ENVIRONMENTAL SCANNING REPORT

Technology & Student Learning

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The idea of a traditional higher education setting with faculty and students in a classroom, using little more than textbooks and the blackboard to learn has changed (Gumport & Chun, 1999, p.403). Students are entering universities never having known a time without computing technologies and the Internet. Students consider these technologies important to virtually every aspect of their life, from work to play. Because of their technology-savvy lifestyles, college-age students' behaviors, attitudes, and views about learning have changed (National Learning Infrastructure Initiative, 2004, p.6). Faculty and staff in higher education are exploring the challenges and possibilities of incorporating various technologies into the learning environment.

Executive Summary

- Educators are becoming increasingly aware that technology enhances student learning. Students today prefer the use of technology, not only to communicate, but in their coursework. This is evident with the growing use of course management systems (CMS) and other tools, which students generally have a positive experience with.
- Technological devices are transforming the delivery of education by providing students with more efficient forms of learning and expanded access to their courses. Additionally, social software and student learning technologies are growing in popularity. Incoming students are coming to campus with expectations about technology, and may in fact be more adept at using them than faculty and staff. Numbers of mediated classrooms are growing.
- Technology has changed the way in which students receive their education. Growing in use and reputation are online/distance education courses & programs. With this growing medium, educational providers are altering their program delivery and support strategies. Educational settings will have to contend with policy pressures concerning technology and the altering of their institution's infrastructures.
- Though the use of technologies in the learning environment is expanding, there is still an extant challenge to engage some faculty in taking advantage of these opportunities. Training and support issues for faculty, and for technology support staff, will likely increase.

Given these findings, it will be important for the University to discuss to what extent the adoption of these tools can enhance the student learning experience, and support faculty scholarship. Growing numbers of institutions are considering ways to integrate technology tools into their curriculum, and student expectations regarding how wired (or un-wired) their learning experience is appears to be rising. To what extent the adoption of these tools, and forays into distance education, impact the institution's mission need to be considered – as is the impact to an institution if it fails to compete

with institutions who are exploring these opportunities. The cost of implementing technologies like these – and maintaining them – is another important concern.

The following environmental scan presents data regarding technology and student computing that will affect student learning, academic programs, and administrative decision-making.

Students' Use of Information Technology

Today's students are "digital natives;" having grown up with technology they prefer teamwork, experimental activities, and the use of technology (Caruso, 2004, p.1). A 2006 EDUCAUSE Center for Applied Research (ECAR)[1] study revealed that 97.8 percent of the students surveyed owned a personal computer, while 38.3 percent of eighteen- and nineteen-year-old undergraduates own a desktop computer as well as a laptop. The study also showed that personal digital assistants (PDA's) are becoming increasingly popular, with 19.8 percent of undergraduates owning one. For students, the issue of access is increasing in importance, with students preferring broadband network connections because of their mobility and speed. A third of these undergraduate students own a wireless hub, while only ten percent use dial-up access. And these "digital natives" like to communicate using technological devices. Ninety-nine percent use e-mail and 80 percent use instant messages. Ninety-eight percent use an electronic device to form documents for class, ninety-four percent surf the Web and use online library institutions, and approximately 91 percent create presentations using a computer or other device (Katz, 2006, p.2-3).

Although today's college students are technological communicators, their level of skill can vary widely. The highest level of computing and technology skills appear linked to those in academic majors such as business and engineering. Overall, on a scale of one (*very unskilled*) to four (*very skilled*), students felt they had the most skill with e-mail (3.60), followed by instant messages (3.54), word processing (3.53), Web surfing (3.47), presentation software (2.90), online library resources (2.88), spreadsheets (2.86), CMS (2.83), graphics (2.45), creating Web pages (2.17), and creating and editing video and audio (2.07). However, student interviews indicated that students have just enough skills to accomplish class work with basic Office Suite applications, but do not have an advanced knowledge of how to use these applications (Caruso, 2004, p.4).

Overall, students appear to prefer courses that use IT to courses that do not. According to the 2006 ECAR survey, the majority of respondents (56 percent) prefer "moderate" levels of IT use in their courses. Only 2.7 percent prefer no IT use, 17 percent "limited" use, 19.5 percent "extensive" use, and 4.6 percent "exclusive" use (Curuso, 2004, p.4). Moreover, the study determined that a student's grade point average is "somewhat associated" with only non-demographic variables, such as the

[1] The study surveyd 28,724 students from 96 institutions about IT.

frequency of use of technology. Students who responded that they often use instant messaging or play Web games had a lower grade point average because their time outside of class was not being used to concentrate on their studies. These findings indicated that socializing and leisure activities were the major factors in students' underperformance, not the lack of their technology skills (Salaway et al., 2006, p.55-56).

