



Literature Review: Technology Investment Needs of Students and Faculty at Community Colleges

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I. Overview

The purpose of this literature review is to examine existing research on the technology needs and wants of today's higher education students and faculty, particularly in community and technical colleges. Most of the research has been conducted under the auspices of EDUCAUSE, a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology. Much of the research is based on surveys of university students and faculty; however, there is some specific to community colleges, and information relevant to this examination can be gleaned from virtually all of the research reported here, regardless of its origin.

II. About EDUCAUSE

is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology. Membership includes institutions of higher education, corporations serving the higher education information technology market, and other related associations and organizations. Resources include:

- professional development activities
- applied research
- strategic policy advocacy
- teaching and learning initiatives
- online information services
- print and electronic publications, including books, monographs, and the magazines *EDUCAUSE Quarterly* and *EDUCAUSE Review*
- special interest collaborative communities
- awards for leadership and exemplary practices

Current membership in EDUCAUSE comprises more than 2,100 colleges, universities, and educational organizations, including 200 corporations, with 16,500 active members worldwide. In Washington, 39 members include 5 colleges and the State Board for Community and Technical Colleges, all of the public universities, numerous private universities, and various corporations including Microsoft, Ingeniux and RealNetworks.

III. Summary of Literature Review Findings

Who are today's students and how do they learn?

- Today's higher education students are diverse in their familiarization with and access to technology, particularly at 2-year institutions, and therefore have different sets of support needs.
- There is often a generational difference between students and faculty, as the average age of faculty in higher education is 50.
- Net Generation (born after 1982) students:
 - Grew up with technology and want to be connected
 - Gravitate toward group activity, are highly social, work in teams and want interactive learning (experiential) with instructors and peers
 - Want practical application of studies in a real-world context.
 - Multitask and want diversity in technology and media.
 - Respond quickly and expect rapid responses from instructors and excellent customer service from institutions
 - Are intuitive visual communicators so lecture-only learning is not satisfying
 - Learn best through exploration and discovery (experiential learning)
- Generation X and Baby Boomers:
 - Are less interested in the social aspects of learning and are therefore more satisfied with fully web-based courses because of convenience and flexibility
 - Are more satisfied with less interaction in courses.
- There are no significant ethnic or gender differences in technology ownership among students, but advanced technology use is driven by majors.

What kinds of technology do students want?

- Students want a learning environment with moderate amounts of technology aimed at supplementing instruction, and face-to-face interaction.
- Students believe IT improves learning, and want relevant (with real world application), interactive technology to improve convenience and collaboration and to better interact with faculty.
- Students want training on technology for themselves and for faculty
- High-school students considering 2-year institutions want online financial aid and tuition estimators more than any other online application.
- Students want cutting-edge customized software allowing them to do things faster.

How is technology currently being used in higher education?

- Most of today's students are tech-savvy, but a technology "underclass" exists where low-income students cannot afford computers, particularly at 2-year institutions.
- Most college students today have computers and less than 10% rely on dial-up internet access, except at 2-year institutions, where 15% rely on dial-up.
- 2-year institutions are more aggressive in offering online classes.

- Technology use in higher education is controlled by instructor preferences and teaching and IT skills.
- Many institutions are adopting digital tools such as podcasts, blogs, wikis and virtual simulations and digital games to supplement classroom content, enhance collaboration and provide visual and real-world learning.

Are Course Management Systems (CMS) successful?

- CMS are used primarily in face-to-face courses and rarely in online courses.
- Students in 2-year colleges are less likely to have used CMS than in 4-year institutions.
- 76% of students who have used CMS report positive experiences, and students want instructors to use CMS more extensively and consistently.
- Faculty primarily use “static” tools in CMS, although students report that the dynamic tools contribute most to their learning.
- Faculty believe CMS reduces their control of instruction and some are reluctant to adopt CMS for fear of constant change in the technology.
- Current CMS programs are weak in measurement ability.

What are some other examples of successful technology uses in higher education?

- Online personal assistants to help students gain critical information.
- Online financial aid applications that link to federal sites and participating lenders so that students submit relevant information only once.
- “Beep a tutor” programs and technical help desks to answer students’ questions and resolve technical issues.
- Interactive web sites to examine authentic records and information about actual historical events.
- Simulations of real-world activities.
- Virtual labs with devices for experiments that can be accessed 24x7.

What are recommendations for technology considerations found consistently in the literature?

