Information Technology Council
Subcommittee on Academic Technology

Academic Technology For Teaching and Learning

Vision and Plan

Excellence and Innovation
at UMass

January 2005

1 . Purpose and Scope

The Information Technology Council Subcommittee on Academic Technology (SAT) is charged with facilitating the development and implementation of a vision for effective utilization of technology in teaching, learning and scholarship at the University of Massachusetts (UMass).

This report presents SAT's vision and implementation framework for effective employment of technology in teaching and learning. The technology vision in support of research, scholarship, and outreach will be the topic of a separate, future report.

The report is organized as follows. Sections 2 and 3 present SAT's view of the importance of broad university attention and commitment to academic technology and the transformation of the academy. The ten-year academic technology vision for teaching and learning is presented in Section 4, along with specific outcomes that will be experienced by stakeholder groups. The implementation plan is discussed in Section 5, in terms of organizing concepts and principles, the roles of faculty, students, and administration, and a framework and timeframe for achieving the vision. Concluding remarks are presented in Section 6, and seven appendices give further information about issues raised in the report.

2. An Imperative for Action

> We begin to perceive the contours of a very different academy, one in which students are supported by networks of human and technological resources and thus, according to our own research findings, more likely to succeed [Lovett05].

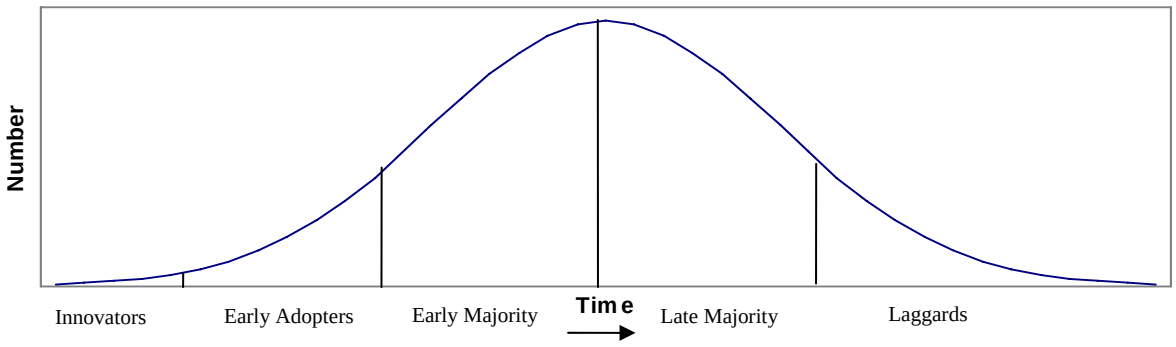
Clearly, the technology revolution impels institutions to explore and declare their vision. But that vision must first be about teaching and learning. Though technology may formerly have been regarded as a tool of efficiency or as a medium for alternatives to traditional practices, we are well into a period in which academic technology will impact the effectiveness of all universities in their primary educational mission. Academic technology provides opportunities for us to teach and learn better, and the institutions that seize those opportunities will be institutions that achieve distinction.

For the University of Massachusetts to fulfill its mission to the Commonwealth and to offer access to excellence in teaching and learning, it must adopt a proactive approach to academic technology, one based on a clear, widely accepted vision and a realistic plan. That acceptance should proceed not from edict but by the collaborative efforts of faculty and staff across the campus as they capitalize on the power of digital technology.

That power is advancing at an exponential rate. Processing power, storage capacity, and communications bandwidth are all doubling about every eighteen months and are expected to continue doing so for the foreseeable future. This amounts to a ten-fold increase every five years and a hundred-fold increase every ten years. The convergence of computing, communications, and content is becoming a reality. Over the next ten years digital and communication technology will become ubiquitous and far less obtrusive.

The potential positive impact of digital technology on teaching and learning is becoming better understood and more widely demonstrated and shared. The next ten years in the evolution of academic technology can be characterized as years where the professoriate is involved in understanding the applicability and benefits of academic technology to teaching and learning, and academic technology products are becoming more integrated, mature, and reliable.

Figure 1: Technology Adoption Life Cycle



A very real challenge is presented in terms of the technology adoption life cycle [Rogers95], in which technology is progressively adopted by groups identified as innovators, early adopters, early majority, late majority, and laggards. While specific technologies are at varying stages along the life cycle, overall use of academic technology in higher education is moving from the small numbers of faculty innovators and early adopters to the pragmatic early majority. Innovators and early adopters tend to be visionary, risk-taking, willing to experiment, and self-sufficient. The early majority is pragmatic, risk averse, wanting proven applications, and frequently needing significant support. The organizational impact of moving from the early adopters to the early majority is large; Moore refers to it as "crossing the chasm" [Moore99].

Forward-looking academic institutions will develop the infrastructure and support structures to enable both the innovators/early adopters and the pragmatic majority of faculty to explore and adopt these technologies, and they will develop and articulate the common vision that ties academic technology goals to their campus missions.

The Imperative for Action: In Lovett's terms, as the contours of a very different academy take on increased definition and shape, UMass must commit to becoming that very different academy. UMass must understand the impact of technology on teaching and learning, build the infrastructure and support services to permit its evolution, and embrace the resulting change in the way faculty, students, and alumni teach and learn together.