The survey also found that students' experiences with IT in their courses were significantly positive[2]. Twelve percent of students "strongly agreed" and 52.4 percent "agree" that IT in their courses improved learning. Ten percent "strongly agree" and 30.1 percent "agree" that they are more engaged in courses that use IT. Twenty-three percent "strongly agree" and 45.1 percent "agree" that IT helps them perform better research for their courses, and thirteen percent "strongly agree" and 42.8 percent "agree" that IT allows them greater control of course activities. Although most students prefer technology in the classroom, 70.3 percent never bring their laptops to class, citing that the weight and risk of theft are major factors (Katz, 2006, p.4-5). Despite the positive relationship most students share with IT, barriers to IT use in courses exist according to 54.3 percent of students' surveyed in ECAR's 2004 IT study. Of this percentage, 16.7 percent feel it is "like extra work," 14.1 percent complained "the applications don't run on [their] computer," 13.4 percent have a "lack of access to printers," while 9.7 percent cited a "lack of technical support" (Caruso, 2004, p.4). Student's use and preference for IT in the academic arena is expected to grow. More students will exchange e-mail for more instant communications, such as instant messaging (Katz, 2006, p.3). With this expected increased interest, campuses will be pressured to respond to growing IT-related concerns, including training faculty and staff to keep abreast with the tools students demand.

According to an *EDUCAUSE Review* article, the top ten IT issues facing CIO's for 2007 are funding, security, enterprise resource planning (ERP), identity/access management, disaster recovery, faculty development, infrastructure changes, strategic planning, using CMS, and IT governance (Camp et al., 2007, p.16). Another challenge for integrating technology into the classroom is engaging faculty. At a recent meeting of the Northeast Regional Computing Program (NERCOMP), educators discussed this issue; one presenter stated that "A lot of teachers are [still] just happy to get something online. The issue is how to make that usable and readable to students" (Cox). Some research suggests that "lukewarm" feelings about technology in the classroom on the part of faculty may be due to "certain emotional barriers that faculty experience when they are asked, or are forced, to use equipment that they are not comfortable using…Some of [these] barriers that advocates of technology face when trying to get their colleagues to use these 'gadgets' include the fear of becoming facilitators instead of teachers, losing control over the teaching process, and an increased workload associated with adapting to a new teaching method…[some faculty have] shared concerns about

[2] See Appendix 1 for more information.

receiving inadequate training and support on the use of instructional technology" (Marvin et al 4).

Course Management Systems

Course management systems (CMS) are a type of software that is distinctively designed to support courses and their activities. Some of the most widely used CMS include, "ANGEL," "EEE," "WebCT," "Blackboard," "Desire2Learn," "Oncourse," and "FirstClass." Although course management systems have been around for years, in the last decade educators have come to embrace them in higher education institutions (Salaway et al., 2006, p.65-66). It is estimated that ninety percent of higher education institutions use CMS (Copyright Clearance Center, 2005, p.2). In the upcoming years, CMS will improve with the use of open source software, such as "Moodle" and "Sakai." Open source software may improve academic computing by allowing many institutions to collaborate on building software that anyone can use or alter (Young, 2004, p.B1, B5).

CMS differ from a traditional classroom experience in that traditional classroom professors have control of when and how students receive lectures, activities, and exams; however, CMS allow students more control over their education. In traditional classrooms students tend to read content, whereas in CMS students tend to scan content. The advantages of CMS cited by professors included the local control over systems, the reliability of enterprise installations, and the ability to move content, such as course grades, within a system (Jafari et al., 2006, p.52, 56). Overall, CMS add to the course experience, but this experience can be hindered by the perceived quality and effectiveness of CMS support services (Frey & Nicoll, 2002, para.19). And, despite the enhanced utility and speed with which student can interact in their coursework, some faculty believe that CMS systems are time consuming and because of this time commitment, faculty compensation is inadequate. Professors must monitor online discussion boards and virtual course chat rooms as well as decide how and what to grade students on: should these professors grade based on the quality of work or the quantity of online interactions (Frey & Nicoll, 2002, para.13-14, 17)? Additionally, some professors feel that CMS should have more help functions, content development aids, automated support features, tracking systems to monitor students' work, and more incorporation of collaborative tools, such as "Flickr," "MySpace," and "Facebook." Recent developments in CMS software may fulfill these needs. In 2007, the University began the process of replacing its current course management system with the ANGEL system.