- Invest in wireless coverage throughout campuses.
- Start slowly with easy to learn and implement technologies.
- Identify and share best practices.
- Help mitigate the high cost of new technology by sharing costs between institutions, leveraging resources system-wide, and using common tools that can be personalized by course.
- Measure and assess faculty IT competencies, and provide training and professional development for faculty, conducted as much as possible by peers.
- Use CMS tools in a standardized manner.
- Measure and assess student competencies, and provide training for students.
- Provide adequate staff for around the clock support.
- Design learning spaces to accommodate teamwork.

IV. Summary of Literature

ECAR Study of Students and Information Technology, 2004: Convenience, Connection, and Control. Kvavik, Robert; Caruso, Judith; Morgan, Glenda, EDUCAUSE Center for Applied Research, 2004

Purpose of Study: To examine the following:

- What kinds of information technologies do students use?
- With what levels of skill are they using these technologies?
- How does this contribute to their undergraduate experience?
- What value does use of IT add to learning gains?

Methodology:

Collected data from 4 sources:

- Literature review to create a set of hypotheses.
- Review of previous studies (faculty use of course management systems)
- Survey of freshmen and seniors at 13 universities
- Focus groups with students and administrators at 6 universities.

Key Findings:

- No significant differences by ethnic group on ownership of technology.
- 81% of students have access to broadband. Freshmen residing on campus use university networks most often. Seniors use commercial access most often.
- Among “digital natives” (born after 1982), there are many reluctant and skeptical IT users.
- Students are discriminating users of IT.
- Frequent frustration occurs with overcrowded computer labs.
- Students use computers for educational purposes, followed by communication and lastly for presentation of materials.
- Student technology use is driven by demands of the major.
- Quantitative data indicate students have the skills they need, but qualitative interviews suggest students do not, particularly application knowledge and problem-solving skills.
- Students prefer moderate technology in the classroom.
- Highest scores for technology impact on improved communication.
- Convenience and communication are highest benefits reported from IT in the classroom.
- ½ of students reported some barriers to classroom IT use—particularly increased work load, application difficulty, lack of printer access and lack of technical support.
- 87% of students had experienced CMS, and 76% of those reported a positive experience, primarily because of convenience.
- Curriculum drives IT use.
- New course-oriented software is making learning more convenient but not yielding breakthroughs in learning itself.

- The following trends will revolutionize students' and institutions' use of IT:
 - Improved understanding of student IT use
 - Improved IT literacy of students and faculty
 - Quality and usability of course delivery systems.
 - Improved information availability.
 - Improved system capabilities
 - Improved planning to implement technology in support of learning.

ECAR Study of Students and Information Technology, 2005: Convenience, Connection, Control and Learning. Kvakik, Robert; Caruso, Judith, EDUCAUSE Center for Applied Research, 2005

Purpose of Study: To examine the following:

- What kinds of information technologies do students use?
- With what levels of skill are they using these technologies?
- How does student use of information and communications technologies contribute to their undergraduate experience?
- What contribution does using IT make to students' learning?

Methodology:

Collected data from 4 sources:

- Literature review.
- Review of the 2004 ECAR Study
- Review of previous studies (faculty use of course management systems)
- Web-based survey of freshmen and seniors at 63 higher education institutions (18,000 students responded)
- Focus groups with 82 students at 7 institutions.
- Interviews with 20 instructional technology support staff at the University of Wisconsin.

Key Findings:

- Students prefer technology in courses to a moderate degree, particularly for convenience and connectedness.
- No gender differences or major study differences exist in core technology use; however, in specialized applications, engineering and science majors possess higher skills.
- Students view technology as supplemental, and prefer face-to-face interactions.
- All students use IT for recreation.
- Technology use in classes is controlled by instructor preferences and teaching and IT skills (instructors determine CMS features that are used).
- Students believe IT has a positive impact in courses, especially in communications.
- Students believe (64%) that IT use improves learning.
- Instructors' skills have the greatest positive impact on student engagement, interest, and understanding of subjects.

- Students in 2 year colleges are least likely to have used CMS (24%) and students at doctoral institutions are most likely (75%).
- Of students who have used CMS, 75% report positive experiences. The more they have used, the more they like it.
- Factors contributing to positive experiences with CMS were control of course activities, instructor skill, and use for feedback to students.
- Students want instructors to use CMS more extensively and consistently.
- Students with the highest IT skills acquired them as a result of course requirements.

