traditional one. In a physical classroom, an instructor can meet with students and have no materials beyond class notes and a text, yet he or she can still deliver the course. In cyberspace, this becomes more difficult. Course materials begin to embody or encapsulate many of the processes of the physical classroom. In the digital setting, it is possible to unbundle course materials and realize the potential profit for each one separately or together as a package. Authority over instructional products and responsibility regarding development and maintenance spurred institutions to revisit existing intellectual property policies, especially those that did not address important emerging questions and conflicts in these areas.

Instructional control and production processes, especially in the online environment, have been transferred to the faculty and learners and away from the institution. As teaching and learning activity increased with the growth in hybrid and online delivery models, intellectual property policies changed to address and capture the new area of instructional product development. Online and blended learning delivery models have already changed the way faculty members and institutions regard ownership and control of instructional products, but the emergence and proliferation of Web 2.0 tools will surely spur on a second wave of institutional intellectual property policy reviews.

In the mid to late 1990s, institutions began to revise their intellectual property policies for several reasons. With the rise of eLearning, new markets emerged for digital instructional products, many that had no value or did not exist in the past, prompting colleges and universities to either develop or revise policy sections dealing with copyrighted materials, including software and instructional technologies. As a result of those changes, many of today's policies contain language that differentiates between digital and non-digital property and contains specific and substantial rights over these now economically viable products. Higher education institutions have generally advanced claims to the faculty's copyrightable intellectual products under certain conditions, which are commonly found in policy language. Some of this language originates in copyright legislation, such as "work for hire," which affords the employer ownership of the property created and, "within the scope of employment," which again effectively enables the institution to claim ownership of the property created. Other language addresses "use of institutional resources" or "substantial use of institutional resources," which furthers an institution's case for ownership and control. In fact, the often-substantial institutional resource contribution (instructional designers, programmers, and support staff) necessary to participate in some forms of eLearning is recognized and specifically mentioned in policy language. The intersection of intellectual property rights, specifically the area of copyright, and technology in higher education is the realm of eLearning, including distance education, digital repositories, and electronic courseware products. The emergence of Web 2.0 tools is likely to spur institutions to once again reexamine their intellectual property policies to ensure that they are addressing development in an online environment.

For the past few years, instructors have been incorporating cloud-based teaching and learning technologies into their courses, often with little or no thought about the privacy implications of having student work in an online, sometimes open, environment. Institutions and faculty members need to be cognizant of FERPA requirements and determine how to interpret them for their classes, as well as develop ways for instructors to structure assignments in such a way that supports course objectives and innovation.

The section of FERPA that is most relevant to instruction is the part that states, "generally, schools must have written permission from the parent or eligible student in order to release any information from a student's education record" (http://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html). Education records are currently defined as records that are directly related to a "student" and maintained by an "educational agency or institution" or by a party acting for the agency or institution (http://www.ed.gov/policy/gen/guid/fpco/pdf/ht12-17-08-att.pdf). When a student's work is posted online, a record of the student's work and involvement in the course is automatically created and thus may be subject to FERPA restrictions, depending on the institution's interpretation of what is "maintained" by the college or university. This is different from a conversation occurring in a face-to-face classroom, where the event is fleeting and not recorded and thus not part of an education record. Similarly, an assignment that is not submitted to the instructor or other party acting on behalf of the institution may not be subject to strict FERPA compliance since it never became part of the education record. Peer review, for example, may not fall under FERPA restrictions because the work is shared between students before it is turned into the instructor, at which point the review becomes part of a student's education record (see *Owasso ISD v. Falvo*).

It is important to note that FERPA is an obligation of the institution, not of the specific faculty member, given that case law does not provide an individual right of action. The consequence of a FERPA violation is a sanction by the Department of Education. Traditionally those sanctions have been in the form of an investigation and a warning letter to an institution found to be in violation. To date, no institution has suffered the more extreme consequence: a restriction on federal funds, including financial aid and grants. Thus, colleges and universities have cause to be vigilant about compliance. For the individual faculty member it is important to remember that he or she carries the weight of that obligation for their institution. While he or she may not be personally liable for a breach, the individual may be subject to internal sanctions within the institution if actions resulted in consequences for the school.

Institutional response and attempts to comply with FERPA, especially as they relate to instruction in online environments, vary significantly. Some are integrating online education into their FERPA training for faculty members and employees, such as the Colorado Community Colleges. They have integrated online learning scenarios into their FERPA training. Other schools have taken their policies further and created guidelines and student consent forms for faculty members to use. North Carolina State University has created a FERPA Privacy checklist for online course hosting, for example, which guides faculty members in the interpretation of FERPA in a web-based environment, while also providing examples of alternatives.

Several items should be considered in making the decision whether or not and how to support Web 2.0 tools. The following steps could serve as guide in forming implementation decisions.

1. Adopt an institution-wide data collection initiative addressing student and their use of technology for learning.
2. Assemble a local institutional team including individuals from the faculty, instructional technology or design, information technology, student body, and administration to collect information and make decisions involving support for faculty members and students around current instructional practice, Web 2.0 tools, and other emerging technologies.
3. Before launching initiatives, consult with and involve individuals who can advise and offer support around policy issues relating to intellectual property, FERPA, and copyright.
4. Periodically explore alternative solutions that can support the faculty and learners in the use of innovative and emerging learning technologies that exist within or can be integrated into an existing LMS product or by locally hosting an externally available Web 2.0 tool.

Technology, learning and information, continues to proliferate and raise costs in ways that make it challenging for faculty members and institutions to keep up. For these and many other reasons it is important to strategically select and support those technologies that are closely related to our core challenges and missions: student access, retention and learning. Regularly assessing the technology tools

and initiatives that exist will enable us to better understand the value of our investments and adjust our resources accordingly.

V. ABOUT THE AUTHOR

Prior to assuming her role as associate director for ELI, **Veronica Diaz** was the Instructional Technology Manager for the Maricopa Community College District, Maricopa Center for Learning and Instruction, the district's faculty development unit. In that capacity, she led learning technologies faculty professional development initiatives for the 10 colleges. She has also served as the Co-Principal Investigator of the Achieving Technological Literacy in Arizona for Students and Teachers, National Science Foundation Grant. Previously, she was responsible for the University of Arizona's, College of Management teaching and learning with technology initiatives, Principle Investigator of the HP Technology for Teaching Grant, and their Tablet PC Initiative. She also serves as Adjunct Professor at the University of Arizona and Northern Arizona University where she teaches various marketing, organizational development, technology, and research courses at the undergraduate and graduate level.

Throughout her career, Diaz has served on various statewide and national information and learning technology advisory boards and steering committees at 2- and 4-year institutions and professional associations that advise on technology policy, teaching and learning with technology, faculty development, higher education and information technology strategic alliances (mobile technologies, desktop computing, centers for teaching and learning), and technology master plans. Active in the field of online and hybrid learning and teaching innovation, Diaz is the co-chair of the EDUCAUSE Advisory Committee on Teaching and Learning and has presented seminars nationally on faculty use of instructional technology, blended learning delivery models, intellectual property policies for distributed learning environments, and emerging technologies.

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