The use of IT in the classroom is most closely related to the use of course management systems; in fact, 72.2 percent of students taking part in the ECAR study reported using a CMS. Of these students, 75.6 percent had a positive or very positive experience, while only 4.5 percent had a negative or very negative experience. Of the services offered as part of the CMS package, on a scale of one (not useful) to five (extremely useful), students cited tracking grades on CMS as the most useful feature

with a mean of 4.25, while the least useful feature was "online discussion boards" with a mean of 3.23 (Katz, 2006, p.5).

Regardless of the specific technologies selected by any given institution, there has been a general increase in recent years in mediated, or "smart," classrooms, which can host a variety of teaching and learning technology tools. Ranging from basic overhead projectors and computer workstations to more sophisticated tools like "clickers" and smartboards, today's higher education classroom is more likely to be mediated than not. Of those institutions taking part in the 2006 Educause Core Data survey, when asked what percent of campus classrooms that are centrally scheduled are permanently equipped with certain technologies, a mean of 89% had wired Internet connections, 57% wireless Internet connectivity, 63% LCD projectors, 51% computers, and 25% of classrooms have document projectors/systems/cameras permanently available[3].

Technological Devices and the Delivery of Education

Not only has the CMS technology transformed the delivery of education by offering instant access to course content, many mobile and personal electronic devices are changing the educational process. This trend may pressure schools to offer more content through devices such as mobile phones, iPod's, MP3 players, PDA's, e-book readers, smart phones, and ultra-mobile personal computers (UMPC). *The Horizon 2007 Report* predicts that within two years mobile phones will be an "accepted tool on campus," just like computers are today. Mobile phones are becoming desirable in educational settings because of their broadband access, increased storage capacity, and their ability to stream rich media. Mobile phones allow instant access to e-mail and instant messages. Mobile phones encourage communication, creativity, and media making; their applications can range from scheduling, training, and study, to delivering campus services. Some examples of these services include networking and the delivery of campus based information, such as class cancellations, and emergency updates. But officials must develop and select which are appropriate for their campuses (The New Media Consortium & EDUCAUSE Learning Initiative, 2007, p.15-16). For example, in the Fall of 2006, Allen University provided every student and faculty member with a mobile phone to increase access to university resources, such as university specific Web sites. Other media with expanding use in higher education:

- The Apple iPod can deliver educational content through file exchanges and the downloading of educational podcasts, such as with Apple's iPod University, which allows professors' lectures to be downloaded for free. In 2004 Duke University provided all freshman with a twenty gigabyte iPod to download, review coursework, prepare for exams, show other

[3] Data available from summary analysis of 2006 Educause Core Data survey. Data is for institutional planning and decisionmaking purposes only, and is not to be shared with any other entity, internal or external. Contact PAIRO for more information.

students their work, and to allow professors to provide exam results. Because of Duke University's success the "Duke Digital Initiative" was created to support efficient teaching through the use of portable, personal technologies. In light of Duke's success other universities, such as Coppin State University and the University of Wisconsin at Madison have followed suit.

- The MP3 player, a digital audio player, is being used in educational settings to download and review audio lectures, as well as listen to audio books for class. Because of these uses, the University of California at Berkeley and Stanford University have integrated MP3 players into their curriculum with the downloading of podcasts. Also, Wake Forest University's "MobileU" program is using the player to promote academics, through the use of quizzes, library guides, and CMS (Salaway et al., 2006, p.25). However, some feel that transferring data in this manner can be time consuming and should be left to other digital devices.
- The PDA, a handheld device which combines computing tools, the Internet, and networking attributes, supports individual learning with the use of audio, video, access to e-mail and the Web, instant messaging, the mass storage of media, and the editing of documents. The PDA can also support shared learning, since students can use the player to present team projects, conduct shared research, take notes in class, and work jointly on documents.
- The e-book reader is a tool that allows students to download their materials and textbooks, and to perform research by reading books on demand. E-book readers enhance student learning through the use of digital bookmarks and full-text searches. Tools like the e-book are having an impact on the traditional academic library. Although the e-book reader can store e-books, newspapers, and magazines, it will not likely soon fully replace libraries or librarians, since only a limited amount of e-books are available. In a more general sense, as new technologies increase the amount of information students can access, the ways in which they can access it, and the speed with which they can access it, the need for librarians to assist with information literacy will still exist (Corbeil & Valdes-Corbeil, 2007, p.52-53). "The National Forum on Information Literacy" defines information literacy as "as the ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand" (The National Forum on Information Literacy, 2007, n.p.). The traditional view of a library as a building full of books is changing to encompass new ways of accessing and storing information. Libraries will be needed to house digital and archival resources, and librarians will be needed to provide instructional services for these resources. As

technology changes the scope of what a library can do, professionals trained in information literacy may be in demand.

