Educating the Net Generation

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Curricula Designed to Meet 21st-Century Expectations

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Association of American Colleges and Universities

Introduction

When I first began working in higher education, most of the traditional-aged students in the class of 2005 had just been born. I remember my excitement when a departing colleague gave me her PC. I confess that I've never used my computer as more than a glorified typewriter; however, I can also say that colleagues and I have done groundbreaking work that used many cutting-edge technologies in the service of learning. This chapter focuses on how higher education can use technologies to implement curricula designed to meet 21st-century expectations for students' learning.

Recently, a new college graduate said to me that, in her experience, professors' use of technology had largely consisted of converting their teaching notes into PowerPoint slides. Where students had once called a large number of their classes "death by lecture," she noted they were now calling them "death by PowerPoint." Why did this student have such a cynical view of the use of technology for learning? Prior to college, most students have used a wide variety of technologies in their everyday lives, ranging from audio book cassettes as very young nonreaders, to sophisticated handheld games as adolescents, to instant messaging programs to "talk to" their friends—at home or abroad—anytime, anywhere via the Internet as young adults.

Yet too often, students' use of technology in higher education settings has been relegated to searching the Internet, accessing an online course, or word-processing. In some pockets of campus, faculty have used technological applications to disseminate information or to help students expedite problem solving. Some typical examples include

- graphing calculators for complex mathematical computations and displaying trigonometric functions;
- graphics programs for displaying phenomena in the natural and earth sciences;
- statistical software packages that can manipulate large data sets in the social sciences; and
- design software for developing architectural and engineering models.

With such specific applications of technology and the limited use of other forms (for example, multimedia), students' low expectations for the use of technology in the curriculum is not surprising. Such constrained use of technology by the faculty in the curriculum and low student expectations may serve to limit innovation and creativity as well as the faculty's capacity to engage students more deeply in their subject matter. Like all organizations, colleges and universities respond to the demands placed upon them. Students' and institutions' low expectations for the use of technology for learning provide insufficient impetus for faculties to change their behavior and make broader, more innovative use of these tools in the service of learning.

Students' personal experience with technology is typically broad and in many cases very deep. Moreover, their extensive use of technology continues throughout their college experience—that is, except fully integrated into the curriculum.

Implications
- Faculty's understanding of the teaching and learning power of technology needs to be increased.
- Increasing the use of technology will increase demands for technological tools to be effectively integrated into the curriculum to enhance student learning.
- Tools need to be developed to help faculty integrate technology into the curriculum.

21st-Century Expectations

Changes in the larger society over the last 100 years—various social movements, the advent of telecommunications, the movement from industrial-based to knowledge-based work, struggles over political boundaries, modern technology and science breakthroughs employed in both the most positive and most negative of circumstances—have in some form or another impacted the ways colleges and universities "do" higher education. Colleges and universities in the 21st century

educate a much larger, more diverse population of students, foster scholarship countless new areas of inquiry, and offer opportunities in many new settings and formats, including online. Yet many facets of higher education have remained relatively untouched by time, at times to the detriment of our functioning in this new era. To better meet individual and societal needs of the 21st century, numerous leaders—inside and outside higher education—recognized at the end of the 20th century that college and university missions and practices needed to be reinvigorated. Within such a process, perhaps consensus could be reached about the new expectations we needed for students, for curricula, and given its infusion into society, for technology.

For Students

Since 2000, the Association of American Colleges and Universities (AAC&U) has engaged colleges and universities across the nation in such a process, through a multiyear, multilayered initiative called Greater Expectations. For the first two years of the initiative, AAC&U senior staff convened a national panel of experts who were charged with identifying the hallmarks of a 21st-century college graduate. With input from a consortium of leadership campuses engaged in innovative practices to realize high achievement levels for their students, the national panel recommended new emphasis be placed on educating students to be purposeful and self-directed in multiple ways—on becoming intentional learners. The report issued from their work, *Greater Expectations: A New Vision for Learning as a Nation Goes to College,* states:

> Becoming such an intentional learner means developing self-awareness about the reason for study, the learning process itself, and how education is used. Intentional learners are integrative thinkers who can see connections in seemingly disparate information and draw on a wide range of knowledge to make decisions. They adapt the skills learned in one situation to new problems encountered in another—in a classroom, the workplace, their communities, and their personal lives. As a result, intentional learners succeed even when instability is the only constant.[1]