Recommendations:

- Establish a set of required skills based on what technologies are needed for courses and curriculum.
- Design training programs for faculty and students.
- Use CMS in a familiar or standardized manner, where courses and materials have a common appearance.
- Ensure reliability with services and support.
- Measure and assess student and faculty IT competencies.

ECAR Study of Undergraduate Students and Information Technology, 2006. Salaway, Gail; Katz, Richard; Kvavik, Robert; Nelson, Mark, EDUCAUSE Center for Applied Research, 2006

Purpose of Study: To expand the previous examination of student technology use.

New Aspects of Methodology:

- Survey is extended to 96 colleges and universities.
- 28,724 respondents: 12% were from 2-year institutions.

Unique New Findings:

- 98% of respondents own computers—preference is for mobility through laptops.
- Less than 10% rely on dial-up internet access, but 15% of 2-year respondents rely on dial-up.
- Preference for academic institution e-mail versus other provider is split.
- Responses to what new technology they wanted depended upon age: 18-19 year-olds want more network speed and music, and 20-29 year-olds wanted more computer labs and IT training.
- More than half want only a moderate amount of IT in courses (younger and female respondents prefer less technology)
- 70% of respondents never bring laptops to class.
- Although 75% of respondents have used CMS, only 55% of community college respondents have used CMS (may need more scrutiny).
- 64% of respondents agree that IT in courses has improved learning—particularly among older respondents and business and engineering majors.

- Higher percentage of respondents from community colleges indicated improved learning was highest benefit of IT compared to 4-year respondents.
- Communication benefits of IT are rated lower in 2006 than 2005.
- Need for additional training for instructors was theme in qualitative data.
- Technology “underclass” exists—low income students cannot afford computers, particularly at 2-year institutions.

Information Technology Trends Assessment, 2007-2008: Industry, The New Learner and Implications for Education. National Workforce Center for Emerging Technologies (NWCET) and Bellevue Community College, 2007

Purpose of Study: The purpose of this study is to present current and emerging trends in IT careers, skills and technology. The majority of the document is not summarized for the purposes of this literature review; however, one section is relevant and is summarized for this report. The section addresses digital tools being used by colleges today to extend the learning experience beyond the confines of the classroom.

Methodology:

- Uses existing research and information.

Key Findings:

- **Podcasts** are audio and video files that can be downloaded from the internet and played on a mobile (MP3) device or personal computer.
- Use of podcasts is increasing as an inexpensive way to supplement classroom content.
- Duke University gave incoming freshmen free iPods in 2004 and reported the following findings in 2005:
 - Audio-intensive courses reported increased frequency and depth of student interaction
 - 75% of freshmen reported using at least one iPod feature for academic purposes, and 60% used the recording ability for academic purposes
- **Blogs** are easily created and updatable websites.
- Blogs can be used in education in the following ways:
 - Classroom communication or as a class portal
 - Student or team site
 - Student e-portfolio
 - Collaborative project space for faculty and students
 - School committees and groups
- **Wikis** are collaborative websites where anyone who has access can edit anything at anytime.
- Wikis can be used in education in the following ways:
 - Creating websites by students that document research, analysis and findings for class projects.

- Involving reviewers of information such as other students, teachers and outside experts
- Providing teachers with a view into the evolution of a project and its team members' participation
- Providing a repository of information and projects to be used by teachers as a basis for subsequent projects and by students as resource information and for e-portfolios
- Affording a flexible framework for teacher collaborative work such as curriculum development, best practice discussions and committee projects
- Serving as resource information repositories and forum discussions for worldwide experts in specific academic fields
- **Virtual simulations and digital games** help with the following student skills:
 - Problem solving and strategy development
 - Interaction and collaboration with others in multiplayer games
 - Fast reaction and decision-making
 - Heightened ability to respond to audio and video cues
 - Cause-and-effect and consequence assessment
 - Acquisition, memorization and integration of large information sets
 - Parallel processing and visual interpretation
 - Creativity and role-playing
 - Navigation through and adaptation to complex and ever-changing environments
 - Trading information and items in complex social communities
 - Functioning in complex virtual communities and environments

The following table summarizes characteristics of digital tools reviewed:

	Podcasts	Blogs	Wikis	Games and Simulations
Mobility	High	Medium	Medium	Medium
Interactivity	Low	Medium	High	Medium to Highest
Collaboration	Low to Medium	Medium to High	High	Medium to High
Complexity	Low	Low to Medium	Medium to High	Low to Highest