- The smart phone, which combines the functionality of a mobile phone and a PDA, has an array of uses which enable students to connect globally. Uses include downloading audio/video content, playing audio/video/Flash movies, editing documents, calendaring, accessing e-mail and the Web, using instant messages, and using the phone for content storage. The recent release of the iPhone is an example of such a technology. These technologies are expected to gain in popularity as text messaging eclipses email as the preferred form of electronic communication. Some institutions, like Wake Forest University, have piloted the use of this kind of tool; the study suggests that "a PDA-plus-phone is a far more compelling device for students than a mere email account or standard PDA device" (Briggs 12/29/05).
- The UMPC, a small version of a laptop, which is very portable and has a seven inch screen, allows for global collaboration with typically the same uses as a smart phone. However, these devices are often too expensive for the average college student, and do not have a full size keyboard (Corbeil & Valdes-Corbeil, 2007, p.53-54).
- Smartboards, which allow faculty to pull up, display, and interact with content on a giant projection-based touch panel, are gaining in popularity. Faculty can make notes on the screen, and the content on the board can be saved for future downloads.
- Personal response systems, also known as clickers, are portable devices used to capture immediate response to questions posed to an audience. Faculty can pose periodic questions, and, using the device, students can submit their answers electronically for immediate tabulation. One pilot of this product at Florida State University found the clicker useful for assessing attendance, gauging understanding of a subject, ensuring that students are paying attention, and testing out possible exam questions (Briggs 2006).

According to a 2004 *EDUCAUSE Quarterly* article, these types of computing, along with the use of simulations, such as a demonstration on an accompanying textbook CD-ROM, boost student motivation by harnessing their interest and increasing the educational meaning of the content being provided through the relevance of simulations. However, to augment student achievement and promote learning, professors can integrate video clips into their lesson plans, use digital editable syllabuses, use wireless capabilities to "beam" solutions to a chalkboard, and use software interaction. In-class group projects foster members' critical thinking, since members must sort through information from different sources. Additionally, if presentation software is used, such as PowerPoint, studies have shown students not

only remember the material longer, but also understand the concepts being presented better.

But there can be a tendency to overuse computing exercises in courses. Most scholars agree that computer exercises should be used to facilitate learning, not become the center of class; some topics are better left to other learning techniques, such as group discussions. Another concern regarding the over-reliance on technology tools in the classroom is the lack of preparation of faculty, who may not have the training resources available to them to use the tools as effectively as possible. Additionally, class time can be interrupted by equipment failure. But, though many professors are reluctant to use these technologies, after professors are trained, many become more willing to use them (Efaw et al., 2004, para.20, 22, 28-36, 57-58, 60).

Social Software in Academia

Along with technological devices like these, social software, such as blogs, wikis, voice over internet protocol (VoIP), social bookmarking, and geographic information systems (GIS) are supporting student learning. Blogs, such as "Word Press" and "Blogger," are online journals containing comments and reflections in chronological order of postings. Classroom blogs have begun to be used as mediums of learning, since blogs enhance interaction amongst students. For instance, professors at the University of Arizona require posting blogs as an assignment; this allows students to interact, reflect on classmates' work, and comment on classmates' postings. Likewise, blogs assist in individual learning through self-reflection, the practice of writing, especially in the case of foreign language coursework, and the chance to review their progress through past blog postings.

Some disadvantages to classroom blogs include difficulty in maintaining the privacy of an online identity, the possibility of a student posting uncomfortable comments that may upset other students, and the possible lack of relevance of blogs to course goals. In the near future, the use of classroom blogs is expected to increase. According to a 2006 "Pew Internet and American Life Project," eight percent of Americans keep a blog, while forty percent read blogs. Also, the Pew survey revealed that most of these bloggers, fifty-four percent, are of typical college aged students between eighteen and twenty-nine (Windham, 2007, p.1, 5-10).

Wikis, another Web publishing tool, are similar to a blog, but do not have a predefined structure. Because of this, wikis are a practical substitute to class websites and are useful for students when collaborating on projects, especially group projects employing multimedia, since members can add and edit pages with ease. Many feel that training students to use Wikis is easier than training for other programs because of wikis' simple syntax and single template pages. Some faculty appear to like wikis because they offer built-in tracking devices that can monitor

forums and grading. On the down side, wikis do not have as many hosting services as blogs, and host enterprise wikis, such as "Socialtext" may require a fee. However, because of wikis global reach, schools like Dickinson College use them to allow their students abroad to publish their work.