3. A Call to Leadership

In a 1980s television ad, former Chrysler Corporation CEO Lee Iaccoca said "you either lead, follow, or get out of the way." While getting out of the way of academic technology is not an option based upon stakeholder needs (see Appendix 2), whether to follow or lead is an appropriate and essential question.

To lead in the adoption of academic technology means to lead in the scholarship of teaching and learning, to foster exploration and innovation, to engage the majority of faculty earlier rather than later, and to envision the interaction of universities with an information age society. To follow in the adoption of academic technology is to learn from others' scholarship concerning teaching and learning, as well as other universities' evolutions enabled by academic technology, and in time utilize the best of their experience.

To lead requires more university commitment – clear vision, high priority, resource commitment, and institutional belief – than to follow. But it is the necessary goal. Teaching and learning will be most improved when faculty engage in a discourse about teaching, not just read about it, and when the university envisions what it can be to its stakeholders, not just tries to keep up with its peers.

Over the past several decades, UMass has engaged in many leading-edge academic technology activities, as a system and as individual campuses. Faculty development centers; Information Technology bonds for libraries, the Massachusetts Information Turnpike Initiative (MITI), and multi-way video; Professional Development Grants for faculty; the pioneering work of CyberEd; and the annual system-wide Instructional Technology Conferences are all indicative of the level of interest, enthusiasm, and innovation of UMass and its faculty. There is still much innovative activity, but both budget difficulties and focused technology commitment to administrative systems have constituted real constraints in recent years.

UMass has not fallen far behind leading universities, and much is in place for attaining a leadership position in the effective use of academic technology: University leadership, improving budgets, technology infrastructure, an excellent faculty bolstered by a post-early-retirement wave of new hires, maturing and less costly technology, and a growing scholarship around teaching and learning.

This Vision and Plan proposes that UMass answer the call to leadership, and aggressively pursue excellence and innovation in teaching and learning. UMass will lead when its faculty innovators and early adopters contribute to the world's knowledge of teaching and learning with technology. UMass will be a true leader when the majority of its faculty effect broad, deep, and lasting improvement in student learning, and UMass becomes, in Lovett's terms, "a very different academy, one in which students are supported by networks of human and technological resources and thus, according to our own research findings, more likely to succeed."

4. The Vision: UMass Academic Technology for Teaching and Learning

4.1 The 2015 Vision

> "The University of Massachusetts is recognized as a leading university in using academic technology to improve teaching, learning, and scholarly interchange, and in evolving its role as a university in an information age society."

4.2 Specific Vision Outcomes

The following are specific outcomes of achieving the academic technology vision for the various stakeholder groups. By 2015,

All:

1. There is a general sense among faculty, staff, and students that UMass campuses value teaching and learning and invest well in it, and that UMass provides a nationally-recognized, innovative, and excellent educational opportunity to its students.
2. Throughout faculty, student, and staff activities, reflective practice and assessment have become part of the culture, and continuous improvement is seen and felt across the campuses.
3. UMass is seen by the economic community of the Commonwealth as an institution that produces a well-educated quality workforce.
4. UMass is prototyping alternative course delivery/economic models in a culture that is comfortable with and encourages change and innovation.

Faculty:

5. Faculty feel that the University provides an environment for success in teaching and learning, and thus fulfill their responsibilities as individual contributors and as department members by continually improving their courses and their curricula.
6. A serious yet lively and invigorating discourse has developed around the scholarship of teaching and learning, and participation in seminars, symposia, and other campus- and system-wide teaching, learning, and scholarship events is flourishing.
7. UMass has an academic technology environment that attracts and retains quality faculty.

Students:

8. Students graduate as reflective independent learners, capable of working effectively in groups, and well-prepared for career development and lifelong learning.
9. Students are most satisfied with the professionalism and quality of the educational environment and of their studies, are ambassadors for UMass, and avid alumni.
10. UMass effectively supports student acquisition and use of computing/communication devices that take advantage of the most forward-looking learning environments. Additionally, UMass assures that students with disabilities have complete and equal access to those environments.

11. UMass has an academic technology environment that attracts and retains quality students.

Alumni:

12. UMass alumni are members of varied virtual communities that support interaction and connectedness between alumni and the University.
13. UMass is the place that alumni turn to for continuing personal and professional education.
14. UMass alumni are aware of and supportive of UMass achievements in teaching and learning effectiveness and maturity.

Support Staff (IT, Library, Centers for Teaching and Learning, etc.):

15. Support services are properly staffed and funded, providing a broad range of technology, administrative, and pedagogical resources in support of the University of vision.
16. Support staff work in close partnership with faculty, and provide effective support to both faculty and students.

Learning environments:

