Chapter 4: Technology Support for Learning-Centered Mission

4.I Introduction

4.I.A Summary

This chapter reviews how technology is being used to support Lehigh’s learning-centered mission and reports on how the University’s planning processes are helping make Lehigh even more effective at using technology to support learning. The main focus of this chapter is the Lehigh Lab, the University’s principal initiative for supporting the adoption of innovative techniques and technologies that advance teaching, learning, and research. The self-study process was used to broaden the understanding of current technology uses and identify the strengths and weaknesses of the Lehigh Lab support model. The following recommendations (explained more concretely in Section 4.IV) emerge from this analysis:

1. **Faculty Recognition and Reward:** The University must do more to recognize and reward faculty members who commit to innovative approaches to teaching and publishing in the digital age. The Lehigh Lab itself can do more in this area (e.g., by removing barriers, providing resources, and highlighting successful projects), but reward and recognition count most when they come from a faculty member’s peers, chair, dean, and provost.

2. **Setting Priorities:** Lehigh should continue exploring a broad range of new technologies, but the Lehigh Lab can do more to help the campus focus on a smaller number of the most promising instructional innovations. Also, to be ready to deploy such innovative approaches, Lehigh must commit to a strategic financial plan for improving its information technology infrastructure (especially the campus network, classroom technology, and high-performance computing resources) and must strategically hire staff to support faculty projects in high-priority areas. Such planning will initiate from Library & Technology Services (LTS), in close connection with emerging University-level strategic planning processes.

3. **Outreach and Communication:** The Lehigh Lab should continue seeking new ways to involve more individuals in its projects by developing programming for instructors at all levels of technology preparedness, by involving undergraduate and graduate students more directly, and by doing more to support learning in co- and extra-curricular settings.

4. **Information Literacy:** Lehigh faculty and Lab staff must continue and enhance programs aimed at improving students’ information literacy skills, as these skills become ever more important for scholarship and communication.

5. **Student Involvement, with Disciplinary Focus:** Lehigh administration and faculty should support the emerging Technology, Research, and Communication (TRAC) Fellows program. This program, which will train a select group of undergraduates in the areas of writing, pedagogy, information literacy, and instructional technology, promises to improve student research, writing, and communication skills, while also providing a new tier of discipline-specific support for faculty.
4.II.B Methodology

This chapter is the product of work conducted by a subcommittee comprising faculty representatives from Lehigh’s four colleges, a graduate and an undergraduate student, and staff representatives from LTS and the Dean of Students Office:

- Bruce Taggart, Co–chair, Vice Provost for LTS.
- Edward Gallagher, Co–chair, Professor of English, College of Arts and Sciences (CAS).
- Gregory Reihman, Co–chair, Director of Faculty Development.
- Tonya Amankwata, Graduate Student, College of Education (COE).
- Anna Chupa, Associate Professor, Art and Architecture (Design Arts), CAS.
- Lynn Columba-Piervallo, Associate Professor of Education and Human Services, COE.
- Timothy Foley, Director of Client Services, LTS.
- Jean Johnson, Team Leader for Education, LTS.
- Jacob Kazakia, Professor of Mechanical Engineering and Mechanics, P.C. Rossin College of Engineering and Applied Sciences (RCEAS).
- Jack Lule, Professor of Journalism, CAS.
- Chris Mulvihill, Assistant Dean of Students, Office of Student Conduct.
- David Myers, Professor of Practice in Finance, College of Business and Economics (CBE).
- Christine Roysdon, Director of Library Collections and Systems, LTS.
- Evan Spark-Depass, undergraduate student.
- Todd Watkins, Associate Professor of Economics, CBE.

The subcommittee has worked since September 2006 to better understand how technology is being used in teaching and learning at Lehigh, to gather input from relevant groups across campus, to identify the strengths and weaknesses of the current model for supporting such uses, and to offer specific recommendations for how Lehigh might become even more effective at using technology to support learning. The charge questions to the subcommittee were:

- How are technology resources deployed to support learning, considering curricular, co–curricular, and extra–curricular settings? What are the objectives of current deployments, and what are the aspirational goals, opportunities, or needs for future deployments? How does the University’s budget process advance the objectives?
- How has the development of policy (academic or administrative) kept pace with the deployment of technology? How can the University become more proactive in adapting policy to technology to keep a focus on technology as an enabler of learning?
- Evaluate the effectiveness of training for technology end-users (faculty, students, staff). How can training be improved to better support learning?
- Evaluate student information literacy skills. How is development of those skills supported by technology?
- Evaluate student awareness of the principles of academic integrity. How is development of those skills supported by technology?
• How does faculty development programming empower faculty to effectively utilize technology in their courses and to promote both information literacy and academic integrity?

• What are the opportunities and challenges for utilizing technology to support and enhance the residential community of learners? How can Lehigh ensure effective support for the community of learners by using technology?

• Evaluate the alignment of off-campus and distance education programs at Lehigh.

To answer these and related questions, the committee met periodically from fall 2006 to fall 2007, completing work according to the timeline outlined in Table 4.1.

**Table 4.1: Technology Support for Learning-Centered Mission Subcommittee Timeline**

<table>
<thead>
<tr>
<th>Timeline</th>
<th>Description</th>
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<tbody>
<tr>
<td>Fall 2006</td>
<td>Collected information through a series of reports from individuals and a broad review of campus documents; identified a set of remaining questions; composed questions for a campus-wide survey.</td>
</tr>
<tr>
<td>Spring 2007</td>
<td>Distributed the survey to faculty, students, and appropriate staff; analyzed survey results; composed a draft report; cross-checked draft to ensure completeness and accuracy; shared draft with Steering Committee; revised draft and compiled appendices.</td>
</tr>
<tr>
<td>Summer 2007</td>
<td>Distributed draft to senior leadership and met with senior leadership for review and recommendations; revised draft and prepared for open-comment period.</td>
</tr>
<tr>
<td>Fall 2007</td>
<td>Distributed draft to campus for open-comment period; solicited input through meetings with appropriate campus committees, a public forum, and email correspondence; assembled and incorporated suggestions into a final draft.</td>
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</tbody>
</table>

The subcommittee tracked its work in a designated course in Blackboard, where members could gather and store background documents, edit content using shared documents and wikis, download and comment upon drafts, and keep apprised of the development of the timeline. The methodology specific to the campus survey is discussed in Section 4.II.D.1, below.
4.II Analysis

4.II.A Introduction to the Analysis

4.II.A.1 The Role of Technology in Lehigh’s Learning-centered Mission

At the heart of Lehigh’s official mission statement is a powerful reminder of the ultimate goal of the University: “The integrating element of teaching, research and service is learning, which is the principal mission of all members of the Lehigh community” (Appendix 2.1). As the University designs, develops, and deploys technologies that promise to enhance instructional practices, it does so with this learning-centered mission foremost in mind.

The purpose of this chapter is to review and evaluate the current use of technology in support of learning at Lehigh and to report on processes for making technology an even more purposeful element of Lehigh’s identity as a residential learning institution. Given that specific goal, the logical focus for this chapter is the Lehigh Lab, the University’s principal initiative for supporting the adoption of innovative techniques and technologies that advance teaching, learning, and research. While not every teaching-related innovation involves technology and not every academic technology requires the direct support of the Lehigh Lab, much of the recent change in culture and practice related to the use of technology in teaching and learning has been driven by the efforts of the Lab. Charged with fostering innovations and excellence in teaching and learning, the Lehigh Lab promotes the view that the entire University is a laboratory for learning, an experimental setting in which faculty, students, and staff test out new instructional approaches and share their results with others. Therefore, to understand the aspirations, activities, and accomplishments of the Lehigh Lab is to understand Lehigh’s commitment to technology support for its learning-centered mission.

In all of the Lab’s practices, student learning and faculty needs are given top priority. When helping faculty, Lab staff (see Section 4.II.B for a description of the staffing arrangements) strives always to understand the teaching context, including the instructional goals and the instructor’s level of comfort with technology. This approach helps the campus avoid the trap of promoting technology for technology’s sake and reinforces the values expressed in the Faculty Development Strategic Plan:

“The goal of promoting student learning is paramount and should always guide practice for those considering the adoption of new technologies, techniques, or approaches.”

“The best form of faculty development takes place when faculty are inspired, not required, to change; authentic, significant, and sustainable change occurs when faculty receive forms of support and guidance that are aligned with their own goals as teachers and scholars.” (Appendix 4.1)

Lehigh faculty and students benefit from a centralized support organization known as Library & Technology Services (LTS), which coordinates the many forms of technology and library systems, applications, and support structures. However, since no one individual or group can predict how information technology will next change teaching and learning, the Lab strives to support faculty projects without being overly prescriptive. Similarly, since neither librarians nor faculty alone can accurately predict changes in the way students will use
resource materials, Lehigh relies on the experimental, collaborative model of the Lab to ensure that the campus can react quickly to new opportunities. The model also provides just-in-time support for faculty members considering new approaches in their classroom. Faculty members are regularly involved in piloting new projects, serving on advisory and policy committees, and sharing research results with others. In this way, faculty members contribute significantly to the direction that technology will take the campus, which helps ensure that the University is able to deploy applications of technology that are well suited to Lehigh’s culture and needs.