Voice over Internet protocol, or VoIP, the routing of voice conversations over the Internet, has increased its technology the last few years and is being used more extensively on campuses. For instance, a VoIP program such as "Skype" offers free voice connections to computers running the program; this allows students to communicate during class or while working on assignments out of class. Some professors are even asking students to record these communications on MP3 players so they may be handed in. Although VoIP technology has improved, connections are still not as reliable as a telephone and bandwidth issues can reduce the quality of sound. As these issues become less of a setback over the next few years, providers such as "Vonage" are expected to see increased calling around the world.

Social bookmarking, when used with such programs as "Furl," allows students to save Web addresses on their accounts and "tag" (use keywords) these sites for later reference. "Tagging" allows a student to organize website(s) and build an account for possible use on research projects. Moreover, social bookmarking permits students not only to view their bookmarks, but to allow others to view them as well, which enhances learning by allowing students to connect with other users that share their educational interests (Bryant, 2006, para.7-8, 10-12, 14-15). However, some disadvantages of tagging include there being no standard set of keywords to allow users clear understanding, there is no structure of tags to allow for the grouping of keywords, some tags may be unclear, and users may mistag bookmarks leading other users to the wrong topic. Social bookmarks are expected to increase in popularity, since services and tools for the product are extending. For example, bookmarks now include options for adding ratings, comments, reviews, e-mail links, and the ability to add notes, as well as subscribe to Web feeds (Wikimedia Foundation, Inc., 2007, para.9-10, 13).

GIS data is an emerging technology that when combined with complex social software enables users to view the likeness of physical space. When GIS is used with social networking sites, such as "Plazes," it enables students to explore through the use of others' posted pictures. For instance, students in a geography class can explore parts of a country they are studying and speak to others in the country through VoIP (Bryant, 2006, para.21).

Student Learning Technologies

In addition to social software, students utilize learning technologies such as user-created content, social networking, virtual worlds, emerging forms of publication, and massively multiplayer educational gaming. User-created content goes beyond passive Web tasks and allows users to classify, evaluate, and add to content. For instance, sites such as, "del.icio.us," "Flickr," and "YouTube" allow users to upload media (audio, images, video) that can be viewed widely. For students, using these sites is an inexpensive way to publish work and acquire vocational skills through the feedback of others. "Flickr" is often used by photography students at Rowan University to post their work, which in turn is given feedback by their professors. Social networking sites, such as "MySpace" and "Facebook" are among the most used sites on the Internet, and because of students' great interest in them, academia is taking notice. For example, not only are Allegheny College students using "MySpace," but the college itself has a page to attract potential students. Academia is beginning to use social networking sites, such as "Elgg," an open source system, on campus so students have a secure, internal educational community site.

The fact that social networking sites attract users and keep their attention is a major reason professors are incorporating them into their classes. For instance, "MIXXER" is an application being incorporated to help foreign language students study by having conversations with other students over VoIP. Overall, social networking sites are interactive, increase self-expression, and can help students to learn about different environments. Virtual worlds, such as "Second Life," "Active Worlds," and "There" are gaining acceptance in academia and can be used in courses ranging from English to Biology. Virtual worlds are flexible tools that are used to stage and create events in three-dimensional molecular models. Virtual worlds can be used to train emergency personnel, envision real-time weather data, model mathematical functions, and build architectural models. Hence, these virtual worlds help students' role play and take on virtual responsibilities of various professions. Virtual worlds are now being used on some campuses, such as the Otis College of Art and Design, to allow art students to build a gallery where other students and faculty can exhibit their work. Overall, virtual worlds allow students "to create as well as observe their surroundings" (The New Media Consortium & EDUCAUSE Learning Initiative, 2007, p.19).

Emerging forms of publication such as "Google Docs," "Gapminder," e-books, and e-portfolios are becoming influential interactive tools to enhance learning. "Google Docs" allows drafts to be shared, as well as edited, by others online, giving students' feedback on their work. On the other hand, "Gapminder" is a visualization tool that brings life to statistical data. These emerging forms of publication are also changing the way online textbooks are delivered. "Texas Politics," an online textbook, developed by the University of Texas at Austin, now includes audio, video, and live speakers.

E-portfolios are becoming a popular tool at many campuses. E-portfolios are a "digitized collection of artifacts including demonstrations, resources, and accomplishments that represent an individual, group, or institution. This collection can be comprised of text-based, graphic, or multimedia elements archived on a Web site or on other electronic media such as CD-ROM or DVD" (Lorenzo and Ittelson 2). The activity of gathering and storing these items in one collection helps students organize work, and other benefits "typically derive from the exchange of ideas and feedback between the author and those who view and interact with the e-portfolio. In addition, the author's personal reflection on the work inside and e-portfolio helps crate a meaningful learning experience" (2). In addition to student e-portfolios, faculty can use teaching e-portfolios, creating a record of teaching materials, professional experiences, and publications (4). The utility of this technology expands beyond basic classroom and assignment activities, serving as a tool for student advisement and assessment, and as a catalog of achievements that can be useful for students and faculty on the job market[4].