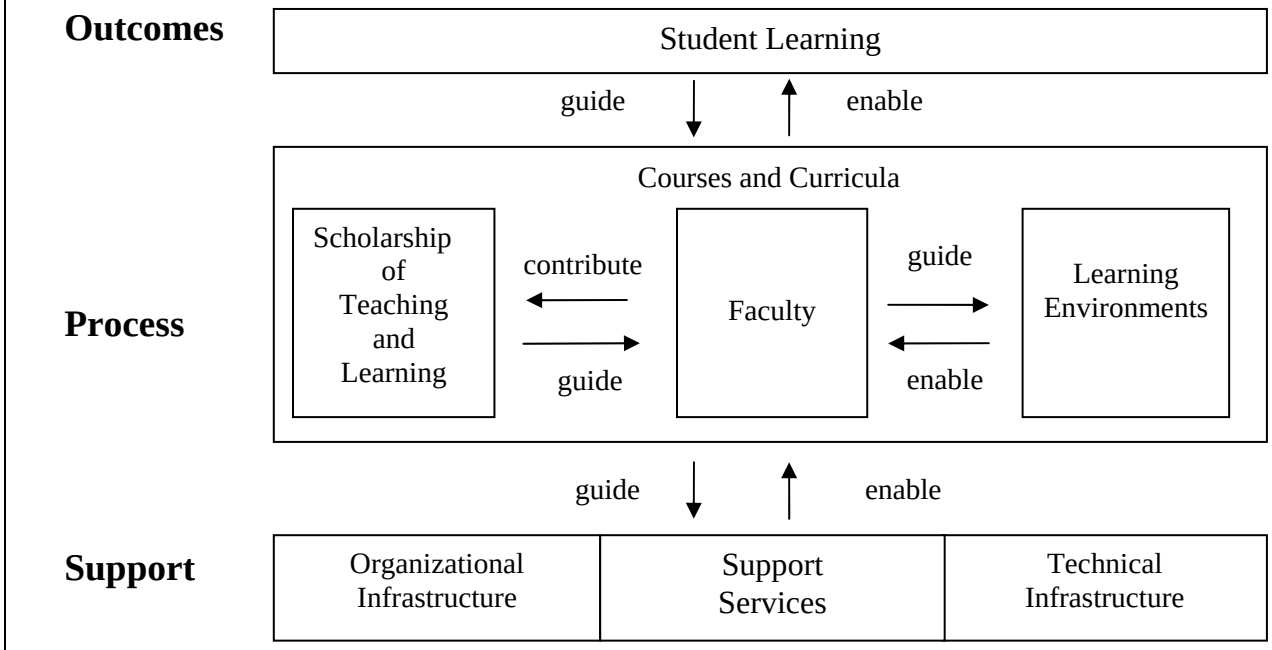
17. Classrooms, libraries, laboratories, and studios are comfortable, flexible, technology-enabled learning spaces that continually evolve to meet faculty and student needs.
18. Classroom building infrastructure is up to standard in terms of power, lighting, acoustics, HVAC, flooring, and aesthetics.
19. Early portals and learning management systems have evolved to powerful virtual learning environments that integrate seamlessly with faculty and student computing and communication usage, and are used effectively by students and faculty.

5. The Plan

5.1 Organizing Concepts and Principles

Consider the following model for teaching and learning in a university. In this model faculty are at the core. Faculty offer courses and curricula guided by the scholarship of teaching and learning, and enabled by the learning environments (classrooms, labs, learning management systems, libraries,…) and the organizational and technical infrastructures. There is a feedback loop whereby faculty contribute to the scholarship of teaching and learning, and guide the development and evolution of the campus' learning environments and support infrastructure. The outcome is student learning, enabled by the efforts of the faculty, the learning environments, and the support infrastructure; again, the feedback from students and reflection on the teaching/learning process guide and inform the evolution of courses, curricula, and pedagogies.

Figure 2: A Model for Teaching and Learning



In thinking through this model and the impact of academic technology, the following principles become evident.

Teaching and learning with technology are about faculty, not technology. Faculty must be actively involved throughout the educational process**.** Instructional development is more than the training of individuals in the use of technology. It underscores the campuses' commitment to a community of teachers who, through their collaborative exploration of their craft, continually improve that craft, and to a system of rewards and incentives that recognize faculty innovations in these areas.

Good practice is built on inquiry and reflection. A vision for teaching, learning, and technology must provide opportunities for reflection on the part of both students ("How do I learn effectively?") and faculty ("How do I teach effectively?"), especially since effective teaching with technology is a work in progress. A critical component of planning must concern the manner in which the University of Massachusetts and its campuses provide an environment in which this reflection can occur. Reflection, good practice, and the scholarship of teaching and learning are discussed further in Appendices 3 and 4.

Evolving academic technology creates new opportunities to build effective learning environments. Learning environments may be physical – classrooms, libraries, labs, studios – or virtual – learning management systems, collaboration tools, virtual libraries, etc. And any single educational experience may well encompass both, to the point that the line between them becomes irrelevant, and the two kinds of environments become mutually dependent.

Infrastructure and support for effective learning environments must consistently be strong. Effective faculty use of technology in face-to-face, online, and blended courses requires a knowledgeable and dedicated support staff, robust technology infrastructure, campus-wide classroom standards, and a reliable and full-featured learning management system. Effectiveness also rests on appropriate physical and virtual library holdings and resources, instructional development support, technology and multimedia services and training, up-to-date faculty computers and software, and support in dealing with broad issues such as copyright and plagiarism.

Initial implementation of technologies is only the beginning. Adopting learning management systems, implementing electronic portfolios, building new classrooms, and establishing hardware replacement programs – to name a few recent ventures – require enormous effort and commitment of resources at the front end. But successful implementation must transcend merely putting these endeavors in place. Their success depends on a progression through the intervening stages to maturity. This evolution requires support, reflective practice, and faculty discourse and sharing over a prolonged period of time, which ultimately entails a commitment of human, material, and financial resources that greatly exceeds the initial material costs. An illuminating concept concerning this evolution, maturity models, is discussed in Appendix 5.