Recommendations to colleges in selecting and implementing digital tools

- Start slowly with easy to learn and implement technologies
- Involve the campus community
- Leverage expert knowledge from faculty and students
- Develop policies and guidelines specific to the technology
- Share best practices
- Involve the campus IT department
- Interact with businesses and organizations to learn about new tools

Challenges:

- Administrative support
 - Evaluation of teaching by traditional standards
 - Access to technology tools
 - Technical support
 - Training
- Diversity of students in access to and expertise with technology
- Finding a new teaching model

Supporting E-Learning in Higher Education. Arabasz, Paul; Pirani, Judith; Fawcett, Dave, EDUCAUSE Center for Applied Research, 2003

Purpose: to assess the use of technology in education in 3 areas: online distance learning, traditional courses supplemented with technology, and hybrid courses.

Methodology:

- survey of 274 institutions that use e-learning about e-learning activities and challenges, resources and necessary support infrastructure.

Key Findings:

- Adequate and reliable technical infrastructure is critical to support e-learning.
- Instructors and students must possess technical skills to support tools—training is essential.
- Instructors must re-design courses to incorporate e-learning.
- 70% of survey respondents indicated that needed support for instructors will outpace institutions' ability to provide that support.
- 2-year institutions are most aggressive in offering online courses.
- E-learning challenges are:
 - Time invested to create teach and maintain an e-learning course.
 - Technical infrastructure limitations
 - Time management in responding to students' communications
 - Students need to learn how to use the technology well.
 - Students do not have equal access to computing capability.

Recommendations:

- The following support resources are essential:
 - Infrastructure:
 - CMS can make or break e-learning adoption. Standardization helps spread knowledge.
 - Continual planning to keep infrastructure up to date is essential.
 - Training
 - Course Development: Institutions should incorporate e-learning tools gradually.
 - Support:
 - Adequate staff for 24x7 support is essential.

- Constant adaptation of support resources to evolving needs is necessary
 - Grassroots support is particularly effective
- Resources can be scaled to meet demand to mitigate funding pressures
 - Sharing costs between institutions
 - Leveraging resources in consortiums or systems
 - Use common processes and tools that can be personalized by course.
- Administrative backing fosters cultural change.

Faculty Use of Course Management Systems. Morgan, Glenda, EDUCAUSE Center for Applied Research, 2003

Purpose of Study: To investigate the use, satisfaction, and adoption of Course Management Systems (CMS) among faculty in the University of Wisconsin System (UWS).

Methodology:

- Survey of 730 instructional faculty and staff using CMS
- Interviews with 140 faculty and staff
- Manual counts and examination of CMS usage logs.

Findings:

- Faculty use primarily 2 CMS: Blackboard (74%) and WebCT (22%)
- Faculty believe some students have difficulty using CMS—only 3% surveyed received a push from students to use CMS.
- Faculty believe CMS reduces their control of instruction and the instructional environment (limited customization and adding bureaucracy).
- Leadership is important in faculty adoption.
- Current CMS are weak in measurement ability—was very difficult to monitor usage over time.
- CMS are used primarily in face-to-face courses (80%) and rarely in online courses (26%).
- Use of CMS is primarily to facilitate quiz administration and other classroom tasks, rather than overall assimilation into teaching pedagogy.
- 11% expressed reluctance to use CMS because of concerns about constant change (change management is critical).
- Training plays a key role in successful adoption, particularly by other faculty.
- Faculty primarily use “static” tools, rather than interactive tools
- Little evidence that CMS improve pedagogy, but that “accidental pedagogy” results from better course organization, transparency, accountability and student engagement.
- 60% of faculty reported that use of CMS increases interaction with students, and 62% believe it increases student-to-student interaction.

***Following the Link to Two-Year Colleges: The E-Expectations of High School Students Considering Community College.* Noel-Levitz, 2007**

Purpose of Study: To describe a study that asked 1000 college-bound high school students whether they were considering community college, then compared e-expectations of those that were and those that weren't.

Methodology: survey

Key Findings:

- The study found few differences in those considering community colleges and those that weren't.
- Both groups wanted access to information electronically.
- Students considering community college wanted an online financial aid estimator more than anything else. Other online applications with very high interest were:
 - Tuition cost calculator
 - Request for a campus visit
 - Admissions application
 - Instant message to an admissions counselor or student worker
- Other differences were:
 - Language used appealed to the two groups differently. (researching target audience is critical)
 - Higher percentage of community college bound students preferred electronic and mail correspondence, others preferred face-to-face interaction.
 - Web info regarding tuition cost was more important to community college bound students.