The current self-study process is used to broaden Lehigh’s understanding of such technology uses, to identify the strengths and weaknesses of the Lehigh Lab support model, and to offer specific recommendations for how Lehigh might become even more effective at using technology to support learning. With these ends in mind, this report contains the following elements:

• An analysis of Lehigh’s current practices in this area, including a brief description of the Lehigh Lab, an overview of recent efforts to enhance faculty development programming and promote student information literacy, and an evaluation of the effectiveness of current practice, based on an in-depth study of a recent campus survey (See Section 4.II).

• A list of conclusions, highlighting Lehigh’s current strengths and weaknesses in these areas (See Section 4.III).

• A set of recommendations for how Lehigh should move forward into its next phase of supporting innovation in this area (Section 4.IV).

4.II.A.2 Connections to the 2003 Periodic Review Report

This report builds on directions and recommendations articulated in the 2003 Middle States Commission Periodic Review Report (PRR), especially the chapter focused on technology integration in teaching and learning. The PRR concluded that instructional technology across campus was becoming increasingly prevalent and that such deployments of technology were perceived by a majority of faculty as enhancing teaching and learning. It also voiced the view, which is echoed here, that not every class necessarily benefits from technology and that student learning should remain the guiding principle when faculty adopt new approaches.

The PRR also made a number of specific recommendations, which are addressed in this self-study in the following ways:

• The PRR recommended that faculty needed more support for technology integration and specifically called on Lehigh to offer support that was focused on various levels of faculty comfort with using technology.

Since 2003, the numerous, ongoing efforts of the Lehigh Lab have worked to address this need, though – as new technologies arise and more faculty members become involved in using technology in new ways – it is recognized that such a task is ongoing. The current self-study reports on the work that was done to meet this recommendation by discussing the Lehigh Lab and its accomplishments (Sections 4.II.B and 4.II.C) and reporting on current views of faculty and students on the effectiveness of the support they receive (Section 4.II.D.5).
In light of these new technologies, the PRR recommended that students receive more help developing information literacy, academic integrity, and communication skills.

Since 2003, Lehigh has implemented programs for cultivating information literacy, promoting academic integrity, and improving writing across the curriculum. These programs and their results are discussed in detail in Sections 4.II.C.2 and 4.II.D.4.

The PRR called on Lehigh to better assess the effectiveness of the technologies that faculty members are using.

This self-study shows ways that faculty members have been assessing the effectiveness of instructional technology (See Section 4.II.D.3) and offers recommendations for how more can be done in this area (See Section 4.IV).

The PRR recommended that more be done to better survey student views of technology at Lehigh.

Since 2003, the University has done more to survey students through both annual surveys about Lehigh’s course management system (Blackboard) and the WIRED residential network survey. Moreover, students were included in the most recent campus-wide Teaching, Learning and Technology survey (the 2003 report surveyed faculty only). The current report discusses student perceptions (see Section 4.II.D), and shows that Lehigh now is doing more to learn, as the PRR asked, “whether students believe technology helps them learn; how they believe technology helps them learn; what types of technology they use and find most beneficial; if they want online courses; and what additional support and/or technology they believe is necessary to enhance their learning” (PRR, p. 33).

4.II.A.3 Compliance with Middle States Standards of Educational Effectiveness

As stated in the previous section, the purpose of this self-study is to evaluate Lehigh’s use of technology to enhance student learning. As part of this evaluation, evidence is offered of Lehigh’s compliance with Middle States Standards 11 and 13.

4.II.A.3.i Standard 11: Educational Offerings

Standard 11 reads, “The institution’s educational offerings display academic content, rigor, and coherence that are appropriate to its higher education mission. The institution identifies student learning goals and objectives, including knowledge and skills, for its educational offerings.” Section 4.II.D.3. Faculty Assessment of the Effectiveness of Academic Technology, discusses ways faculty members determine whether their innovative approaches to teaching are helping them meet the learning goals specific to the courses they teach.

Moreover, since Standard 11 also focuses on students’ skills at accessing, evaluating, and using information, this self-study demonstrates compliance with Standard 11 in both Section 4.II.C.2, Developing Information Literacy and Promoting Academic Integrity, and Section 4.II.D.4, Information Literacy and Academic Integrity. These two sections discuss specific programs that cultivate information literacy and technological competency, and report on the effectiveness of these programs by reviewing faculty and student views on which skills are being taught, which skills are being learned, and which skills need more attention.

Furthermore, Section 4.II.D.2, The Educational Impact of Current Uses of Technology,
outlines faculty and student views on the role technology plays in helping students meet both core and discipline-specific learning outcomes related to writing, basic research and analysis, library research, communications, and more.

As noted in the course catalog (Appendix 3.25), “Your education at Lehigh University will help prepare you to excel by discovering and building upon your personal strengths in a campus community where active learning connects with real-world applications. Learning at Lehigh incorporates active academic research and hands-on experiences, both in and outside the classroom. As a comprehensive university, Lehigh offers students an education that integrates course work across four colleges and different fields of study in a dynamic learning experience that can be customized to individual interests.” That statement derives its strength from Lehigh’s mission to integrate learning through teaching, research, and service.

The basic requirements of degree programs in each undergraduate college are outlined in the course catalog. Each bachelor’s degree curriculum (Appendix 4.2) requires two semesters of English composition, at least one semester of mathematics, and coursework distributed across the humanities, the social sciences, and the natural sciences (Table 4.2). Each college has additional basic requirements that prepare students for meeting the curricular objectives of that college.

<table>
<thead>
<tr>
<th>Table 4.2: Minimum credits for basic degree requirements</th>
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<tbody>
<tr>
<td><strong>CAS (BA or BS)</strong></td>
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<tr>
<td>English Composition</td>
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<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Humanities</td>
</tr>
<tr>
<td>Social Science</td>
</tr>
<tr>
<td>Natural Science</td>
</tr>
<tr>
<td>Additional college requirements</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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</tbody>
</table>

Note 1. 12 credits of calculus + 3 credits of linear methods
Note 2. Minimum of 13 credits of humanities + social science
Note 3. Minimum of 4 credits of chemistry + 10 credits of physics
Note 4. Choices and Decisions (Arts 001, 1 credit) + First-year seminar (1–4 credits) + writing intensive course (3–4 credits)
Note 5. Includes common CBE core
Note 6. Eng 001 + Eng 005 + Eco 001

The course catalog also details requirements for graduate degree programs. All master’s degrees require a minimum of 30 credits, at least 18 of which must be courses at the 400 level. Departments may require a thesis or research project (3–6 credits) or a comprehensive examination. The MBA program requires a group capstone project. Doctoral degrees have no universal University requirements other than minimum registration (48 credits for students beginning with a master’s degree or 72 credits for those beginning with a bachelor’s degree), the “concentrated learning requirement” (minimum of two full-time semesters of study at Lehigh), a qualifying examination, a general examination, and a dissertation. Each department establishes course requirements for its doctoral degrees.

Narrative statements in the course catalog describe the program goals for each undergraduate and graduate program. Chapter 5 discusses program goals in the context of student–learning assessment.
Lehigh accepts relatively few transfer students (about 70 per year; the total number of transfer students is less than 5% of the undergraduate population). Transfer credit policies are published prominently in the course catalog (p. 31) and on the websites of the Registrar (Appendix 4.3) and the Admissions Office (Appendix 4.4).

Lehigh offers three accelerated, combined-degree programs in medicine (with Drexel University College of Medicine), optometry (with SUNY State College of Optometry), and dentistry (with University of Pennsylvania School of Dental Medicine). Each program entails a total of seven years of study. Complete policies for admission and transfer to the professional schools are described in the course catalog (pp. 37–38) and on the website of the College of Arts and Sciences (Appendix 4.5). The Admissions Office website links to the CAS page for a description of these programs.

4.II.A.3.ii Standard 13: Related Educational Activities

Standard 13 states, “The institution’s programs or activities that are characterized by particular content, focus, location, mode of delivery, or sponsorship meet appropriate standards.” To demonstrate compliance with Standard 13, this self-study discusses specific activities related to Lehigh’s distance and distributed learning programs. Lehigh’s activity in this area is currently confined to select graduate programs, professional programs, and niche undergraduate courses that meet specific curricular needs (Appendix 4.6). Section 4.II.B.3, Policies, discusses some of the ways the campus ensures that all such distance education approaches meet appropriate standards. This section also demonstrates compliances with specific elements of Standard 13 by showing that Lehigh’s curricular offerings are consistent with the institution’s mission and goals, and that the technical and academic infrastructure is well suited to support such approaches to education.