Institutional structure must establish paths of least resistance. At times, institutions profess goals and objectives that are correct and meaningful to their missions, but those attempting to meet the goals find that it is an uphill battle with many institutional obstacles to overcome. If the University wishes to effectively use technology to enhance and change teaching and learning, it must understand how its underlying structure aids or impedes faculty use of technology, and change the underlying structure to provide both a culture and an environment that facilitates the faculty's efforts. The University's constituents should collaboratively review policies and procedures with respect to such issues as workloads, promotion and tenure criteria, rewards and incentives, day/DCE distinctions, FTE allocations, governance procedures, registration, and course articulation. Institutional commitment and support is discussed in more detail in Appendix 6.

5.2 Roles

In accordance with the organizing concepts and principles and with the ten-year vision, it is useful to articulate the roles and responsibilities of those involved in providing or supporting teaching and learning.

President's Office and Trustees will:

1. Promote and advocate this vision for teaching and learning with academic technology.
2. Take responsibility for improving teaching and learning outcomes and for securing the resources needed for attaining leadership in the effective use of academic technology.
3. With campus input, set expectations and assess system-wide progress.
4. Seek to understand how system culture and underlying structures aid or impede system progress, and work to remove impeding forces and establish supportive structures.
5. Facilitate synergy between the campuses through appropriate system-wide committees (such as SAT), communities of interest, invited speakers, and symposia.
6. Provide shared support services such as learning management system hosting and wide-area networking services, in accordance with support service roles and responsibilities listed below.

Chancellors, Provosts, and Deans will:

1. Promote and advocate this vision for teaching and learning with academic technology.
2. Take responsibility for improving teaching and learning outcomes and for securing the resources needed for attaining leadership in the effective use of academic technology. Set expectations and assess campus progress.
3. Seek to understand how campus culture and underlying structures aid or impede progress, and work to remove impeding forces and establish supportive structures.
4. Provide adequate campus resources (faculty/staff, capital, and operating funds) to establish and maintain the campus' teaching and learning capability.
5. Provide internal grants, stipends, and other incentives to facilitate innovation and progress.

Support Services (IT, Library, Centers for Teaching and Learning, etc.) will:

1. Work with faculty to understand and articulate how their teaching and learning needs and aspirations can be supported through the appropriate use of academic technology.
2. Function as "forward observers," looking over the horizon for new and effective technologies and pedagogies.
3. Provide quality support services.
4. Grow their capacity through participation in their professional societies, and collaborate with their peers across the campuses.
5. Utilize reflective practice and assessment to improve their services.
6. Articulate their resource needs in relation to faculty needs and expectations.

Faculty will:

1. Engage in the scholarship of teaching and learning, and participate in faculty discourse and sharing within and across the campuses.
2. Utilize reflective practice and assessment to improve their teaching, and lead students in reflective practice and assessment to grow their capacity to learn.
3. Use technology appropriately to enhance instructional quality and increase access.
4. Work to continually improve sections, courses, and curricula.
5. Articulate their needs for educational support services, and provide direction and feedback to support service providers.

Students will:

1. Take responsibility for their learning and for their capacity to learn, actively engage in their courses, and actively participate in their learning communities.

5.3 Implementation

Fulfillment of the roles described above is essential to the University's achieving distinction in the employment of academic technology. The separate role imperatives may strike some as straightforward or even obvious. However, taken as a whole, their adoption signals a sea change involving a major commitment of energy and resources. Such a commitment must be implemented with care, and with a full awareness of its impact on all constituents of the University.

Based upon the organizing principles, the vision, and the roles articulated above, we propose the following implementation plan. An overall framework for system-wide action is presented, and then specific goals and actions are proposed for years 1, 2 and 5.

Framework

To lend structure to the implementation planning, five areas or threads of effort are identified:

- Physical and virtual learning environments
- Faculty engagement and the scholarship of teaching and learning
- Course and curriculum redesign
- Assessment
- Support Services

Working groups will be established for each of these areas, as subcommittees of SAT. The (to be hired) Associate Vice President for Academic Technology will be the convener and an ex officio member of the groups.

To facilitate progress in these areas, four mechanisms are envisioned:

- Expectations and assessment
- Innovation grants and pilot program support
- Intercampus collaboration and synergy
- Faculty and staff incentives

UMass will structure the implementation to address the needs of both:

- Innovators and Early Adopters, who generate ideas and insight concerning teaching and learning technologies, and
- Early and Late Majority, who bring broad, deep, and lasting change to teaching and learning at UMass.

Goals and Actions

Goals for Year 1:

1. Achieve buy-in for this initiative from all parties.
2. Hire the Associate Vice President for Academic Technology.
3. Establish effective governance for the virtual learning environment being operated by University Information Technology Services (UITS) for UMass Online and the campuses.
4. Establish the work groups specified in the framework above.
5. Establish task forces to evaluate the status quo and make recommendations concerning:
    a. The role of teaching in the promotion and tenure process.
    b. Faculty development efforts on the campuses.
    c. Maturity models appropriate to guiding and assessing the evolution of teaching and learning.
    d. Deferred maintenance issues for existing classroom buildings.

Goals for Year 2:

1. Establish realistic end of Year 5 goals in the five areas identified in the framework.
2. Establish meaningful metrics for measuring progress in the five areas.
3. Augment AQAD in accord with technology, teaching, and learning objectives.
4. Establish a strategy for sharing innovative applications of academic technology among the campuses, such as the academic technology symposium formerly held in Boxborough.