***Boomers, Gen-Xers and Millenials: Understanding the New Students.* Oblinger, Diana, EDUCAUSE review, 2003.**

Purpose of Study: to understand new students in higher education and identify the implications for institutions.

Methodology:

- review of existing literature and studies

Findings:

- Higher education has average faculty age over 50.
- Enrollment growth is higher in 2-year colleges than in 4-year colleges.
- More part-time students today
- Higher proportion of female students today
- More students over the age of 25 today
- More non-traditional students today

- Delayed enrollment
- Attend part time
- Work full-time
- Financially independent
- Have dependents
- Are single parents
- Lack a high school diploma
- Study points to other research that has concluded the following regarding high school students:
 - 94% use the internet for school research
 - Students find the use of technology in schools disappointing
 - Students believe they are more internet-savvy than their teachers
 - Students believe teachers' use of the internet is uninspiring
- Article points to other research about university and college students:
 - 84% own computers
 - 79% say the internet has positively influenced their college/university experience
 - Adult learners often cite lack of timely support as reason for abandoning studies.
- Information age mindset:
 - Computers are not technology, but a part of life.
 - Internet is better than TV
 - Reality isn't real
 - Doing is more important than knowing.
 - Learning is trial and error problem solving, not logic.
 - Multi-tasking is a way of life.
 - Typing is preferred to handwriting.
 - Staying connected is essential.
 - Zero tolerance for delays
 - Consumer and creator (of digital information) are blurring.

Implications for Colleges and Universities (and Best Practices):

- Must eliminate delays in processes

Example: University of North Carolina Greenborough developed online personal assistants, automated e-mail responses, web portals and web-mail to provide instant responses to students. Virtual information station provides answers to many questions regarding all topics from admission to graduation.

Example: University of Phoenix created Financial Aid Paperless Project (FAPP) to allow online applications then links to the federal student aid web site to be filed online with a lender. Computers of participating lenders are linked to FAPP's computers to pull appropriate data. Students learn immediately that applications are complete and in process.

- Must provide excellent customer service

Example: At Athabasca University, all service expectations are provided on a website, and each service is accompanied by a standard and contact person's email address and phone number.

Example: Rio Salado College initiated a "beep-a-tutor" program 24x7 for students' questions, and a technical help desk to help students resolve technical issues.

- Must provide experiential, interactive and authentic learning

Example: MIT's WebLab microelectronics lab enables use of virtual microelectronic devices 24x7. WebLab handles more than 2000 users and 15,000 experiments weekly. Excess capacity is available to students in Sweden and Singapore.

Example: University of Virginia's "Valley of the Shadow" interactive web site allows students to examine authentic records and information about the Civil War via multiple paths to draw their own conclusions.

Example: Columbia Center for New Media Teaching and Learning created a "simulation" to allow students to examine newscasts, websites and interviews to react to simulated disease outbreaks.

- Must provide ways for students to stay connected

Example: Drexel University developed "DrexelOne Mobile" allowing students to retrieve personalized information (such as grades, classroom changes, schedule updates) from any web-enabled handheld device.

Is It Age or IT: First Steps Toward Understanding the Net Generation

Oblinger, Diana; Oblinger, James. . 2005

Purpose of Study: to characterize the Net Generation students

Methodology:

- Existing studies and literature

Key Findings:

- Characteristics of the Net Generation:
 - Born after 1982
 - Gravitate toward group activity
 - Identify with parents' values and feel close to their parents
 - Believe it's cool to be smart
 - Are fascinated by new technologies
 - Are racially and ethnically diverse