Moreover, in Sections 4.II.B, The Lehigh Lab 2002-2006, 4.II.C.1, Faculty Development Strategies, and 4.II.D.5, Quality of Support and Effectiveness at Promoting Technology in Teaching, this self-study demonstrates further evidence of appropriate orientation, support, and training for faculty members who teach in such distributed and hybrid learning environments. In addition, by providing the perspectives of numerous faculty and students who teach and learn in such settings, the report demonstrates how these new deployments of technology (in distance, distributed, and blended courses) meet appropriate educational objectives and promote student learning.

Lehigh does not have a separate organizational structure for distance or distributed learning; instead, the Distance Education program, part of LTS, coordinates such programs. This means that the same instructors who teach regular Lehigh courses also teach distance or distributed learning courses. As a result, certain elements of Standard 13 that pertain to partnerships with external providers are not relevant. Additionally, distance, distributed, and blended curricular offerings are developed in departments in the same way as traditional classes, and so are subject to the same standards of quality of instruction, academic rigor, and educational effectiveness as traditional courses.

As a general rule, Lehigh does not admit under-prepared students for undergraduate study. Adequate preparation is particularly important for the quantitatively demanding curricula in CBE and RCEAS, and a long-standing tradition of selecting students who have done well in academically rigorous high school curricula has served Lehigh and its students well across all undergraduate programs. Accordingly, with only two exceptions, Lehigh does not offer pre-college-level courses to remediate deficiencies in preparation. The first exception is Math 000, Preparation for Calculus, which is intended to provide an intensive review of the fundamental mathematical concepts required for the study of calculus,
including functions and graphs, exponentials and logarithms, and trigonometry. Math 000 does not count towards graduation, but it bears two credits in the student’s term course roster. It is best suited for CAS and CBE students whose intended curricula require calculus, but it is not recommended for RCEAS students because it introduces a delay in completing calculus.

The second exception is the non-credit Step Up program offered through the English as a Second Language (ESL) program (Appendix 4.7). Step Up is an intensive program of English language and American culture designed to prepare international undergraduate and graduate students for the academic and social expectations of an American university. Students can elect full- or part-time participation in summer, fall, or spring. The ESL program also offers credit courses for both undergraduate and graduate students, but Lehigh does not consider them to be “pre-college” offerings, and the credits do count towards a student’s total for graduation.

At present, the Global Citizenship Program (GCP) is the only undergraduate certificate program offered at Lehigh. The GCP is selective, and admits about 30 students per year from the population of matriculating first-year students. The requirements for this program are not just credit-based and include language study and study abroad, including a cohort trip in the first year (Appendix 4.8).

Graduate certificate programs at Lehigh require 12 credits of coursework.

- CBE offers two graduate certificate programs (Corporate Entrepreneurship and Supply Chain Management), each of which admits students who have completed accredited undergraduate degree programs with at least a 3.0 GPA. The students are admitted as non-degree students.
- CBE and the COE collaboratively offer a graduate certificate program in Project Management, which prepares students to sit for the Project Management Professional certification examination offered by the Project Management Institute. This program is available to non-degree students and students in graduate degree programs in either college.
- COE students can complete certificate programs in English as a Second Language, International Counseling, Teacher Leadership, Special Education, Technology Use in the School, and Educational Technology.
- RCEAS offers a graduate certificate program in Nanomaterials.
- The Office of Distance Education provides the Supply Chain Management certificate program online or via satellite broadcast and online certificate programs in Manufacturing Systems Engineering, Analytical Chemistry Principles of Pharmaceutical Science, Bio–organic Principles of Pharmaceutical Science, Regulatory Affairs in a Technical Environment, and Project Management.

Experiential and independent learning are highly valued at Lehigh. Many courses integrate experiential learning, and many others provide students with opportunities to structure real-world experiences as part of their academic experience. Lehigh offers a structured co-operative educational program to undergraduate and graduate students in RCEAS, and students in each of the three colleges can avail themselves of internships. The course catalog describes the requirements of the co-op program (p. 46; pp. 197–198).
Office of Career Services contributes support for the undergraduate co-op program (Appendix 4.9).

Internships are highly valued by students as introductions to the world of work and career. Many departments have a course through with students can earn academic credit for an internship, and several departments strongly recommend an internship or practicum experience. Not all experiences labeled as “internships,” however, are worthy of academic credit, and the Lehigh faculty follows three specific criteria for awarding academic credit for an internship: (1) 80 credits of work are required for each credit, (2) no credit will be awarded ex post facto, so prior arrangements are required, and (3) the student must be registered for the internship or practicum course during the same term in which the work is conducted (Course Catalog, p. 35). A faculty member must oversee the student’s academic work associated with the internship, which usually consists of a journal or portfolio and some reflective or other written work.

Lehigh does not award academic credit for “life experience.” All coursework must be completed under the supervision of Lehigh faculty members or in approved transfer coursework (see discussion of Standard 11).

4.II.B  The Lehigh Lab 2002-2006

4.II.B.1 Origin and Purpose

The Lehigh Lab is Lehigh’s principal organizational means for fostering a climate of innovation and excellence in teaching and learning. Like a center for teaching and learning, it offers instructional support, consultations, and workshops for faculty. Like a center for instructional technology, it offers computing support and consults with faculty on instructional technology and digital media. Unlike other such centers, it integrates these two approaches and, moreover, adds librarians, a Faculty Fellow, and a Writing Across the Curriculum Coordinator. The result is a dynamic arrangement of cross-functional support teams from Computing, Media Services, Distance Education, Instructional Technology, the Library, Faculty Development, and Enterprise Consulting. Individuals in these groups work together to help faculty adopt innovative technologies and techniques that enhance teaching, learning, and research. By bringing together all of the above areas in both a physical and virtual space, the Lab provides a centralized point of contact for those wishing to create new and innovative teaching and learning environments at Lehigh. By viewing the entire University as a laboratory for learning, this organization supports faculty members who want to teach differently, to test new technologies, or to discover and adopt best practices for promoting learning, enhancing student engagement, deepening knowledge acquisition, and improving skill development.

To implement the Lehigh Lab, LTS staff and faculty drafted a white paper in 2001 (Appendix 4.10). The white paper described the Lab’s purpose, staffing and facilities and outlined the following key objectives:

- Promote student and faculty technology-enhanced innovations for education.
- Provide training programs for students, faculty, and staff.
- Develop new strategies for adaptable classrooms.
- Implement a permanent, accessible database of digital media.
- Develop methods for evaluating the effectiveness instructional tools and services.
- Conduct classroom observation and consultation with individual faculty members about their teaching.
• Develop strategies and guidelines for the best use of technology in teaching.

In 2003, a space within the Media Center was selected as the principal physical location for the Lehigh Lab. Named the Technology Resource Learning Center (TRLC), this site was renovated at a cost of approximately $170,000. The TRLC houses an experimental classroom, a work area for students, and the offices of the Faculty Fellow, the instructional technology team leader, the Director of Faculty Development, and the team leader for instructional media services.

In addition to this central physical location, the extended Lab relies on a campus well equipped with technology and library resources, which in aggregate provide the material conditions that enable technological innovations in teaching, learning, and research. More information about campus resources can be found in Appendices 4.11, 4.12, 4.13, 4.14 and 4.15.

4.II.B.2 Organization
The Lehigh Lab is co-directed by the Director of Faculty Development and the Lehigh Lab Faculty Fellow. The Director of Faculty Development, who reports to the Vice Provost for LTS, is charged with providing leadership across Lehigh’s four colleges for innovation and excellence in pedagogy, including the incorporation of technology into teaching and student research. The director is responsible for ensuring that faculty members are provided with tools, development opportunities, and consultations that facilitate their design and delivery of innovative classes. The director also supervises the coordinator of the Writing Across the Curriculum program and co-supervises, together with the LTS Director of Client Services, the instructional technology team leader. The Faculty Fellow, a full-time faculty member invited to hold this position for two years, has three primary roles. First, the Fellow is given release time (one course per semester) and assistance from Lab staff to focus on specific projects. Second, the Fellow works with the director of faculty development to help identify and consult with other faculty members who are interested in thinking differently about the role of technology in teaching and research. Third, together with the Director of Faculty Development and other Lab staff, the Fellow helps set the direction of the Lab by contributing to the process whereby topics for workshops, projects, and events are selected.

The Lab uses a three-tiered staffing system. The first tier is the Technology Resource Learning Center (TRLC), located in Lehigh’s Fairchild-Martindale Library and staffed by the Director of Faculty Development, the Faculty Fellow, the team leader of Media Services, and the Instructional Technology team leader. Staff members from the second tier – those units within LTS that, on the basis of their existing expertise and work, are involved consistently with Lab projects – provide additional staff for the Lab itself on a rotating or “loaner” basis and provide most of the expertise for the project teams. This tier includes Distance Education and a number of teams within Client Services, such as Student and General Services, Scientific and Desktop Computing, Librarians, Instructional Technologists, and Instructional Technology Support Services. The third tier is composed of infrastructure teams within LTS that provide expertise and assistance with projects on occasion, but which are not directly involved with the Lab’s work on a regular basis. These teams include Enterprise Systems, Technology Management Services, and Information Management Services.