Another tool, massively multiplayer educational gaming is less prevalent and more expensive, but can offer students strong learning opportunities. A type of multiplayer educational gaming is the massively multiplayer online (MMO) games. MMO games have multiple players, allowing students to work in collaborative or competitive groups. For instance, the "Rich Man Game" places students in a competition to conduct business deals, building their net worth. The Synthetic Worlds Initiative at Indiana University is creating a three-dimensional MMO game so students can explore the life of William Shakespeare. Although MMO games are about five years away from becoming mainstream, they offer students the opportunity to discover and apply knowledge learned from their courses (The New Media Consortium & EDUCAUSE Learning Initiative, 2007, p.9-10, 12-13, 18-19, 20, 23, 25-26).

Another important technological tool in higher education is Internet2 (I2), a high-speed network connection educational institutions, primarily for research purposes. I2 allows institutions to share content over their network, ranging from presentations and group audio-visual interaction, to demonstrations of scientific research. Video conferencing is a popular tool within this medium. The University of Scranton is a regional I2 aggregator, providing connections to I2 not only to our faculty and students, but to other regional education groups[5].

Online/Distance Education

With the increase in technological devices, social software, and other student learning technologies, the way in which students engage in their education – indeed,

[4] For more on how some institutions are utilizing e-portfolios, see: Villano, Matt. (2006). Electronic student assessment: the power of the portfolio. *Campus Technology*, 8/29/2006.

[5] For more about Internet2 at the University, see http://matrix.scranton.edu/internet2/default-internal.shtml

create their educational experience - is changing. Some do not even come on campus, engaging in coursework via distance education. In fact, for the fall of 2005, online enrollment in the United States reached 3.18 million and is expected to grow. Most online program offerings were offered for Associate's degrees, which had a national penetration rate of 23.3 percent, followed by a Certificate (22.0 percent), Master's degree (17.0 percent), Bachelor's degree (16.3 percent), Professional degree (2.1 percent), and a Doctoral degree (1.9 percent) (Allen et al., 2007, p.1, 23).

Within academic disciplines, business studies offered the most online course (31.7 percent), followed by the liberal arts and sciences, general studies, humanities group (30.7 percent), computer and information sciences (25.7 percent), other programs (22.9 percent), health professions and related sciences (20.5 percent), social sciences and history (20.5 percent), psychology (17.2 percent), and education (16.2 percent) (Allen et al., 2007, p.24). Although these statistics seem promising, some educators are asking whether online education is as effective as on-site education. Online education advocates such as Thomas L. Russell, report finding "no significant difference" between on-site and online courses (Busacco & Grigorescu, 2005, p.7). However, others, such as Dale Fowler, an instructional designer at the Center for Distributed Learning at Indiana Wesleyan University, believe educators are asking the question in the wrong way. Fowler flips the question, asking "are on-site courses as effective as online?" Fowler discovered that online courses can in fact be more effective, since there are no student absences, students are not affected by others lack of interest, inefficiencies of on-site courses, such as technologically unequipped rooms, are nonexistent, and professors can spend more time designing activities, instead of "making photocopies." Nonetheless, Fowler warns that online courses need to be as well organized as on-site courses (Fowler, 2005, p.7).

Despite educators' questions about the use of online courses, students generally see more advantages then disadvantages in them; some advantages include self-paced and self-directed learning, the accommodation of different learning styles, collaborative student interaction, global communication, and improved computer skills (WorldWideLearn, n.d., para.3). On the other hand, the disadvantages include slow, asynchronous communication, no simultaneous relations, a lack of student/professor interaction, little depth regarding course procedures, questionable quality, and technical problems. To aid in some of these problems campuses are providing more training to professors. At Georgia Perimeter College, a fellowship was created to assist professors in developing online courses. Some of the topics covered included how to build an online course, CMS training, course standards, legal/copyright issues, Americans with Disabilities Act compliance, pedagogical skills training, how to use streaming media, and creating a positive online tone. (Mansour & Mupinga, 2007, p.244, 246).

The Role of Technology & Institutional Mission

Technology is changing the traditional delivery of content of education and the services provided to students (Vigilante, 2004, p.5). Because of these changes, many Jesuit higher education institutions are questioning its role in their traditional missions. A typical Jesuit course centers on "interaction, dialogic exploration, ethical focus, and excellent communication skills" (Vigilante, 2005, p.13); technology requires institutions to adapt alternatives to develop the internal skills of students (Vigilante, 2005, p.13).