- Are focused on grades and performance
- Are engaged with extracurricular activities
- Other characteristics:
 - Bricolage thought process
 - Intuitive visual communicators
 - Can integrate virtual and physical
 - Can shift their attention rapidly
 - Learn better through discovery than by being told
 - Able to shift attention rapidly
 - Able to respond quickly and expect rapid responses
- They are:
 - Digitally literate
 - Connected
 - Immediate
 - Experiential
 - Social
 - Work in teams
 - Achievement oriented
 - Oriented toward inductive discovery (making observations, formulating hypotheses, figuring out the rules)
 - Visual and Kinesthetic
 - Social conscience
- ¾ of all undergraduates are non-traditional, and therefore less likely to persist in college after the first year or to graduate.
- University of Central Florida study: older students are more likely to be satisfied with fully web-based courses than traditional age students.
- Older learners are less interested in the social aspect of learning, want convenience and flexibility
- Students want a moderate amount of IT in the classroom
- Students use online syllabi, class readings and online submission of assignments
- Students want face-to-face interactions
- Want technology to increase customization, convenience and collaboration
- Online conversations with faculty are as meaningful as in person.
- Study at George Washington University showed a positive correlation between interaction and student retention.
- Students retain 10% of what they read but 30% of what they see. Students prefer graphics before text.

Technology and Learning Expectations of the Net Generation. Roberts, Gregory. University of Pittsburgh-Johnstown. 2005.

Purpose of Study: to understand the Net Generation's views on technology and learning as a student and member of the Net Generation

Methodology:

- a series of interviews, polls, focus groups and conversations

Key Findings:

- Technology expectations:
 - Cutting edge software
 - Ability to adapt programs to benefit individuals
 - Power to do things faster
 - Access to information or communication
 - Customization
- Learning expectations:
 - Expertise and passion of faculty members
 - Ability of faculty to customize classes
 - Use of contemporary software by faculty
- Students overwhelmingly prefer a balanced lecturing/interactive environment.

Using Technology as a Learning Tool, Not Just the Cool New Thing. McNeely, Ben. North Carolina State University. 2005.

Purpose of Study: to provide a student's perspective on the Net Generation and its implications for higher education.

Methodology:

- Author's own experience

Key Findings:

- Faculty must understand interactions between Net Geners and each other, with technology, and with life in general.
- Best use of technology in a class: hands-on, experimental, and interactive.
- Students want to do hands-on work and work in groups.
- Technology should augment what is already there—not a replacement for the exchange of tacit knowledge.
- Challenges and skills for higher education:
 - Funding
 - Computer skills for meaningful use of technology—students need skills beyond fundamentals.
 - Technology must be relevant and interactive to the coursework.
 - Technology must be practical.

The Student's Perspective. Windham, Carie. North Carolina State University. 2005.

Purpose of Study: to provide a student's perspective on the Net Generation and its implications for higher education.

Methodology:

- Author's own experience

Key Findings:

- Basic principles guiding the Net Generation:
 - Students need the opportunity to interact with faculty and researchers
 - Students want to learn about subjects through exploration.
 - Students want practical application of studies in a real-world context.
 - Students want diversity in media use.
 - Students need instruction in basic research skills beyond the internet.

Preparing the Academy of Today for the Learner of Tomorrow. Hartman, Joel; Moskal, Patsy; and Dziuban, Chuck. University of Central Florida. 2005.

Purpose of Study: Report on Research Initiative for Teaching Effectiveness' (RITE) at UCF regularly conducted survey of students' online learning experiences.

Methodology:

- Current survey: 1489 students (30% return rate)
 - 22% baby boomers
 - 55% Generation X
 - 23% Net Generation

Key Findings:

- Learning Engagement:
 - Older students reported more positive learning engagement for online courses
 - Baby boomers didn't like lack of face-to-face interaction in an online environment
 - GenX students were more interested in getting to the point
 - Net Gen were most disappointed...they felt faculty response times lagged behind expectations
- Interaction Value
 - Older students had more positive interaction value for online courses— boomers believed communication patterns constituted one-on-one attention.
 - GenX students found substantial pointless interaction in class
 - Net Gen students found interaction mechanisms inadequate
- Change in Approach to Learning
 - More than ½ of baby boomers enhanced their technology skills and integrated them into studies
 - Less than ¼ of net gen students changed their approach to learning.
- 6 characteristics students attribute to best faculty are those that:
 - facilitate student learning
 - communicate ideas and info effectively
 - demonstrate interest in student learning

- organize courses effectively
- show respect and concern for students
- assess student progress fairly and effectively.
- **Conclusions:**
 - Blended learning can help to bridge generations
 - Faculty can redesign courses to focus on being student-centered and interactive with help from faculty development courses for web instruction.
 - Growing discrepancy between institutional infrastructure and student's personalized facility with information.
 - Students' have a tendency to learn through bricolage and universities are slow to respond.
 - Must monitor technology developments and their impacts on students.