This approach – keeping TRLC’s own staff relatively small, and drawing most team members from other LTS areas of operation as needed – encourages teamwork and flexibility, promotes a focus on the Lab’s clients and their needs, and is highly cost-effective.
in terms of staffing. By drawing expertise from all sectors of LTS (and beyond when necessary), the Lab creates new teams as they are needed. Some of these teams deal with ongoing issues and may be permanent or at least semi-permanent. Examples of permanent teams include functional teams (e.g., the instructional technology consultants) and the college-specific support teams (four separate teams each with librarians, instructional technologists, and computing consultants). Others teams are more temporary, are often informally assembled and disassembled to work on short-term matters and may be reconstituted into different teams, or joined with other teams for major assignments.

4.II.B.3 Policies
Lehigh’s policy and budgetary models in the area of technology deployment for teaching and learning combine top-down and bottom-up approaches. Policies, ultimately, are set by a variety of faculty-chaired committees, whose names and purposes are outlined in Table 4.3 below. (Appendix 4.I6)

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<tr>
<th>Committee</th>
<th>Purpose</th>
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<tr>
<td>Advisory Council for Information Services (ACIS)</td>
<td>Sets campus-wide policy for University information resources, acceptable use policy, and LTS service standards.</td>
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<tr>
<td>Library Users Committee</td>
<td>Offers advice on library acquisitions, hours, and lending policies.</td>
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<tr>
<td>Library Liaison Group</td>
<td>Offers detailed, discipline-specific input on the acquisitions of journals, monographs, etc. (Roster includes a representative from each department.)</td>
</tr>
<tr>
<td>Data Advisory Committee (DAC)</td>
<td>Reviews and safeguards University data, establishes rules and procedures for backup and recovery, and identifies data stewards.</td>
</tr>
<tr>
<td>High-Performance Computing Committee</td>
<td>Sets policy and advises on acquisition, budgeting, and use.</td>
</tr>
<tr>
<td>Distance Education Steering Committee</td>
<td>Reviews distance education practices and coordinates approaches across the colleges.</td>
</tr>
<tr>
<td>Lehigh Lab Advisory Committee</td>
<td>Advises on programming and faculty development approaches.</td>
</tr>
<tr>
<td>Graduate Student Senate Technology Advisory Group</td>
<td>Advises Vice Provost of LTS on effective uses of the technology fee and on the impact of policy on graduate students.</td>
</tr>
<tr>
<td>Undergraduate Student Senate Technology Advisory Group</td>
<td>Advises Vice Provost of LTS on impact of policy on undergraduate students.</td>
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</table>

These committees set library and technology policies through an annual review of existing policies and ongoing adjustments based on new developments in technology. In some cases, actual policy has changed in response to developing technologies. For example, changing practices among users led to changes to the acceptable uses of Internet bandwidth to accommodate higher levels of data transfer. In most cases, however, rather than having caused a change in policy, new technologies have resulted in changes in the implementation of policy. For example, the campus licensing of the anti-plagiarism software Turnitin did not require a change to academic integrity policy, but it nevertheless has had an impact on how such policy is enforced (Section 4.II.D.4 below).
Such policy considerations are guided by the objectives set forth in the LTS Strategic Plan, written by LTS senior leadership in close consultation with faculty and student representatives (Appendix 2.20). The strategic plan, in turn, was developed in alignment with both University-level goals (e.g., the “Seven Goals for Lehigh”) and the specific aspirations of each college. The LTS Strategic Plan states early on the importance of focusing technology-related policy and implementation on enabling new and better forms of learning. Moreover, this view guides the thinking throughout the Plan:

“The continuing challenge directly related to Lehigh’s essential character is how to leverage technology in this environment to improve learning, teaching, and research. How can we (1) increase and improve collaborative learning spaces, (2) engage faculty in using technology and embracing other pedagogical innovations without overloading them, (3) continue to expand our high performance computing support model for our campus research community, and (4) provide enough support for students and faculty to utilize library and technology resources effectively at all the times they need it?” (LTS Strategic Plan 2006-2010)

To meet these challenges, LTS has set 10 goals, each with numerous correlated objectives. However, rather than review these specific goals and objectives, the remainder of this section offers a glimpse of the specific planning process that lies behind the work done to meet these goals.

Because the strategic plan has a four-year operations cycle, compared with the 12-24 month budgeting process for technology financial planning, the strategic plan does not include a formal financial plan. Instead, funding decisions for new and ongoing technology initiatives occur in the following manner:

- All LTS-related projects include both one-time and cost-of-ownership budgeting. Typically, one-time costs are funded by LTS directly and cost-of-ownership is funded at the Provost level. When new initiatives begin, they are typically funded out of individual budgets of LTS units based on staff recommendation and director’s approval. For example, when a new academic software package becomes available or a new feature for Lehigh’s course management system (Blackboard) is released, the instructional technology consultants typically will request funding from the Director of Client Services. Or, when a new classroom technology becomes available for testing, a pilot will be run using funds from Instructional Media or Faculty Development. Such an approach allows Lehigh to respond quickly to new opportunities without waiting on an annual budget cycle.

- For larger projects, LTS staff typically conducts a cost-benefit analysis and make a recommendation at the LTS Directors meeting. Based on this analysis, the directors and Vice Provost decide whether and how to fund the project, seeking input from other campus units – including student advisory groups – as appropriate. Decisions on classroom response systems, identity management software, constituent relations management software, and campus Internet search technologies have been made in this way.

- In some cases, large projects are funded out of the Vice Provost’s Special Projects account. Examples include the Innovation in Teaching Large Lecture Introductory Courses (ITaLLIC) project, the provisioning of Centra Symposium, enhancements to the Campus Portal, startup funding for High-Performance Computing, the creation
of the Technology Learning Resource Center, the acquisition of video streaming servers, funding for a Council of Library and Information Resources (CLIR) post-doctoral fellow, and a major upgrade to the telecommunications system.

- In the case of even larger budgetary items (over $100,000), the Vice Provost of LTS will make a formal request to the Provost during the annual budget process. Examples include lifecycle funding for technology enhanced classrooms, major purchases for academic and research computing, funding for expanded eLibrary resources requested by the Library Liaison Group, and the licensing of Blackboard and the Campus Portal. The Provost then works with his senior leadership team to decide where and how funds are to be allocated.

This process is nimble enough to take action quickly but cautious enough to include careful review and broad input by faculty, staff, and students through the various committees. As a result, Lehigh is able to make policy and budgetary decisions that reflect the culture and values of the University, while still adapting to and promoting the adoption of new technologies that promise to reinforce these values.

Clearly, however, not all plans and policies in this area are set within LTS. Many individual colleges, programs and departments have plans and policies that guide practice in this area. In CBE, for example, the Rauch Center for Business Communications and the Financial Services Lab both actively promote instructional technology innovation (often in coordination with LTS and the Lehigh Lab). And COE’s 2002-07 strategic plan lists as one of its six major goals “Enhance learning through innovative teaching methodologies and curricula.” For the most part, however, because of the rapid pace of technology development, these plans and policies pertain mostly to the encouragement of innovative and excellent teaching practices, with less emphasis on the specifics of how to bring such practices about.

4.II.B.4 Other Policies and Approaches

Although the Lehigh Lab is the University’s primary means of organizing technology support for student-centered learning, there are policies and uses that extend beyond the purview of the Lab, especially as they pertain to co- and extra-curricular applications. For example, the campus portal recently was enhanced with an “admitted student portal” through which Admissions can communicate with high school students who are considering attending Lehigh. Matriculated students are then enrolled in a “first-year student portal,” where they receive information about Lehigh, take placement tests, connect with other students, and begin learning about campus culture. Such efforts help Lehigh connect with potential and incoming students, thereby starting the educational process and building community before students even arrive on campus.

On campus, the Office of Student Affairs uses various portal groups, Blackboard courses, social networking sites like MySpace and Facebook, and online tutorials such as AlcoholEdu, to help educate and support students once they arrive on campus (Appendix 4.17). Similarly, the Athletics Department uses extensive web resources and databases for recruitment and student-athlete tracking, audio and video resources for recording and broadcasting events, advanced technology for training and treating injuries, and sophisticated use of mobile telecommunications to ensure that coaches and students stay in contact with the campus during athletics-related travel (Appendix 4.18).
4.II.B.5 Early Accomplishments

Although the major accomplishments achieved since the June 2003 PRR in the area of technology support for teaching and learning are too numerous to itemize here, the following list offers a few highlights:

- **Lehigh Lab Leadership**: Two faculty members have served as Faculty Fellows and a new Director of Faculty Development was hired and charged with co-directing the Lab. A third Faculty Fellow will begin spring 2008.