The report also notes:

> The intentional learner is empowered through intellectual and practical skills; *informed* by knowledge and ways of knowing; and responsible for personal actions and civic values… Mastery of a

range of abilities and capacities empowers intentional learners as they maneuver in and shape a world in flux…. Intentional learners possess a core of knowledge, both broad and deep, derived from many fields…. Through discussion, critical analysis, and introspection, intentional learners come to understand their roles in society and accept active participation.[2]

In short, students are expected to draw on various knowledge bases, integrate them, conduct increasingly more sophisticated analyses as they progress through college, and use their integrated knowledge to solve complex problems.

In 2004, AAC&U commissioned a series of focus groups to determine students' views of liberal education. Data obtained from these sessions with high school and college seniors in Indiana, Oregon, and Virginia revealed that both groups of students have individualized and material interests in mind in wanting to obtain a four-year college degree.[3] Greater Expectations—and by extension, many institutions of higher education—has broader goals for Net Generation student learning than do students themselves. In other words, each group has a very different view of higher education's purpose. In addition to articulating the larger purposes of higher education and aligning students' and institutions' expectations, increased attention must be paid to how technology can be used for both these purposes.

Implications

▸ Better alignment is needed between higher education's communication of its purposes and what K–12 education, parents, and the community perceive as its purpose.
▸ Communication needs to include better uses of technology to assess[4] high-quality educational environments.

For the Curriculum

Low-level technologies such as overhead projectors, televisions, and videocassette recorders have been used for some time to focus college students on specific subject matter. The use of technologies typically included text, equations, graphics, and pictures to enhance learning through models and content-rich stories. Early work in learning technology focused on combining what we knew about visual learning and low-end technologies to create multimedia tools to enhance student learning.

Examples of products of this early work by the Cognition and Technology Group at Vanderbilt University (CTGV) included the Adventures of Jasper Woodbury Series and Scientist in Action.[5] Today, these tools still provide middle school teachers with vehicles to enlarge their students' learning. Math and science problem sets are embedded in authentic stories that students understand because the stories reflect their everyday experiences. These authentic problem-solving exercises not only engage students in their learning but also stimulate them to want to learn more.

From the beginning, however, a problem arose in that those middle school students went on to high schools and later to colleges that did not (and do not) provide this type of rich learning experience—a learning experience that can best be achieved when technology is used in the service of learning. If we are to adequately prepare students for an era of change, information, and knowledge explosion in the 21st century, we must alter this scenario. Schools, colleges, and universities must draw on a variety of technologies and use them as resources to deepen students' learning. When we simply ensure that students have access to the latest, most powerful computers, we make technology an end unto itself instead of the powerful teaching and learning tool that it can be.

Implications

▶ Much of the learning technology innovation in higher education has been focused on K–12 teacher preparation and development. More focus needs to be placed on preparing existing faculty for the future Net Generation students who will populate the 21st-century classroom.

▶ To the extent that colleges and universities involve interested faculty and students in working together to develop tools that truly engage them both, the more fruitful their efforts are likely to be for the larger higher education community.

For Technology

Over the past 20 years, most colleges and universities have moved technology from being a one-time budget expenditure to being a hard budget line to support the purchase, maintenance, and, in many cases, use of technology on campus. Less attention has been given to how to help students achieve the desired learning outcomes through technology. While significant financial resources have been devoted to building the technical infrastructure at colleges

and universities, much less has been devoted to ensuring that this investment is used to its maximum.

For example, at present, new residence halls are almost never built without considering the choice of hardwired or wireless high-speed Internet access. The question is not if, but how, to make technology more accessible for students. Colleges also increase students' access to technology by establishing computer labs in various locations on campus, defining laptop requirements, and offering computer loan programs. Yet, comparatively little support has been devoted to helping faculty use computers and other technologies in creative and innovative ways to deepen student learning. Worse yet, institutional structures and practices to resolve technical problems that faculty invariably encounter are very limited or are not the type of aid needed. Such lack of support limits the amount of time faculty can spend on what they do best—building a compelling curriculum and integrating technology for more powerful learning.