Convenience, Communications, and Control: How Students Use Technology. Kvavik, Robert. Center for Applied Research and University of Minnesota. 2005.

Purpose of Study: to assess students' access to and use of technology

Methodology:

- 2004 survey of 4374 freshman and senior students from 13 universities.
- 95% were 25 or younger, and 95% were full-time.

Key Findings:

- 93.4% of students owned computers. More seniors owned computers, but freshmen primarily owned laptops.
- All students had internet access.
- Highest computer use was for academic activities, followed by communication.
- Use of presentation software was driven by students' majors and curriculum.
- 2 types of skills needed: information literacy and technical skills needed to use tools—training students is in high need.
- Highest skills in PowerPoint and spreadsheets reported by seniors, particularly in business, engineering and life science fields of study.
- Students prefer moderate use of technology in the classroom.
- Highest preference for technology in the classroom by engineering, business and science students.
- Highest perceived benefits from technology use in the classroom are: better communicate with the instructor, instructor feedback, communicate with classmates.
- Students view technology investments as contributing primarily to convenience and facilitating communications.
- 76% of students claimed positive experiences with Course Management Systems (CMS).
- Interactive features used least by faculty were features that students indicated contributed the most to their learning.

- Highest feature use by students were: using a syllabus, reading online, tracking grades, and taking sample exams.
- Students indicated a need for more consistent approach to CMS.
- Students and faculty asked for more training on CMS.

The Real Versus the Possible: Closing the Gaps in Engagement and Learning.

Ramaley, Judith; Zia, Lee. University of Maine and National Science Foundation. 2005.

Purpose of Study: to identify ways to use technology for improved learning.

Methodology:

- Existing studies and literature.

Key Findings:

- High speed internet access is good, but internet resources are not yet fully integrated into the day-to-day classroom routine.
- Disconnect between how students use technology for personal use and how they use it under teacher direction.
- Gap between what the research community has discovered about learning and what the faculty know and practice.
- Key to learning is to make it interactive. IT supports 4 categories of interactivity:
 - People to people (faculty to students, students to students)
 - People and tools (distributed computing environment)
 - People with concepts (image databases, simulations, animations)
 - People with contexts (rich-media communication and collaboration)
- Examples of interactive education:
 - Animations
 - Concept inventories (diagnostic tests)
 - WeBWorK (<http://webwork.math.rochester.edu/>)--automated homework grading system with real-time feedback
 - AskNSDL (<http://www.nsd.org/asknsdl/>)--electronic reference service of the National Science Digital Library)
 - Molecular Workbench (<http://workbench.concord.org/>)--virtual environment to carry out experimentation, observation and analysis)
 - BugScope (<http://bugscope.beckman.uiuc.edu/>)--scanning electron microscope available worldwide
- Emerging technology:
 - Participatory simulations—mobile wireless devices for experiment simulations
 - Distributed data collection—consolidating calls to analyze feedback and patterns
 - 3-D Digital Printing—to create virtual reconstructions of objects
 - Immersive Virtual Reality Experiments—telecollaboration and telepresence for telemedicine.

Recommendations on Factors Necessary for Faculty for Success:

- Revisit assumptions—what are students’ experiences in classrooms?
- Engage learners
- Relax control
- Return to core values—drawing students into ways of thinking and examination of ideas.
- Reflect on the true meaning of learning—the nurturing of a prepared mind, sense of social responsibility and commitment to community.
- Model the highest standards.

Curricula Designed to Meet 21st Century Expectations. Clayton Pedersen, Alma; O’Neill, Nancy. Association of American Colleges and Universities. 2005.

Purpose of Study: to identify challenges and recommendations for faculty adoption of new technology.

Methodology:

- Existing studies and literature.

Key Findings:

- Implications of students’ extensive use of technology:
 - Must increase faculty’s understanding of teaching and learning power of technology
 - Demand for technological tools to be effectively integrated into curriculum is increasing.
 - Tools are needed to help faculty integrate technology into the curriculum.
 - More focus on preparing existing faculty for future tech-savvy students needed.
 - Colleges and universities should involve faculty and students to develop tools.
 - Institutions should explore and assess the best use of technology for learning
 - Greater investments in faculty professional development for effective technology use needed.
 - Faculty needs support in developing strategies for resolving technical difficulties.
- Use of Technology to help students achieve learning outcomes:
 - Multiple media
 - Increased flexibility
 - Real-time engagement
 - Undergraduate research
 - Repositories over time
 - Blended instruction (technology and traditional)

Support Services for the Net Generation. Wagner, James. Pennsylvania State University. 2005.