- **Teaching and Learning**: Teaching and learning support was increased substantially through the following measures:
  1. A significant increase in the number of consulting and development opportunities for faculty.
  2. The construction of a Technology Resource Learning Center.
  3. A doubling of the number of professional staff in direct support of instructional design and instructional technology.
  4. The provisioning of the Centra and Elluminate virtual classroom software.
  5. Numerous expansions and upgrades to the Blackboard course management software.
  6. Extensive collaboration with the Mellon-funded Clipper project.
  7. The initiation of an Information Literacy program.
  8. The intentional development of many more classes that are blended, multimedia-intensive, or online.

- **Portal and MyLibrary**: LTS implemented the Campus Pipeline Luminis Portal and subsequently developed the first-year student Portal, the MyLibrary Portal, and the accepted student Portal. About 4,500 individuals log into the Portal daily with a single sign-on that allows access to registration, course management, and other services. The “groups” function provides for convenient communication among many academic, administrative, athletic, service and social groups. Lehigh received the Center for Digital Education’s “Best of Web” award in 2004 for the Portal implementation.

- **2020 Infrastructure and Classrooms**: As part of the Lehigh 2020 initiative (explained in Chapter 2 of this document), LTS upgraded classroom technology and network infrastructure dramatically. As a result, 85% of classrooms are now “technology enabled” with, at a minimum, an electronic podium, computer (or cable for laptop use), projector, screen, and DVD/VCR. Network speed, reliability, and flexibility were enhanced by installing new switches in all campus buildings and replacing the entire cable plant in key research-intensive facilities.

- **Digital Library**: The virtual library became a reality through the creation of the MyLibrary Portal, implementation of SFX links, and the addition of myriad retrospective electronic journals, databases, and collections. Ten diverse digital library projects integrated Special Collections materials into the curriculum and provided worldwide access to these materials and campus scholarship.

- **High Performance Computing (HPC)**: HPC capacity was enhanced significantly. Projects include the acquisition and support of an SGI Altix 350, two Beowulf Clusters, two grids, 20 IBM Intellistations, the Egenera BladeFrame, and a system donated by the Partners for the Advancement of Collaboration Engineering Applications (PACE).

- **Distance Education**: There has been significant growth in college-initiated online course offerings (750%), courses delivered (80%), and course registrations (40%).
funded Marketing Initiative has produced quality materials, advertising, and needs assessment in an intensely competitive market.

- **Wireless**: Wireless connectivity was added to all common spaces, including residences and some outdoor areas. As a result, secure wireless connectivity is available in 60% of campus academic and administrative buildings. In addition, laptop computers with wireless capability were added for a student loan program from the two libraries.

Faculty members involved in early Lab projects were enthusiastic about the results, as evidenced by the following faculty testimonials offered in 2003:

“In the last five years or so, the institution has made a dramatic, positive shift in the priorities given to the training, support, and encouragement provided for our user community in bringing new and innovative resources and approaches to bear on our myriad educational challenges. The efforts of our Library & Technology Services group, the newly established Lehigh Lab system whose flagship is the Technology Resource Learning Center, the CyberTools Institute held each summer, as well as many other notable activities have all created an environment that has excited the campus about the use of information technology.” (Professor, College of Education)

“In fact, if I were to single out one thing that marks the institutional essence embodied in Lehigh Lab, it would be the successful creation of a culture of collaboration. I serve on a faculty committee that reports to the boss. I have been proud to cite technical staff by name and contribution in articles and presentations on my course experiments. I recently shot off an email and got immediate advice about a linking problem my students were having using online archives at the Library of Congress. Indeed, indeed, I do not work alone. So, I am still an ol’ dog, still a sexagenarian, but I am reinventing. I do all my campus teaching in a computer classroom. I have taught a dozen online courses ... with Lehigh Lab at my shoulder.” (Professor, College of Arts and Sciences)

“In the new world of teaching and learning in cyberspace, the Lehigh Lab provides us with colleagues with whom we can turn what we imagine into what we can do. Other institutions should use the Lehigh Lab as a flexible model to aid them in designing their own approaches to enhancing faculty interest in working with technology.” (Professor, College of Arts and Sciences)

As a result of these positive outcomes, and as an early endorsement of the effectiveness of the Lab model, Lehigh received the 2004 EDUCAUSE Award for Systemic Progress in Teaching and Learning (Appendix 4.19).

**4.II.C Changing How Technology Enhances Teaching and Learning**

**4. II.C.1 Faculty Development Strategies**

Even with a well-established organizational structure in place and many successes, Lehigh had room to grow in this area. Since its inception, the model has been continually refined, most notably with the hiring in 2004 of a new Director of Faculty Development who, together with the Faculty Fellow, is charged by the Vice Provost for LTS with planning and overseeing the Lab environment. The new director set the following priorities:
Integrate faculty development programming more fully with the resources and consulting services provided by LTS staff.

Broaden and deepen faculty involvement in Lab activities.

Increase the visibility of the Lab on campus and beyond.

Develop new ways to archive and disseminate information (projects, resources, results, etc.).

The director and Lab staff worked to meet these priorities in a number of new ways. The remainder of this section outlines these approaches and comments on how well they are working to enable faculty members to discover and adopt effective technologies in their teaching.

To provide a means of recording and disseminating innovative uses of technology in teaching (including best practices, recommendations, and discoveries), Lehigh launched an online journal called *Lehigh Lab Notes*, which includes regular columns by key staff and the Faculty Fellow, together with feature articles by faculty and staff. As of December 2007, nine issues have been published, with 51 regular columns and 25 feature articles. Current and archived issues can be found online at www.lehigh.edu/~inllnote. In a recent survey of faculty and LTS staff, 44% of respondents had read one or two articles and 22% had read “many” articles (22% of respondents had not heard of the *Notes*). As Lehigh Lab 2.0 is deployed, this means of archival and dissemination will become increasingly important, as will be shown below. The Lab also enhances communication with faculty via regular columns about faculty development activities and major Lab projects in “LTS Connections,” a newsletter published twice a semester.

To involve a broader audience of faculty and staff in the process of using technology to support student learning, a new series of events – called the Lehigh Lab Forum – was launched in January 2005. The Forum unifies what had been two separate series of events: Teaching, Learning, Technology Roundtables (TLTR) and an independent faculty development series focused on more traditional teaching and learning topics. Regularly scheduled events now include presentations of new instructional technologies, conversations about teaching and student learning, roundtables on the educational role of libraries, computing, and new media, and discussions about information literacy and academic integrity (Appendix 4.20). Bringing these events under a common umbrella, the Forum purposefully blurs the distinction between discussions of academic technology and traditional teaching and learning topics in order that both subjects will be explored in unison whenever possible. The hope is that teaching issues will be at the forefront of technology-focused events, and technology options will be explored during conversations that are predominately pedagogical. For example, in a session on “Managing Quizzes and Homework,” faculty members presented on strategies that included, among other approaches, the use of Maple TA (a web-based assessment tool) to simplify classroom assessment practices. In a different session, “Fostering Great Discussions and Improving Student Participation,” presenters discussed both effective classroom approaches and highlighted the usefulness of online discussion boards to enhance in-class conversations.

These Forums have been successful, regularly drawing between 15 and 30 participants per session, with faculty and staff in approximately equal numbers. Moreover, as evidenced by Table 4.4 and 4.5, faculty from all colleges and ranks are taking part.
Table 4.4: Faculty participation in Lehigh Lab Forums and related faculty development events, by rank.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Total</th>
<th>Participant</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistant</td>
<td>111</td>
<td>72</td>
<td>65%</td>
</tr>
<tr>
<td>Associate</td>
<td>102</td>
<td>35</td>
<td>34%</td>
</tr>
<tr>
<td>Professor</td>
<td>220</td>
<td>57</td>
<td>26%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>433</td>
<td>164</td>
<td>38%</td>
</tr>
</tbody>
</table>

Table 4.5: Faculty participation in Lehigh Lab Forums and related faculty development events, by college.

<table>
<thead>
<tr>
<th>College</th>
<th>Total</th>
<th>Participant</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS</td>
<td>225</td>
<td>96</td>
<td>43%</td>
</tr>
<tr>
<td>CBE</td>
<td>52</td>
<td>21</td>
<td>40%</td>
</tr>
<tr>
<td>COE</td>
<td>30</td>
<td>11</td>
<td>37%</td>
</tr>
<tr>
<td>RCEAS</td>
<td>126</td>
<td>36</td>
<td>29%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>433</td>
<td>164</td>
<td>38%</td>
</tr>
</tbody>
</table>

The evaluations of these sessions are positive, with 94% of attendees who responded to a recent evaluation rating them as good or excellent. More specifically, the vast majority of respondents agreed or strongly agreed that the Forum(s) they attended will have a positive effect on their teaching (92%), that they learned something valuable at the Forum(s) (100%), that they planned to make specific changes in their teaching as a result of having attended the Forum(s) (62%), that they would recommend the events to their peers (96%), and that they would attend a future event on a similar topic (96%).