College and university faculty must effectively tap students' existing familiarity with technology to engage them in constructing an integrated knowledge base and developing habits of the mind that will enable them to become lifelong learners. Technology can then become a tool used in the service of learning rather than an end itself.

Implications

▶ Institutions need to establish greater expectations for maximizing their investment in technology by exploring and assessing the best use of technology for learning.

▶ Greater investments may be needed in faculty professional development in the effective use of technology for learning.

▶ Faculty's effort to infuse technology into the curriculum requires support in developing strategies and in resolving technical difficulties. This means more than the technical help desk. What is needed is assistance for using technology to achieve the teaching and learning outcomes we desire.

Technology and the Curriculum

What is the current role of technology in the college curriculum? To develop intentional learners, the curriculum must go beyond helping students gain knowledge for knowledge's sake to engaging students in the construction of knowledge for the sake of addressing the challenges faced by a complex, global society.

According to the Greater Expectations National Panel, the curriculum and the cocurriculum should provide numerous paths by which students can achieve broad liberal education outcomes alongside specialized knowledge of one or more disciplines. If students have achieved these outcomes, they will excel at

▶ communicating well in diverse settings and groups, using written, oral, and visual means;
▶ employing both quantitative and qualitative analysis to describe and solve problems; and
▶ working well in teams, including those of diverse composition, and building consensus.[6]

These outcomes can be achieved through strategies such as writing assignments (expository, creative, and personal writing); required and critiqued oral presentations; and problem-based learning.

Students need mastery in areas that include knowledge of human imagination and expression, global and cross-cultural communities, and modeling the natural world. This mastery can be obtained thorough

▶ undergraduate research;
▶ inquiry-based science labs;
▶ planned and supervised experiences in teamwork, both in class and in off-campus settings;
▶ interdisciplinary and integrated courses on creativity through the ages;
▶ drawing on students' diverse experiences to enrich classroom discussion;
▶ integrating study abroad into courses back on the home campus;
▶ teaching courses worldwide through videoconferencing; and
▶ student team-designed lab experiments to answer questions.[7]

Students can be expected to be responsible for active participation as citizens of a diverse democracy, understanding themselves and their multiple identities by engaging in

▶ service learning;
▶ debate on proposed solutions to current social problems; and
▶ personal writing that requires self-reflection on a wide variety of subjects and that situates the self in relation to others.[8]

Use of Technology

In what ways might technology enhance each of these innovations and help students achieve desired learning outcomes? At the most basic level, effectively

using computer technology is itself a skill that we want students to develop. Using computer applications such as Access and Excel makes managing and manipulating data much more efficient.

While it's clear that such applications have great utility in business administration courses such as accounting, these programs are often used for other purposes and in other subjects. These applications can be designed to sort a variety of types of information, such as to sort information obtained from qualitative interviews or to sort by predetermined criteria a number of funding possibilities for a service-learning project. The mere act of setting up small text databases and linking them to equations for analysis gives students practice in managing knowledge, as well as allowing them to easily transfer text to charts and displaying information in a variety of ways. Knowing how to use all the functions of these and other programs such as PowerPoint enables learners to efficiently edit text and include graphics in the final products they submit to demonstrate their learning. These uses of technology can be applied to undergraduate research and can contribute to students making reasoned linkages among seemingly discreet pieces of information, therefore integrating knowledge for deeper learning.

Multiple Media
By using multimedia, faculty and students can demonstrate an enriched teaching and learning enterprise that goes well beyond more traditional "cubicle-based" computer use. Consider this scenario: A sociology professor forms student teams to explore the presence of various racial and ethnic populations in the United States over time, with a focus on groups that are underrepresented in higher education today. Technology is to be used to facilitate team cohesion, as well as to demonstrate outcomes of the research. The professor first has the class discuss the process of working in teams, both in person and virtually, with one outcome of the project being for students to learn to work in diverse groups.[9] The professor then explains that the project will require a traditional literature review and written analysis, but teams are encouraged to make the text Web-based and combine it with graphics and video to provide comparative analysis and illustration of, for example, voluntary immigration to the United States among new African populations versus patterns of involuntary enslavement of Africans over a specifiedperiod of time. The use of multimedia allows this particular team to incorporate video clips of descendents of slaves from library archives and their own interviews with new immigrants alongside third-person historical accounts

and newspaper articles. At the end of the project, the professor asks the teams to include video clips of a reflection session where the group considers what benefits might have been accrued from working in a diverse team that would not have been gained by tackling the project individually. By opening up both the process and the content to multimedia, the professor encouraged more powerful learning than would have occurred with simply assigning independent term papers.