Purpose of Study: to identify challenges in support services and provide and recommendations from Penn State.

Methodology:

- Existing studies and literature.

Key Findings:

- Relevant characteristics of Net Generation students:
 - Customer-service culture
 - Want problems solved quickly
 - Care about what technology enables activities
- Relevant characteristics of both Net Gen and Non-Traditional Learners:
 - Want customized and personalized services
 - Have different sets of support needs (therefore adult learners may need extended support)
- Examples used by Penn State:
 - National Student Clearinghouse
 - Penn State's administration of placement tests through secure web applications.
 - Penn State's eLion to organize present and deliver support services.

Faculty Development for the Net Generation. Moore, Anne; Moore, John, Fowler, Shelli. Virginia Polytechnic Institute and State University. 2005

Purpose of Study: to identify examples of faculty development at Virginia Tech.

Methodology:

- Existing studies and literature.

Key Findings:

- Faculty development is pivotal investment for integrating technology in higher education.
- Fluency in Information Technology (FIT) defined by National Research Council:
 - Contemporary skills—ability to use today's computer applications
 - Foundational concepts—basic principles and ideas of computers, networks and information that underpin the technology
 - Intellectual capabilities—ability to apply information technology in complex situations.
- To bridge the gap between faculty expertise and student needs, institutions must:
 - Gain awareness of students' approaches to their learning needs

- Enable faculty through professional development
- Integrate disparate pieces.
- Examples:

Faculty Development Institute (FDI) at Virginia Tech: helps faculty acquire teaching strategies that leverage instructional technologies to improve student learning.

Offers:

- Recurring 4-yr. cycle of faculty development workshops.
- Links so professional development will replace faculty computers every 4 years
- Course development initiatives
- Student digital literacy activities
- Appropriate technology for classrooms.

Evolution:

- Early programs focused on lowering faculty anxiety related to using new technologies with focus on basics of using technology and software.
- FDI involves faculty as workshop presenters on as many topics as feasible.
- Resources and contact info are provided for each program track on its website to facilitate faculty-to-faculty queries and conversations.

Current programs focus on:

- Faculties' perceptions of students' expectations.
- Students' use of technologies
- Teaching strategies
- Ways to design for active learning
- Ways to deal with privacy and security issues

Graduate Education Development Institute: engages future faculty in teaching, learning and technology issues as an integral part of their graduate student professional development.

The New Academy. Barone, Carole. EDUCAUSE. 2005.

Purpose: To discuss the changes on campuses brought about by the convergence of technology and pedagogy.

Methodology: Examine existing studies and best practices.

Key Findings:

- Online enrollments are growing and are expected to continue to grow.

- An example of the new academy is the University of Central Florida, where groups of faculty within each department offer blended courses on how to teach blended courses.
- North Carolina State University’s SCALE-UP program in physics puts introductory students in small teams seated at round tables, resulting in higher completion rates.
- Virginia Tech’s Math Emporium uses online models and online testing accompanied by real-time help for students encountering difficulties.
- Institutions cannot afford to “study the problem to death”.
- The secret to success in the new academy is to create a culture of evidence.

Planning for Neomillennial Learning Styles: Implications for Investments in Technology and Faculty. Dede, Chris. Harvard University. 2005.

Purpose: To examine the continuing evolution of computers and telecommunications and speculate on new learning styles they may enable.

Methodology: speculative

Findings:

- 3 emerging interfaces:
 - “World to the Desktop”—access to distant experts and archives
 - “Alice in Wonderland” multiuser virtual environments (MUVES)—participants’ avatars interact with computer-based agents and digital archives in virtual contexts.
 - Ubiquitous Computing—mobile wireless devices infuse virtual resources to movement through the real world.

Recommendations for Investments in Infrastructure:

- Provide wireless coverage throughout the campus
- Create multipurpose habitats
- Experiment with “mirroring”—virtual environments that replicate physical environments but allow magical capabilities for immersive experience

Recommendations for Investments in Professional Development:

- Develop learning experiences students can personalize
- Use knowledge-sharing among students
- Infuse case-based participatory simulations into presentational/assimilative instruction.
- Evaluate collaborative, non-linear representations using peer-developed and peer rated forms of assessment, and employ student assessments to provide feedback on faculty effectiveness.