In order to more effectively track and assess the number of faculty members who are involved in the experimentation with new technologies in their teaching, Lehigh Lab staff has begun using a variety of new data management systems. Prior to the development of these resources, there had been no reliable way to measure how many faculty members were involved and at what level. The Director of Faculty Development designed a database of participants and projects that improves the tracking of which faculty are interested in which kinds of instructional approaches and helps determine who might serve as potential early adopters for pilots of new academic technologies. This database also allows the tracking of progress in participation and provides a way to measure the results of efforts to increase faculty involvement. For example, in 2005 the Director of Faculty Development met or worked with approximately 50% of the Lehigh faculty and reported that approximately 33% had attended at least one Faculty Development or Lehigh Lab Forum event. By 2006, the director had met or worked with approximately 60% of faculty and could report that 38% had attended at least one event (See Tables 4.4 and 4.5 above for more detail). This system also has improved communication with faculty. For example, whereas the earlier TLTR listserv reached only 126 self-identified faculty and staff, Forum activities and events now are regularly announced to all faculty, all LTS staff, and interested staff from other units. A second system, used by many Lab staff, is an automated tracking system called “Footprints,” which helps ensure that requests for consultations or assistance are completed in a timely manner. This approach also allows LTS consultants to share a growing knowledge base and simplifies the production of comprehensive monthly activity reports.
While these systems have helped improve and track the efficacy of technology support, campus outreach, and faculty involvement, neither the faculty development database nor the Footprints systems overlap or interconnect with systems used by other individual Lab teams to track projects and participation. As a result, there is no single all-inclusive way to track or report on all Lab projects or faculty and staff involvement. Also, this self-study’s analysis of faculty involvement has revealed that, while there is currently broad participation of faculty from all four colleges and all ranks, nevertheless there remains a large portion of instructors – namely, adjunct professors, graduate student teaching assistants, and graduate student teaching fellows – who are not yet adequately included in Lab outreach efforts and hence participate only minimally. Suggestions for improvement in this area will be addressed in the Conclusions and Recommendations section below.

Yet another change to Lab practices was the creation of “Spotlighted Projects,” a new section of the Lehigh Lab website designed to help highlight and promote current projects. This site, launched in fall 2004, showcases new developments under four headings: Innovative Courses, Teaching Tools, Faculty Research, and Special Projects (www.lehigh.edu/lehighlab/selected_proj.htm). Like the Lehigh Lab Notes, this website provides a way to keep the community apprised of recent developments on campus. Also like the Notes, this resource would be more effective if information were drawn from a greater number of faculty and staff who know of tools, projects, and courses that should be spotlighted. In addition, the site would be more useful to visitors if it were updated more regularly, and publicized to the campus community more broadly and frequently. Lab staff members already are aware of the need to address these issues and are currently developing ways to do so.

As more Lehigh faculty and staff become involved in technology-related teaching projects, the directors of the Lab have worked to ensure that such efforts are connected and coordinated. By encouraging cross-campus and inter-unit collaboration, the directors discover areas of overlapping interest and create new avenues for spreading effective practices in teaching and uses of technology. Examples of cross-campus involvement include collaborations between Lehigh Lab staff and the Office of the Provost, the Office of Research, Graduate Life, ArtsLehigh, Global Citizenship, Joint Multicultural Program, Disability Advisory Committee, Office of Institutional Research, Mentoring Committee, President’s Office, Academic Integrity Task Force, Academic Standards Task Force, Educational Policy Committee, South Mountain College, and the Dean of Students’ Office (including Academic Support Services, Writing and Math Center, Office of First-year Experience). Collaborations with these other units have led to various shared projects, jointly sponsored events, and valuable consultations on future directions. Moreover, such collaborations help ensure that, as technology projects are developed, they complement rather than contradict the goals of these other campus units and programs. (Appendix 4.21)

The following example illustrates how Lab activities align with other campus interests. In spring 2006, the Lab was looking for a way to involve faculty more deeply and in a more sustained fashion. At the same time, the administration became interested in promoting innovations in teaching lecture courses. To meet both needs, the Lab developed a faculty development seminar called Innovations in Teaching Large Lecture Introductory Courses (ITaLLIC), in which nine faculty and four instructional technology consultants met biweekly to identify challenges that arise in teaching large lecture classes and to discover or develop pedagogical and technological solutions to these challenges. The ITaLLIC project resulted in seven significantly redesigned courses, in which faculty experimented with a variety of new approaches, including audience response systems (“clickers”), MapleTA assessment
tools, enhanced presentations using more effective PowerPoint, video libraries of case studies, peer instruction, iTunes U for podcasting faculty and student voices, and the incorporation of new writing assignments where writing had not previously been a focus. (See www.lehigh.edu/~illnote/issues/issue7/Lecture.htm). The success of this pilot suggests that it should be adopted as a model for future seminars.

As mentioned earlier, the Lab seeks broad input from across campus to ensure that technology adoption suits campus culture and meets faculty and student needs. To accomplish this goal, Lab staff has worked to systematize the way the campus selects and pursues technology-related topics and projects. The current process, which involves numerous forms of input and feedback for continuous improvement, is visually represented in Figure 4.1 and described below.

Figure 4.1: Current Lehigh Lab Selection Procedure

- To identify areas of focus, Lab staff and the Faculty Fellow keep abreast of recent trends in academic technology and meet with various campus representatives to discern areas of need.
• They then identify four or five innovative practices taking place in Lehigh’s classrooms and four or five topics that represent new trends worthy of further investigation.

• The director of faculty development, in consultation with other Lab staff, then selects five or six Lehigh Lab Forum events to be offered over the course of the subsequent semester.

• Faculty members who attend those Forum events and are interested in using some of the new technologies or approaches receive offers of support from Lab staff. In the subsequent semester, the director typically invites several of the presenters to write a Lehigh Lab Notes column and invites one or two of those experimenting with new approaches to present at a Lehigh Lab Forum.

In this fashion, the cycle continues, resulting in a campus community that is aware of promising new instructional tools and approaches. Moreover, this process creates an ever-broadening circle of participants in technology-related teaching activities and helps capture and disseminate results and best practices.

While this procedure has been effective, an investigation into the process has revealed several gaps. For example, it appears there could be broader campus participation in the identification of new practices and technologies (at present, such input comes in only through informal conversations with faculty or when faculty contact Lab staff informally to make suggestions). In addition, more can be done to increase even further the number of faculty members who move through the cycle from start to finish (i.e., who identify a project with a clear plan for implementation and assessment, with an expectation that their results will be disseminated through publication or presentation). The ITaLLIC project and recent efforts to connect specific projects to Forum presentations and Notes articles have been a move in the right direction (Appendices 4.22 and 4.23).

These many new approaches outlined in this section demonstrate that Lehigh is effectively supporting its faculty members who wish to adopt new technologies. Moreover, it is clear that an ever-increasing number of Lehigh’s faculty are becoming involved in faculty development programming, a crucial component to any campus effort to improve the deployment of technology for the improvement of student learning. This process empowers faculty members to adopt technology that improves learning and engagement, rather than pushing technology adoption and deployment. And, while these systems of support and dissemination are not perfect, the ongoing commitment to improvements to the support systems indicates that they will continue to become even more effective in the coming years.

4.II.C.2 Developing Information Literacy and Promoting Academic Integrity

The steady increase in both the use of academic technologies and the volume of immediately available information creates new challenges for faculty and students. The nature of library research has changed, the Internet poses new challenges to those wishing to identify reliable sources, and – as age-old questions of academic integrity arise in modern guises – students confront new ethical dilemmas. Given such facts, it has long been apparent to many at Lehigh that faculty and students alike have to think differently, not only about issues of scholarship (i.e., how students are asked to conduct research and communicate ideas) but
also about academic integrity (i.e., how students come to make good choices when faced with instantly available information).

Because such challenges often arise at the intersection of library and technology resources, and because the Lab staff regularly works with faculty members to update and enhance instructional practices, the Lehigh Lab began working, in concert with the Office of the Provost, to guide the University’s response to these challenges. In 2003, the Lab launched an Information Literacy Working Group comprising client services librarians and an instructional technologist. In 2004, this Group launched an Information Literacy initiative, which included several “town meetings” on the information literacy concept with administrators and faculty, meetings with staff and graduate students who worked with first-year students, and an LVAIC (Lehigh Valley Association of Independent Colleges) conference to discuss the topic.

The Group also drafted an Information Literacy Competencies Statement and a list of competencies specific to Lehigh, based on the Association of College and Research Libraries (ACRL) and Middle States Information Literacy Standards (available online at http://www.ala.org/ala/acrl). In 2004, the Group administered a survey through the first-year student portal to assess the research skills of entering first-year students, reporting on the results at professional meetings and locally at a Lehigh Lab Forum. In 2005-2006, the Working Group developed a presentation for Arts and Sciences 1: Choices and Decisions (a course required of all first-year CAS students) based on deficits identified in the research skills assessment. This presentation, which was one of the first on campus to use audience response system technology (“clickers”) to engage students, has been very well received by faculty and students alike.