Technology in higher education may help institutions fulfill other elements of their mission, by providing underprivileged and diverse students more educational access. To help in this process, twenty-five of the twenty-eight Jesuit institutions in the United States have developed "The Jesuit Distance Education Network" (JesuitNET) to help share online programs. The use of JesuitNET is likely to expand internationally, decrease costs through its collaborative efforts, and expand Jesuit education (Busacco & Grigorescu, 2005, p.7). Currently, JesuitNET is being used to meet the needs of traditional and non-traditional students by accompanying traditional classroom courses. In the future JesuitNET hopes to expand the "Messina Commons," a virtual campus where information and resources are shared, in order to offer education to refugees (Smith, 2007, para.4, 6).

Many higher education institutions are integrating technology to keep abreast of the increasing need for lifelong learning and serve the needs of adult students. Distance learning activities, from online courses to degree programs that are offered fully online, are growing rapidly. But there are challenges, in particular attempting to ensure that the online student learning experience is of high quality. One way to address these challenges is for institutions to "identify the instructional and assessment strategies that match the goals and objectives of the course [or program]" and continually evaluate if they have been met (Conceicao 89).

Colleges and universities are under continual pressure to adopt new innovations in order to outpace other higher education institutions. But moving too quickly can have its drawbacks. For instance, are too many technologies being adopted before their educational values have been proven? Are campuses forgetting about the value of traditional faculty lectures? For the role of technology in education to work in the future, a human resource infrastructure must be used in combination with technology to execute higher education's purpose of promoting learning (The Gale Group, Inc., 2002, para.1, 4-5, 24).

Technology and Learning Infrastructures

IT is now a central part of institutional infrastructures, and regardless of the delivery or type of technology students are using, policy pressures will continue exist on campuses. Administrators ask faculty to "do more with less" while

simultaneously improving the return on investment, increasing efficiency, expanding access, and upholding quality. This push to "do more with less" is often in the form of reducing expenses by replacing personnel, which account for eighty percent of campus costs, with technology. However, using technology in place of personnel is unlikely to decrease expenses because of the investment in hardware, software, networking infrastructures, and maintenance/support costs. In light of this situation, new positions for information resource specialists have emerged. Because technology networks require the upgrade of skills, faculty must be willing to learn from these specialists or risk being ousted by a more technologically advanced professor (Gumport & Chun, 1999, p.413-414, 416-417).

The impacts of technological infrastructures are causing administrators to seek alignments in strategic planning, governance, communications, and cost control. But they're not there yet. According to a July 2004 EDUCAUSE study, only fifty-six percent of respondents believed their IT governance is effective and forty-five percent believe it is well understood. The study also revealed that fifty-seven percent of respondents have an IT plan and twenty-five percent are developing their plans. Promisingly, seventy-eight percent of institutions associate their IT plans with their budgets (Pirani, 2004, p.1-2). However, a December 2004 EDUCAUSE survey found that sixty-four percent of respondents reported that their budgets are not covering increasing IT costs, especially maintenance costs (Goldstein & Caruso, 2004, p.2).

Increasing technological costs are causing institutions to decrease technology support, use more open source software, and delay technological upgrades (Goldstein & Caruso, 2007, p.2). The cost for students is increasing as well. For example, in August of 2006 the "must have" back-to-school items for incoming freshmen included mobile phones, the iPod, and a laptop. These technological devices, according to the National Retail Federation, will contribute to students' estimated ten and a half billion dollar back-to-school spending (Salaway et al., 2006, p.24).

Since institutions are investing human resources and capital, they must protect their information assets. Computing infrastructures have been in anguish lately with increasing bandwidth demands and the increase in computer crimes. However, according to a October 2004 EDUCAUSE survey, only twenty percent of respondents had a full-time IT security manager, while half had part-time managers. To increase IT effectiveness institutions are limiting protocols allowed through firewalls, restricting access to servers, and timing out sessions. Institutions are using firewalls (eighty-seven percent in this survey), secure socket layer technology, authentication, antivirus protection, security exposure practices, and sixty-eight percent of respondents monitor their networks (Kvavik, 2004, p.1, 3-4).