The use of multimedia enables students to demonstrate learning beyond a specific topic under study. The example above specifically focuses on comparisons of voluntary and involuntary immigration; however, working in teams and using multiple technological forms facilitates the introduction of other topics such as social justice, ethics, and economic systems more easily. Group work where students can match their talents and interests to specific technological tasks enables each student to pursue an aspect of the assignment that appeals to the way she or he learns best.

Add Flexibility
Because we know that different students learn best when they are challenged to learn in different ways, technology allows teachers to add flexibility to how they present new information and provide feedback to students. For example, both skills and content will be enhanced when students are asked to demonstrate their learning through multimedia presentations to the rest of the class. Virtual discussions allow instructors to help the class develop their analytical judgment.

Real-Time Engagement
The course assignment cited above can also help students explore the circumstances surrounding each immigrant group's departure from its homeland, the route or routes taken to arrive in the United States, where they arrived, and why. The assignment could take on a deeper dimension by using videoconferencing and e-mail to link teams to students living in the countries of origin of the groups being studied. Integrating real-time global experiences into the classroom can provide a new, first-person information source and engender debate about the validity of various sources of information used in conducting research. These technologies make it easier for courses to depart from chronological, linear formats.

Undergraduate Research

Undergraduate research can provide students with an opportunity to learn problem-solving and discovery techniques and to apply what they've learned to real-life, unscripted problems. With the infusion of technology, students can learn not only new techniques for discovery but also techniques for demonstrating the results of discovery. For example, as part of a Fund for the Improvement of Postsecondary Education grant, several colleagues and I at Vanderbilt University embedded student research in a course designed to develop a multimedia Diversity Opportunity Tool (DOT). The tool was designed to help students, faculty, and staff develop the skills needed to productively respond to acts of discrimination and to make decisions about when they need to act, depending on the situation. The team-taught course required students to conduct a literature review on U.S. race relations historically and currently, the psychology of discriminatory behavior, and racial-attitude development. Students also conducted interviews with peers and analyzed the data in light of specific topics they would cover in their final projects. They then developed scripts that told compelling stories centered on discrimination, connected to the findings of their original and archival research. Students integrated their learning through a demonstration video that served as a companion piece to their final written work.

Our goal was to combine students' research with video stories to shape vignettes that would make up this educational tool. In developing the scenarios, scripts, video, pilot testing, and final products related to DOT, graduate and undergraduate students were engaged in filming, acting, and producing the tool. Undergraduate research, combined with technology, became a vehicle to bring research into practice in a tangible way and to contribute to the fields of educational and antidiscrimination training.

Repositories over Time

These illustrations focus on course-level learning, but technology can support learning in broader, cumulative ways as well. For example, students can use multimedia e-portfolios as repositories for culminating classroom assignments, for demonstrations of learning in the major and in general education, and for a senior-year capstone project. Additionally, e-portfolios can be used to demonstrate leadership and learning outcomes gained through cocurricular and work experiences, and they can follow a student if she or he transfers from one institution to another.

Blended Instruction

As faculty become more comfortable with assigning multimedia projects—and students with completing them—there will likely be growth in interdisciplinary multimedia assignments and projects. These assignments not only serve the student developing the project but also can be used as a resource for users' learning. Tools such as the Adventures of Jasper Woodbury, Scientists in Action, and DOT illustrate this potential. Each had elements of its development tied to graduate and undergraduate research and coursework. Such tools can enable users to engage in self-paced movement through activities or can be blended into traditional group training.

The examples given above integrate multiple learning objectives and introduce students to many of the learning strategies outlined in the *Greater Expectations* report, such as

▶ practice in team building;
▶ writing that is both expository and creative;
▶ multiple forms of communication;
▶ informed judgment about sources of information; and
▶ reflection that situates the self in relation to others and provides an opportunity for individuals to come to a deeper understanding of differences, commonalities, and systemic inequities.