In 2005, the Group created a website, “Navigating Information@Lehigh,” as a repository for web-based research skills tutorials for students and materials for faculty and students on citing and plagiarism (see www.lehigh.edu/library/infolit/, Appendix 4.24). That same year, a Council on Library and Information Resources (CLIR) Fellow devoted part of her fellowship year to the creation of a website promoting “plagiarism proof” assignments (see www.lehigh.edu/library/infolit/faculty/plagiarismproofing.html, Appendix 4.25), and originated group projects for student research using digitized primary documents from Lehigh’s Special Collections. Overall, during the 2004-06 time period, Client Services Librarians provided, by faculty invitation, information literacy instruction to 7,201 students enrolled in 384 classes.

Starting in 2006, the Working Group initiated a set of focus groups with faculty from four departments in order to stimulate new thinking about information literacy in upper level courses in the major. Information literacy in the major also has been supported through the introduction of the MyLibrary portal within the campus portal, offering personalized, customizable information resources based on a student’s major.

Closely related to the topic of information literacy is academic integrity. An ongoing concern among Lehigh faculty about academic integrity started a campus conversation that in 2003 led to the licensing by the Provost’s office of Turnitin (a web-based plagiarism detection service) as a campus resource. At that time, a primary concern among faculty, graduate students, administration, and staff was that Turnitin would be seen as a simple panacea to a complex problem. Many feared that the technology tool would be used in inappropriate or ineffective ways in the classroom. To help address these concerns, the Provost’s office, in July 2005, asked the Office of Faculty Development to assume oversight of Lehigh’s Turnitin.com account. Working with the librarians, Faculty Development hosted Lehigh Lab Forums and created web resources promoting the effective and appropriate use
of this tool. Also, as mentioned above, librarians developed new resources that not only helped faculty design assignments in ways that deterred plagiarism but also offered new methods of detecting inappropriate uses of sources.

The results have been positive: The number of instructors using Turnitin has more than doubled since it moved under the purview of the Lab (from 25 to 57) and the number of papers submitted has increased from 90 to 2,424. While it is up to individual faculty members to decide the exact role Turnitin will play in their classes, it is crucial to the success of this program (far more important than the number of users) that faculty now receives guidance in the effective and appropriate use of this tool (See www.lehigh.edu/~infldi/AcademicIntegrity.htm, Appendix 4.26). More importantly, faculty is now encouraged to see this tool as only one part of an overall plan for promoting academic integrity. This self-study concluded that faculty members are in fact using it this way, to help teach principles of academic integrity and not merely to enforce rules related to academic dishonesty.

In September 2005, the Provost appointed an Academic Integrity Task force to unify the various resources being developed by Library, Faculty Development, and Student Services. The result was a simplified system for faculty and students called “Fostering Academic Integrity,” which includes statements from the undergraduate and graduate student senates, policy documents, and advice and tutorials for students and faculty (Appendix 4.27).

In addition, the Office of the First Year Experience has developed a session on academic integrity during Orientation in which student leaders guide conversations in which first-year students articulate their own values and learn about Lehigh’s values and rules about conduct. These sessions end with each student signing a document stating his or her commitment to academic integrity and the student code of conduct. These documents are then collected presented to the President at a ceremony at the end of Orientation.

These various efforts underscore Lehigh’s strength in adapting to changing educational environments and flexibility in bringing together various campus units to coordinate new approaches to new challenges. Furthermore, as evidenced by additional analysis below (Section 4.II.D.4), these efforts are having a positive impact on campus by improving students’ information literacy, helping faculty understand and address students’ needs in this area, and generally promoting the importance of academic integrity at Lehigh.

4.II.D Use of Technology in Teaching and Learning: Current State of Affairs

4.II.D.1 Introduction to the Campus Survey

The preceding section discussed the organization of the Lehigh Lab and reviewed many of the processes used to foster a supportive environment for effective instruction using academic technologies. In this section, our focus turns to a description and analysis of campus views regarding the use of technology in teaching and learning.

Through individual contacts and various campus surveys, LTS and the Lehigh Lab continually strive to keep abreast of current instructional practices on campus. Doing so helps ensure that computing, instructional technology, and library resources are meeting faculty needs. However, to most accurately address topics pertaining to the current Middle States Accreditation self-study, existing information was supplemented by conducting a new survey of University faculty, students, and Library and technical staff.

The last broad campus-wide survey on Teaching, Learning and Technology, conducted in advance of the 2003 PRR, focused mostly on identifying the types of technologies being
used and how frequently faculty used them. The new survey was designed with the following additional goals in mind:

- To learn how technologies were being put to use,
- To learn whether these technologies enhanced teaching and learning.
- To learn how well students were gaining literacy with these new tools.
- To gather additional feedback on the quality of campus support for these uses.
- To capture Lehigh’s vision for how technology might enhance teaching and learning in the future.

To meet these goals, the survey focused on the following five areas:

- Current uses of technology and their educational impact.
- Faculty assessment of the effectiveness of these technologies.
- Information literacy and academic integrity.
- Effectiveness at promoting and supporting use of technology.
- Visions of the future.

The remainder of this section offers a quantitative and qualitative analysis of the survey results. The survey instrument can be found in Appendix 4.28 and complete results, including deeper numerical analyses and complete sets of responses to the questions, are available online (www.lehigh.edu/~infdl/teachtech, Appendix 4.29).

The survey was sent to 447 full-time faculty members, 4,620 undergraduates and 2,048 graduate students. Responses rates are shown in Tables 4.6 and 4.7. As in 2003, the survey was conducted online. Because the sample of faculty and students who chose to complete the survey are likely those who are more comfortable using technology, it is likely that the results slightly overestimate the extent of technology adoption. Nevertheless, because the technological barriers were quite low, there is little reason to believe the results will be skewed significantly. Moreover, because both surveys were subject to the same limitation, results from the two surveys can be compared in a meaningful way.

<table>
<thead>
<tr>
<th>Table 4.6: Faculty response rates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>Total Responses</td>
</tr>
<tr>
<td>Response rate</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4.7: Student response rates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>Total Responses</td>
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<tr>
<td>Response rate</td>
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<td></td>
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</tbody>
</table>

4.II.D.2 The Educational Impact of Current Uses of Technology

The vast majority of Lehigh faculty and students believe that technology is having a positive impact on their teaching and learning: 88% of faculty strongly agreed (46%) or agreed (42%)
that technology has enhanced their teaching and 80% strongly agreed (32%) or agreed (48%) that technology has enhanced their students’ learning. Moreover, the survey data reveals a significant increase from 2002 in the percentage of faculty members who believe that technology is having a positive impact in this area, as seen in Figure 4.2:

**Figure 4.2: Faculty assessment of technology’s impact on teaching and learning.**

![Bar charts showing faculty assessment](chart)

It is clear that there has been a sizable and significant shift in faculty perspective on the impact of technology on teaching and learning in the past five years. This self-study attributes this change to a number of factors, including a commitment of financial resources to classroom technology and software and library resources, a cultural change among existing faculty towards an increased willingness to try new approaches in the classroom, the hiring of a large number of new faculty members who may arrive on campus familiar with academic uses of technology, and the gradual normalization of certain uses of technology such as email, Blackboard, and PowerPoint. We also believe that the efforts of the Lehigh Lab, including effective faculty development programming, the work of the Lehigh Lab Faculty Fellow, and the high quality of library, technical, and classroom support have played a central role in this increase. Evidence for this conclusion will be discussed in Section 4.II.D.5 below.

It is also clear, if somewhat puzzling, that faculty members in three of the four colleges rate the impact on their teaching more positively than they rate the impact on their students’ learning. In one sense, it is surprising that the gap exists at all, since improvement in teaching seems possible only if there is improvement in learning. However specific comments made by faculty help explain these gaps. One professor in CAS reported finding Blackboard, Turnitin, and smart classrooms useful but expressed uncertainty as to whether “students take full advantage of the resources that technology offers them.” An assistant professor in COE had a different concern: “Blackboard has helped me to be more organized [but] sometimes technology can detract from the interaction between instructor and student.” An associate professor in RCEAS put the concern this way: “Overall I feel that the average student in the class has a better understanding of the subject matter when the technology tools are employed. [However,] the down side of all of this is that for some students, making the material too convenient and packaged, they are no longer making the hand/mind connection.” Observations such as these help explain why many faculty view technology’s role in teaching differently than its role in learning: They are concerned with their students’ level of engagement, they see the possibility that technology might be creating new barriers between faculty and student, and they are worried that certain key skills are no
longer being cultivated. Despite this difference, however, the number of faculty members who believe that technology is helping teaching and learning is still quite high; in fact, the more significant finding is the sizable increase over five years in the number of faculty members who believe technology is enhancing teaching and learning.

One other measure of this change is seen in the survey of faculty attitudes towards technology adoption. Faculty members were asked to describe their approach to technology at present and five years ago. The changes in early adopters and mainstream users, combined with the decrease in skeptical users and nonusers (as seen in the graph below) are exactly the trends the University would like to see as it tries to cultivate a culture of appropriate technology adoption on campus.