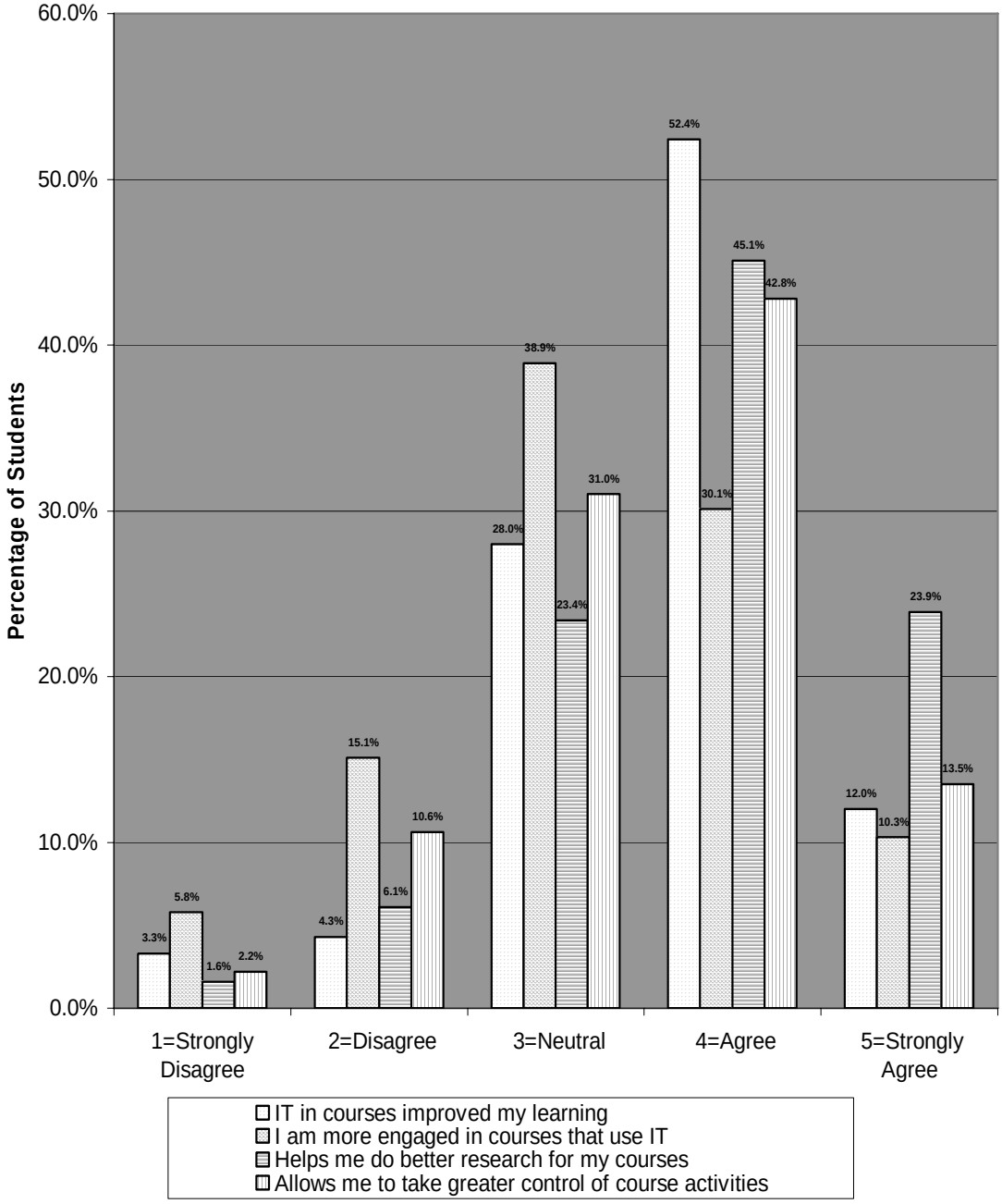
As technologies change, so must learning infrastructures, especially learning spaces. Over the next few years it is estimated that higher education institutions will spend fifty billion dollars to redesign learning spaces (National Learning Infrastructure Initiative, 2004, p.15). Learning spaces must be flexible and adaptable to respond to user needs, upgrades, and reconfiguration. These spaces need to embrace group gatherings, through their physical design, as well as, portable devices, such as laptops, with the use of horizontal surfaces (Milne, 2007, p.14, 18, 20, 24)

Conclusion

Many types of technology can be used to deliver, support, and enhance student learning. Each of these technologies are an important part of the education process. Students can learn from technology and can learn with technology (North Central Regional Educational Laboratory, 2005, para.1, 4); however, educators must be ready to learn these technological skills themselves to effectively incorporate them into their courses (Pirani, 2004, p.1). With the increase use of technology in the classroom, educators are not only aiding students in the present, but in their futures as well, since studies have linked technology in the classroom to increased skill in the workforce (Efaw et al., 2004, para.68). Students' exposure to technology and the ethical use of it helps them distinguish its overall economic, social, moral, and political bearing on society (Busacco & Grigorescu, 2005, p.9). Given its mission, the University of Scranton will need to consider to what extent the inclusion of technology-based learning tools will enhance its students' learning experience.

Appendix

Student Experience with IT in Courses (Katz, 2006, p.6)



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