Technology alone does not make this happen. Each of these strategies is facilitated through the intentional use of a variety of tools—both traditional and cutting edge—by individual faculty and campus-wide curriculum planners.

Some faculty have expressed concern that expanding the use of technology in and out of the classroom will both undermine the role of faculty and overburden them with additional responsibilities. With the expansion of online courses, cyberdiscussion groups, the increasing ubiquity of communication technologies, and faculty already feeling the pressure of added responsibilities, these concerns are not surprising. Faculty concerns perhaps center less on being "replaceable" and more on worrying that the teaching and learning enterprise will be reduced to students gathering information that can be easily downloaded, causing them to rely too heavily on technology instead of intellect.

The *Greater Expectations* report recognizes new demands on the faculty at all educational levels. Yet there are at least two reasons why technology concerns should be allayed. First, traditional age students overwhelmingly prefer face-to-

face contact with faculty to mediated communication. Second, technology used in the service of learning will require more—not less—sophistication on the part of students as they engage in processes of integration, translation, audience analysis, and critical judgment. The learning outcomes of a 21st-century education will enable us to meet new challenges here and abroad, ranging from information "overload" to persistent inequality and pressing social issues. These challenges require educators who can think in interdisciplinary, multimedia ways to construct the 21st-century curriculum. Faculty with expertise in one or more subjects, who have been exposed to what we know about how people learn, can determine how to enhance this learning through the use of technology. But simply understanding how to use technology will not provide the integration needed to reach the desired learning outcomes.

When thinking about integrating technology into the curriculum, Chickering and Gamson's seven principles of good practice continue to be sound:

▶ Encourage contact between students and faculty.
▶ Develop reciprocity and cooperation among students.
▶ Encourage active learning.
▶ Give prompt feedback.
▶ Emphasize time on task.
▶ Communicate high expectations.
▶ Respect diverse talents and ways of learning.[10]

Implications

▶ There is a need for integrating technology that is in the service of learning throughout the curriculum.
▶ More intentional use of technology to capture what students know and are able to integrate in their learning is needed.

Assessment

As we increase the use of multiple technologies in the service of learning, we will need to assess its impact. Students tend to be more technology savvy than faculty. Faculty are still much more knowledgeable about the subject matter at the heart of what students should learn. As such, concerns that students choose form over substance are probably unwarranted—content will triumph over glitz when it is delivered in rich, engaging, purposeful, and practical ways, as can be done with multilayered teaching strategies and tools.

In light of this, higher education will need to assess the elements of technology that work best to facilitate students' learning—not just generically but under specific circumstances. This requires that an initial baseline of students' prior use of technology be established (including the kinds of technology used) and the contexts in which they have used technology. Faculty, as architects of the curriculum, must then articulate learning outcomes for the different levels of curriculum (course, sequence, major, general education, and entire collegiate curriculum). Those faculty members interested in the intersection of teaching, technology, and learning must identify the elements critical to learner success as well as those that can impede success. But we must also listen to our learners. Too often we engage in curricular design and assessment without benefit of feedback from students.[11]

Implications

▸ Students' learning of the subject matter and the role of technology in their learning will need to be assessed.

▸ The extent to which technology is a tool for learning and a tool for assessment of learning will facilitate faculty's increasing comfort in integrating technology into the curriculum.

Conclusion

Future careers will require higher levels of education than in the past. That education must enable individuals to discover what they need to know rather than just having static knowledge. Society will need college graduates with mental agility and adaptability.

If this is the goal of education, colleges and universities must reexamine how that goal is achieved. The Net Generation and the current capabilities of information technology make it possible to support learning activities that will enable graduates to be mentally agile and adaptable. However, beyond technical infrastructure, the use of technology in the service of learning is limited.