Though the specific goals for Year 5 will not be fully determined before the end of year 2, implementation over the next 10 years may be characterized as follows:

Years 1 to 5: Achieving a Baseline

During years 1 to 5, much activity will take place in the five areas. Innovative, externally-funded individual and departmental teaching and learning initiatives will increase. Yearly progress tracking will be in place. Assessment will evolve based on experience. At the end of the

period, there will be an external assessment of the progress to five year targets, and recommendations concerning years 6-10. The 10 year vision will be revisited and refined.

Years 6 to 10: Achieving Maturity

With effective structures in place, a well-defined direction, and a successful track record, UMass and its campuses will proceed along the continuum to maturity and continuous improvement. Innovative, externally funded campus- and system-wide teaching and learning initiatives will be undertaken.

6. Conclusion

"There are no silver bullets."
Fred Brooks, 1986

Though Fred Brooks was referring to claims about methodologies for significantly improving the development of large software programs, his point applies to doing any intrinsically difficult task.

Improving teaching and learning across a multi-campus institution using changing technology is an intrinsically difficult task. The vision and plan outlined above aim to develop over time an environment in which faculty can broadly and creatively improve teaching and learning in their courses and curricula, and UMass can assume a leadership position based on its excellence and innovation in teaching, learning, and technology.

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Appendix 1: The Subcommittee on Academic Technology and Its Charge

The Subcommittee

The Information Technology Council Subcommittee on Academic Technology (SAT) is charged with facilitating the development and implementation of a vision for effective utilization of technology in teaching, learning and scholarship at the University of Massachusetts. In support of the implementation of the vision, the goals are to:

- identify and facilitate the resolution of system-wide academic information technology issues and policies;
- encourage the sharing of information and expertise among campuses and promote faculty development activities;
- facilitate pilot projects and demonstrations to illustrate new uses of academic information technology;
- monitor system and campus progress towards effective academic uses of technology;
- support new constituencies for technology-based delivery of academic programs;
- identify external funding opportunities for multi-campus academic information technology projects.

SAT Membership

The Academic Year 2003-2004 members of the Subcommittee on Academic Technology were:

Co-Chairs
Robert Green, Vice Chancellor for Library Services, Information Resources, and Technology, UMass Dartmouth
Mark Schlesinger, Director, Communication Studies, UMass Boston

Amherst
Mary McCulloch, Director, Professional Education for Engineering and Applied Science
Richard Rogers. Faculty Advisor to the Provost for Undergraduate Education

Boston
Paul Fonteyn, Provost

Dartmouth
Magali Carrera, Professor, Art History
Margaret Dias, Director, Educational Technology and Support Services

University Libraries
Elaine Martin, Director of Library Services

Lowell
Susan Gallagher, Assistant Professor, Political Science
Luvai Motiwalla, Professor, Management and MIS
Steve Tello, Associate Director of Distance Learning, Continuing Studies and Corporate Education

UMassOnline
Brian Douglas, Chief Technology Officer and Director of Operations

Barbara Macaulay, Chief Academic Officer

Worcester

Elaine Parker, Assistant Professor, Graduate School of Nursing

President's Office

Kate Harrington, Associate Vice President for Academic Affairs

Appendix 2: Stakeholders and Their Needs

The University of Massachusetts, as with any large, comprehensive university system, is made up of several key constituent groups. These generally include all that are connected with the learning/teaching process, directly or indirectly. Specifically, the stakeholder groups are: 1) Students – current and prospective; 2) Faculty; 3) Staff; 4) Alumni; 5) Internal Administration (Chancellors, Provosts); 6) Trustees; 7) Parents—current and prospective; 8) Employers; 9) Taxpayers and General Public; 10) Legislators; 11) Donors and grant funders. In addition, there are support units that also have stakeholder status—student services, campus-based/faculty development and teaching centers, libraries, vendors, deans/heads/chairs of departments, governance/organizational structures, reading/writing/learning support centers, and internal and external accrediting bodies.

A chart has been provided below that looks at some of these key constituencies and their needs that need to be considered in a broad and meaningful technology vision. Common to all groups is the need to have a role within the vision, both in terms of development and implementation, the need to be a valued component within the vision, the need for continuous learning and development, the need for support and resources to "live" the vision, and the need for accessibility, user-ease, and broad application of the technology.

Stakeholder Group	Needs
Students as Learners	▪ Guidelines for information fluency—UMass can provide something different, not just access to the Internet. ▪ Intelligent use of technology. ▪ Solving problems using technology—problem-based learning, lifelong learning skills. ▪ Discipline-based knowledge. ▪ Collaboration skills. ▪ Presentation skills. ▪ Critical thinking. ▪ Information assessment. ▪ Faculty and program support.
Faculty as Teachers	▪ Needing to feel valued—critical learning process. ▪ Students who have basic skills. ▪ Teaching environments (both face-to-face and online) that support pedagogies, teaching styles, learning objectives. ▪ Flexible, almost "invisible" technology that is comfortable to use, reliable, supportive, and can accommodate large numbers if necessary. ▪ Time for learning new ways to deliver information, create learning environments. ▪ Knowing why this is important, why change is needed. ▪ System wide vision with resources and rewards. ▪ Campus wide vision with time incorporated to learn new tools. ▪ Web-based resources rather than workshop formats. ▪ System-wide web-based faculty resource centers.