The *Greater Expectations* report calls for a focus on developing intentional learners; it also calls for developing intentional institutions. Colleges and universities are connecting silos of administrative work with relational databases so that, for example, financial aid structures can interface with human resources and accounting, ensuring students can work for the institution and maintain simultaneous student and staff categorizations. Eight years ago this was not

easy, but today no one thinks it should be any other way. Clearly, technology can facilitate the achievement of the operational goals of the institution. But achieving one of its most important goals—improving the learning of all students—through technology will require conversations at all levels—department, college, institution, and state. With calls for greater accountability for increased spending and for assessment of student learning, we can ask for no less than the effective and coherent integration of technology into an enriched curriculum that meets both student and societal expectations.

Endnotes

1. Association of American Colleges and Universities (AAC&U) *Greater Expectations National Panel, Greater Expectations: A New Vision for Learning as a Nation Goes to College* (Washington, D.C.: Association of American Colleges and Universities, 2002), <http://www.greaterexpectations.org/>, pp. 21–22.

2. Ibid., pp. 22–23.

3. AAC&U, unpublished research.

4. The Education Trust will be releasing a database of information that provides every college and university's graduation rates disaggregated by race and ethnicity. This database will enable parents and communities to begin to make comparative analysis of their college choice based on one criterion—graduation rates. This will not indicate quality, but it is a start in demonstrating comparatively the outcomes of colleges. As such databases become easier to develop and make accessible, I envision the inclusion of more compelling criteria that gets directly at the learning outcomes defined in the Greater Expectations initiative.

5. A description of the Adventures of Jasper Woodbury Series can be found at <http://www.enc.org/about/partners/donors/0,2134,86356,00.shtm>. New copies of the series are unavailable, as efforts are focused on converting the video materials into a CD-ROM problem-solving format. Contact the Department of Teaching and Learning at Peabody College, Vanderbilt University (http://peabody.vanderbilt.edu/tl/index.htm) for more information.

6. AAC&U Greater Expectations National Panel, op. cit., p. 22.

7. Ibid., p. 33.

8. Ibid., p. 33.

9. For more on structuring groups to accrue the educational benefits of students' compositional diversity, see Jeffrey F. Milem, Mitchell J. Chang, and Anthony L. Antonio, *Making Diversity Work on Campus: A Research-Based Perspective* (Washington, D.C.: AAC&U, 2004); available January 2005 at <http://www.aacu.org/>.

10. See Arthur W. Chickering and Zelda F. Gamson, "Seven Principles for Good Practice in Undergraduate Education," *AAHE Bulletin,* vol. 39, no. 7 (March 1987), pp. 3–7, <http://aahebulletin.com/public/archive/sevenprinciples1987.asp>.

11. Beyond classroom and programmatic assessment, it is important to consider how research on technology and learning can be fostered on our campuses and used to inform our institutional functioning. For more information on the scholarship of teaching and learning, visit the Web sites of The Carnegie Foundation for the Advancement of Teaching (http://www.carnegiefoundation.org/CASTL/index.htm) and the American Association for Higher Education (http://www.aahe.org/projects/campus_program/index.html). A simple Google search on the scholarship of teaching and learning and technology will reveal many campus efforts devoted to this work, such as Penn State's Teaching and Learning with Technology (http://tlt.its.psu.edu/).

Further Reading

J. D. Bransford et al., "Anchored Instruction: Why We Need It and How Technology Can Help," in Don Nix, R. J. Spiro, and Rand Sprio, eds., *Cognition, Education, and Multimedia* (Hillsdale, N.J.: Erlbaum Associates, 1990).

Arthur W. Chickering and Stephen C. Ehrmann, "Implementing the Seven Principles: Technology as Lever," *AAHE Bulletin*, vol. 49, no. 2 (October 1996), pp. 3–6; available with updated information at <http://www.tltgroup.org/programs/seven.html>.

Cognition and Technology Group at Vanderbilt, "Anchored Instruction and Its Relationship to Situated Cognition," *Educational Researcher,* vol. 19, no. 6 (1990), pp. 2–10.

Cognition and Technology Group at Vanderbilt, "Anchored Instruction and Situated Cognition Revisited," *Educational Technology,* vol. 33, no. 3 (1993), pp. 52–70.

About the Authors

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curriculum in science, math, and language arts for more integrated learning. She completed her undergraduate degree at the University of Wisconsin–Milwaukee and her MEd and PhD degrees at Vanderbilt University.

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