	▪ "Just-in-time" support and transitional support. ▪ Long term planning support as well. ▪ Faculty models for using new methods, such as demos and "proof" that these work. ▪ Believing that long term commitment from the top is there. ▪ Organizational/governance structures that support curriculum approvals, etc.
Staff (Includes support staff, technology support, staff that support faculty)	▪ Needing to feel valued—critical learning process. ▪ Understanding vision and feeling part of it. ▪ Commitment to roles—ongoing education and learning. ▪ Reasonable expectations-what kind of support is needed to do this right? ▪ Sufficient resources to do their work. ▪ 24x7 needs – who takes care of this? ▪ Opportunities for professional growth. ▪ Opportunities to learn from each other.
Chancellors/Provosts	▪ Vision to support investment, to make informed decisions ▪ Guidelines for implementation framework for going forward. ▪ Vision/plan to keep technology on front burner – part of supporting teaching and research mission. ▪ Vision that creates culture of expectations in all levels - engaging people in implementation. ▪ Support for meaningful faculty development to learn how to teach in different ways. ▪ Encouraging opportunities for engaging in teaching/learning.
Trustees	▪ Need to know why we are doing this, why it is important (context). ▪ Seeing that core mission cannot be completed without doing this. ▪ Need to see ROI. ▪ Rudimentary training on what "this" is. ▪ Statement regarding need for state-of-the-art teaching/learning. ▪ Seeing that investments are efficient, collaborative, "best use." ▪ Demonstrate that academic technology can provide for transformation. ▪ Concept of system vision and that campuses participate / benefit. ▪ Trustees need to provide for this vision via tools, etc. ▪ Need to understand value of academic technology.
Prospective Students/Parents	▪ Need to understand why we do this and why this makes UMass a better choice. ▪ Website needs to demonstrate forward use of technology. ▪ Technology needs to be friendly with a personal side. ▪ Statement of expectations, with roles and responsibilities clearly stated. ▪ Seeing both academic and consumer sides. ▪ Understanding that UMass values education and uses technology as a way to demonstrate that; maximizing ROI. ▪ Use of technology needs to thread down to schools and departments; showing what this means for students. ▪ Both "Substance and Glitz." ▪ Having various learning styles and needs met well. ▪ Communicating cultural diversity. ▪ Know that technology will be supported, at reasonable costs. ▪ Easy "shopping," with thorough and usable information.

Opportunities and Threats:

- Competition from other institutions requires the integration of technology.
- Need to retain students and quality faculty.
- Supports access to education and quality.
- Need to support the core mission.
- Provides the ability to serve a broad span of learners and to increase access.
- Provides faculty with tools to improve/enhance teaching.
- Provides increased means for getting/buying loyalty of alumni.
- Enhances employability of students, supporting their ability/capacity to have multiple careers.
- Builds lifelong learning capacity.
- Investment can generate revenues.
- Leverages use of resources better.
- Manages "seat time" differently, creating opportunities for expanding use of physical space.
- Provides opportunities for collaboration system wide and statewide.
- Gives UMass the opportunity for a significant leadership role.

Appendix 3: Reflective Practice and the Scholarship of Teaching and Learning

Teaching and Learning should be focal in the day to day discourse of the University and its campuses. Technology should not be considered as an end in itself, but as a means to support and, equally importantly, improve the educational process.

3.1 Reflective Practice

Good practice is built on inquiry and reflection. Some have adopted the term "reflective practice" to signal a habit of basing one's actions on at least implied hypotheses about their efficacy, and then reflecting on and adjusting those hypotheses:

> With ongoing reflection, your practice can develop into a systematic inquiry that begins alone with reflection on your own teaching and learning experiences but becomes collective when informed by our interactions with colleagues, students, and theoretical literature. (Syracuse University website)

A vision for teaching, learning, and technology must include reflective practice for both students (how do I learn effectively) and faculty (how do I teach effectively – especially since effective teaching with technology is a work in progress). A critical component of planning must concern the manner in which the University of Massachusetts and its campuses provide an environment in which this reflection can occur.

3.2 The Scholarship of Teaching and Learning

Ernest Boyer [Boyer90], in his Carnegie report of *1990 Scholarship Reconsidered: Priorities of the Professoriate*, proposed four types of scholarship: the scholarship of discovery (research), the scholarship of integration (textbooks, synthesizing reviews), the scholarship of application (outreach drawing on scholarly expertise), and the scholarship of teaching.

Shulman [Shulman98] in an AAHE volume on the course portfolio, observes that "a scholarship of teaching will entail a public account of some or all of the full act of teaching — vision, design, enactment, outcomes, and analysis — in a manner susceptible to critical review by the teacher's professional peers, and amenable to productive employment in future work by members of that same community."

Broad and deep utilization of academic technologies will demand more than ad hoc usage by individual faculty, namely, a scholarly consideration and sharing of teaching practices among the professoriate.

For a broad review, see also [Hutchings99].

Appendix 4: Chickering's Seven Principles for Good Practice in Undergraduate Education

Absolute principles of effective teaching and learning can be elusive and even dangerous, but a starting place may be identified in the well respected "Seven Principles for Good Practice in Undergraduate Education" [Chickering87]. Briefly, good practice . . .

1. Encourages contacts between students and faculty
2. Develops reciprocity and cooperation among students.
3. Uses active learning techniques.
4. Gives prompt feedback.
5. Emphasizes time on task.
6. Communicates high expectations.
7. Respects diverse talents and ways of learning.

Effective use of technology, then, rests on the extent to which it can enable good practice, whether by augmenting long standing teaching approaches or by enabling new modes of teaching. Table 1 suggests ways in which technology can abet good practice. It is drawn largely, though not exclusively, from work by Chickering and Ehrman [Chickering96].

Principle	Technological Enhancement
1. Encourages contacts. . .	Technology extends the manner and ways in which students and faculty can maintain a dialog beyond the classroom. Email, discussion forums, the Web, and other forms of interaction enable exchange of information and work that students may actually find more engaging and less inhibiting.
2. Develops reciprocity and cooperation. . .	Technology provides means whereby students share work and information more effectively, engage in collaborative scholarly inquiry, and thus enhance overall student engagement.
3. Uses active learning techniques. . .	Technology can broaden student participation. Students who might otherwise sit quietly in the back of the room may gain from technology-supported discussion forums, journals, weblogs, and the like. Further, in appropriate fields (music, art, sciences, for example) technology can provide "hands-on" experience, simulations, and "design and build" activities that enable the student to practice and assess his or her own work.
4. Gives prompt feedback. . .	Technology increases opportunities for professors to comment on student work in process, so that students and faculty become mutually engaged in constructive assessment, not simply the summary evaluation of student work. Technology can support portfolios or other repositories that enable student and professor to monitor progress over time.
5. Emphasizes time on task. . .	"Time plus energy equals learning." Technology not only extends opportunities for students to work outside the classroom, but by doing so it can help reshape face-to-face interaction. Students and faculty can cover core issues, for example, in a physical classroom, while procedural issues or specific threads can be pursued in the

	technologically extended classroom.
6. Communicates high expectations. . .	Professors employing technology can raise the bar by more clearly and more frequently communicating criteria and standards and by providing more opportunities for feedback (above) and gauging student progress toward goals.
7. Respects diverse talents and ways of learning	The variety of technological approaches affords "opportunities for students to show their talents and learn in ways that work for them. Then they can be pushed to learn in new ways that do not come so easily."

Table 1 **The Seven Principles as Augmented by Academic Technology [cf. Chickering96]**

As with any tool, the mere employment of academic technology cannot assure the improvement of quality, and can, of course, even diminish that quality. We maintain, however, that wise use of technology in light of salutory educational goals will enhance the teaching and learning experience for all parties.

Appendix 5: Maturity Models

The Software Engineering Institute at Carnegie Mellon University published the Capability Maturity Model for software engineering several decades ago [Paulk93]. The premise was that companies doing software development were at one of five levels of maturity reflective of their capability to develop reliable software on time and within budget. The five levels were sequential, in a developmental sense, and were named Initial (ad hoc), Repeatable (managed), Defined (standards-based), Managed (assessment and measured outcomes), and Optimizing (continuous improvement).

Recent authors have applied this model to teaching/learning topics including online course design and e-Portfolios [Love04, Marshall02]. This model comports well with our view of the scholarship of teaching. Adopting learning management systems, implementing electronic portfolios, building new classrooms – to name a few recent ventures – require enormous effort and commitment of resources a the front end. But successful implementation must transcend merely putting these endeavors in place.

Their success depends on a progression through the intervening stages to maturity. Consider, for example, the use of a learning management system (LMS) such as WebCT, whereby faculty can post to a web environment course components that present information, guide students, and engage them in course activities. The maturity model suggests the following questions:

- Is the professor just beginning to explore where LMS's fit in to his/her teaching, and is using the LMS based upon initial training and occasional evident utility? (Level 1: Initial)
- Has the professor established a format and role for the LMS in the way he/she provides learning materials, structures the course, and engages the student? (Level 2: Repeatable)
- Is the professor's structured usage based upon best practice and consistent campus usage? (Level 3: Defined)
- Has the professor engaged in meaningful assessment of the LMS usage, and defined measurable outcomes? (Level 4: Managed)
- Does the professor measure outcomes and use the assessment results to improve the manner in which the LMS is used in his/her courses? (Level 5: Optimizing)

The moral of the story is two-fold. Firstly, implementing LMS systems is just the beginning, as their use has to advance from ad hoc through the intervening stages to optimizing. This evolution requires support, reflective practice, and faculty discourse and sharing over a prolonged period of time. Secondly, if UMass is to realistically assess its leadership and its overall utilization of LMS's as an academic technology, a maturity model and a maturity assessment provide a framework and a meaningful assessment measure. That is, in examining how university faculty use LMS's, what percentages of faculty are utilizing LMS's at Level 1? Level 2? Level 3? Level 4? Level 5? And as importantly, how does this compare to last year? Two years ago?

Maturity models point out the long-haul nature of substantive change, and provides a framework for measuring the degree of change.

Appendix 6: Institutional Commitment and Support

The University and its campuses must confront several imperatives if academic technology is to play the kinds of roles envisioned in this report. In this appendix, we identify several such imperatives.

Quality Matters. Though it is hard to argue, it is nonetheless important to say: our mission has to be access to quality education, not just access to education. As we take steps forward in utilizing technology in the classroom and online, we will take on opportunities and challenges that will at times be less than fully successful.

The need is two-fold: (1) to engage in meaningful assessment and learn what works and what doesn't (the scholarship of teaching), and (2) ensure that a sufficient level of quality is maintained in all our courses and programs.

Involving Faculty. A pioneering professor may use technology in very creative and effective ways to teach a course, but all the course components, and any investment in them, may be lost when another faculty member is assigned the course. Departmental curriculum planning and assessment should direct prominent attention to technology. And campus and system-wide planning should offer ways to provide incentives and rewards for faculty who develop and implement new approaches and help others do the same.

Instructional development, in this light, is more than the training of individuals in the use of technology. In the spirit of the scholarship of teaching, it bespeaks the campuses' commitment to promote a community of teachers who, through their collaborative exploration of their craft, continually improve that craft.

Recognizing that such collaboration is time consuming and even risky (for example, an over-reliance on student evaluations of first-time or experimental offerings can greatly inhibit venturing), campuses need to work to assure that venturing faculty are rewarded for their work through various means, ranging from public recognition to financial incentives.

Infrastructure and Support. Effective faculty use of technology in face-to-face, online, and blended courses requires a robust technology infrastructure, campus-wide classroom standards, and a reliable and full-featured learning management system – in essence, effective learning environments.

In addition, campuses must provide appropriate physical and virtual library holdings and resources, instructional development support, technology and multimedia services and training, up-to-date faculty computers and software, and support in dealing with broad issues such as copyright and plagiarism.

System and campus planning, then, should offer targets for and routes to the adoption, development, and maintenance of appropriate infrastructure, including ways in which cross-campus collaboration can enhance each campus's access to appropriate technologies.

Paths of Least Resistance. At times, institutions profess goals and objectives that are correct and meaningful to their missions, but those attempting to meet the goals find that it is an uphill battle with many institutional obstacles to overcome. According to Fritz [Fritz99], organizations develop "paths of least resistance" over time, but what works for some professionals in some eras does not work for others at other times.. Policies and procedures designed for a bygone era, when telecommunications were not around to encourage course delivery to offices, homes, and other campuses, can impede the effective development of curricula and pedagogies that transcend the traditional classroom. They thus diminish each campus's ability to broaden its base, to benefit from the efforts of other institutions, and to provide wider choices and experience for its students and faculty. Fritz shows how we can change underlying structures and redirect paths of least resistance.

If the University and its campuses wish to effectively use technology to enhance and change teaching and learning, it must understand how its underlying structure aids or impedes faculty use of technology, and change the underlying structure to provide both a culture and an environment that facilitates the faculty's efforts. We share an imperative to review policies and procedures with respect to such issues as workloads, promotion and tenure criteria, rewards and incentives, day/DCE distinctions, FTE allocation, governance procedures, registration, and course articulation.

Cost Matters. In serving the interests of students and taxpayers, we must strive for cost efficiency. Though there is a common perception that reduced costs equate to reduced quality, recent experiences have shown this doesn't need to be the case. The Pew Foundation program for course redesign, led by Carol Twigg, funded the redesign of approximately 75 courses over a three year period. The goal was to reduce cost-per-student while improving student performance as measured by indicators such as successful completion rates and student achievement on tests and assignments, and that goal was achieved in all cases, though certainly to varying degrees from modest to exceptional.

An academic technology vision must include appropriate opportunity and encouragement for both evolutionary and perhaps revolutionary changes to educational delivery models in order to improve student performance and reduce costs.

Appendix 7: Draft Job Description

Title Associate Vice President for Academic Technology

Charge

- Enhance the quality of academic programs in the University of Massachusetts through the use of academic technology.
- Coordinate cross-campus activities that:
  - Recommend vision and priorities for the effective use of academic technology in teaching and scholarship
  - Promote instructional development in service of the vision and priorities
  - Foster a scholarship of teaching, whereby faculty and staff actively explore more effective ways to carry out teaching and learning
  - Promote assessment of programs and learning outcomes related to the employment of academic technology in teaching
  - Create incentives and remove bars for campus-based and cross-campus use of academic technology to improve teaching and scholarship
  - Enhance communication among campuses and constituencies in the UMass System with respect to academic technology.

Responsibilities

- Provide leadership and direction within the President's Office with respect to policy and operational issues related to AT
- With campus input, recommend expectations to the VPAA and assess system-wide progress in teaching and learning
- Seek to understand how system culture and underlying structures aid or impede campus progress, and work to remove impeding forces and establish supportive structures.
- Provide focus on critical academic technology issues, and facilitate appropriate interaction and commitment to action among the following:
  - Vice President for Academic Affairs and Provosts
  - Chief Information Officer and University Information Technology Services
  - Campus academic program directors
  - Campus IT staffs
  - External agencies
  - Funding and granting
  - State and Community College System
- Associations and other organizations promoting the quality of instruction
- Co-Chair and coordinate the ITC Subcommittee on Academic Technology
- Propose, coordinate and/or facilitate instructional development activities, including:
  - Workshops and seminars
  - Conferences
  - Special Interest Group collaborations

Reporting

- Reports to the Vice President for Academic Affairs and to the Chief Information Officer

Qualifications

- Record of effective college teaching employing academic technology.
- Knowledge of good practice in teaching, per se, and in the use of academic technology to promote more effective teaching
- Successful experience in working with college faculty to promote more effective instruction
- Excellent writing, speaking, collaborative, and coordinative skills