![Figure 4.3: Faculty approach to using technology in teaching (self-assessment).](image-url)

The data presented in Figures 4.2 and 4.3 raise some interesting questions about where Lehigh’s future focus should lie. As recommended by the 2003 PRR, faculty development programming is based on recognition that faculty members fall into these different groups (innovator, early adopter, etc.) and that each group has particular needs related to support and change. This new data should be used to drive such programming in the future. For example, given that there are fewer Nonusers and Skeptical Users now than in the past, Lab leadership may wish to change how events are organized and promoted and as Mainstream Users grow in number, more programming should be focused on this group.

It is notable that there has not been an increase in the numbers of faculty who see themselves as innovators. In itself, this is not a problem and we encourage the Lab leadership to not set any specific goal in terms of moving faculty into any particular category.
represented above. That said, if many faculty and students are truly interested in adopting some of the innovative technologies discussed in the Future Visions section (See Section 4.II.D.6), then the Lab will have to do more to discover and remove the obstacles that keep faculty members from moving into unexplored terrain and seeing themselves as true innovators, if that is indeed where they wish to go.

In short, Lab staff should continue existing practices of meeting faculty members where they are, discovering where they want to go, and helping them get there. We therefore recommend that all who promote such changes remain respectful of a common faculty view on this subject; namely, that not every problem has a technological solution and not every instructor should be pressured into being an innovator. As an associate professor in CBE noted, “What I don’t like is the suggestion that we should use technology just to say we are using it. Faculty may take some time to adopt it; part of that may just be that it takes time to learn new tools and to think out how to effectively incorporate them into a class, but part may also be that, in some areas of different courses, technology doesn’t have much to offer.”

A professor in CAS made a similar point this way: “Technology should be like a well-stocked kitchen: You don’t need saffron every day but it’s lovely when you find it waiting for you late one Thursday afternoon.” We believe that the Lab, in philosophy and in practice, takes this approach and should continue to do so. By supporting change in this way, many faculty members will naturally move along the adoption curve, while others will not. The outcome, we believe, will be change that is organic, properly suited to Lehigh’s culture, and, as a result, sustainable.

Turning now to student views, when asked about the overall value of technology in their education, 94% of students said they believed that technology has enhanced their learning, and 80% of students believe that technology has enhanced their instructors’ teaching (See Figure 4.4). These results offer further evidence that technology is being deployed in effective, educationally meaningful ways on campus.

Figure 4.4: Student assessment of technology’s impact on teaching and learning.

<table>
<thead>
<tr>
<th>a. Students: “Overall, technology has enhanced my learning.”</th>
<th>b. Students: “Overall, technology has enhanced my instructors’ teaching”</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS 95%</td>
<td>CAS 80%</td>
</tr>
<tr>
<td>CBE 94%</td>
<td>CBE 85%</td>
</tr>
<tr>
<td>COE 95%</td>
<td>COE 83%</td>
</tr>
<tr>
<td>RCEAS 93%</td>
<td>RCEAS 76%</td>
</tr>
</tbody>
</table>

LTS support staff had similar views on the effectiveness of faculty and student uses of technology to enhance teaching and learning: 96% said faculty use was very effective or effective, and 96% said student use was very effective or effective.

To better understand how faculty and students were applying technology, survey respondents were asked to rank the educational value of 13 specific uses. Table 4.8 shows the percentage of respondents who reported that the use of technology was “very valuable” or “valuable” in their teaching/learning (the list is in rank order according to faculty response).
Table 4.8: Faculty and student responses to the question “How valuable are the following uses of technology in your teaching/learning?”

<table>
<thead>
<tr>
<th>Use of Technology</th>
<th>Faculty</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications (using email, instant messaging, discussion boards, announcements, etc.)</td>
<td>92%</td>
<td>85%</td>
</tr>
<tr>
<td>Course management (distributing course documents, collecting assignments, etc.)</td>
<td>88%</td>
<td>82%</td>
</tr>
<tr>
<td>Access to student records (using Portal/Banner, Blackboard to access grades, rosters, etc.)</td>
<td>86%</td>
<td>87%</td>
</tr>
<tr>
<td>Presentation (classroom presentations, online displays of information, etc.)</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>Library research (students using online databases, journals, websites, online books, and articles, etc.)</td>
<td>74%</td>
<td>62%</td>
</tr>
<tr>
<td>Writing (students using Word software, shared documents, blogs, journals, peer review, wikis, online tutorials, etc.)</td>
<td>60%</td>
<td>80%</td>
</tr>
<tr>
<td>Engagement (increasing student involvement and interest in their learning)</td>
<td>55%</td>
<td>65%</td>
</tr>
<tr>
<td>Basic research/analysis (students using technology to conduct experiments, analyze data, etc.)</td>
<td>43%</td>
<td>41%</td>
</tr>
<tr>
<td>Teaching to diverse learning styles (offering students multiple ways of learning information)</td>
<td>37%</td>
<td>47%</td>
</tr>
<tr>
<td>Student collaboration (students working together in online groups, using shared documents, etc.)</td>
<td>30%</td>
<td>37%</td>
</tr>
<tr>
<td>Publication (students disseminating their academic work within the class or beyond)</td>
<td>32%</td>
<td>38%</td>
</tr>
<tr>
<td>Students’ sense of control (helping students set the pace and direction of their learning)</td>
<td>29%</td>
<td>62%</td>
</tr>
<tr>
<td>Assessment (using clickers, web-based homework, quizzing, testing, surveying, online writing, etc.)</td>
<td>29%</td>
<td>59%</td>
</tr>
</tbody>
</table>

This side-by-side comparison reveals that faculty and students place the highest value on a shared set of core uses of technology, including course management, communication, access to records, and presentation. Fewer individuals from both groups see value in using technology to enhance student collaboration and publication, to accommodate diverse learning styles, or to enhance basic research/analysis. This is perhaps unsurprising, since the core uses – course management, communication, and presentation – constitute enhancements to the most basic pedagogical functions while the other uses may be perceived as specific to some classes but not to others (e.g., nearly all classes require some form of communication, presentation, and document exchange, but not all require student collaboration, not all are able to take student learning styles into consideration, and not all use technology to conduct experiments or analyze data).

Moreover, the three core uses employ tools – course management systems, email, discussion boards, basic websites, and PowerPoint – that are older and better established at Lehigh compared with newer tools – wikis, blogs, iTunes, the MapleTA web-based assessment tools in Blackboard – that support collaboration, publication, and assessment. Lastly, some of these uses (e.g., using technology for formative assessment, to increase
student control of learning, and to accommodate diverse learning styles) are tied to pedagogical approaches that are becoming increasingly common, but are certainly not the norm in all courses. That said, it is nevertheless disappointing that only about a third of faculty are finding technology useful in promoting student engagement, student collaboration, publication, sense of control, and assessment. This is disappointing both because these are areas where technology holds great promise and also because it seems (based on information presented in 4.II.D.6, Future Visions) that many more from both groups recognize that these are areas they want to explore, but it is clear that they are not yet doing so.

The subcommittee asked about these particular 13 uses because they appear on the horizon as some of the most useful applications of technology in instruction. However, because there are many uses and tools that do not fall under these 13 categories, the survey also invited faculty and students to itemize specific technology tools or uses that were not included in the list. Tables 4.9 and 4.10 list some of the many uses listed by faculty and students, respectively. (The complete list is available at www.lehigh.edu/infdli/teachtech)

<table>
<thead>
<tr>
<th>Table 4.9: Other Technology Tools or Uses Listed by Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Student digital portfolios</td>
</tr>
<tr>
<td>• Use of CDs and DVDs in class</td>
</tr>
<tr>
<td>• Musical score notation</td>
</tr>
<tr>
<td>• Digital storytelling</td>
</tr>
<tr>
<td>• Podcasting to remote students</td>
</tr>
<tr>
<td>• Geographical information systems</td>
</tr>
<tr>
<td>• High-performance computing</td>
</tr>
<tr>
<td>• Remote experimentation</td>
</tr>
<tr>
<td>• Turnitin</td>
</tr>
<tr>
<td>• Social bookmarking</td>
</tr>
<tr>
<td>• LabView for lab data acquisition</td>
</tr>
<tr>
<td>• Financial data analysis</td>
</tr>
<tr>
<td>• Computer Aided Drafting programs</td>
</tr>
<tr>
<td>• International peer-to-peer faculty interactions</td>
</tr>
<tr>
<td>• Using the Internet to prepare for lectures</td>
</tr>
<tr>
<td>• Conversion of slide collection to a digital database</td>
</tr>
<tr>
<td>• Increase of in-class interaction due to improved information delivery</td>
</tr>
<tr>
<td>• Online lab instruction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4.10: Other Technology Tools or Uses Listed by Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Accessing archived video streams</td>
</tr>
<tr>
<td>• Accessing software from public sites</td>
</tr>
<tr>
<td>• Assistive technology</td>
</tr>
<tr>
<td>• Accessing Lehigh content from home</td>
</tr>
<tr>
<td>• CDs with textbooks</td>
</tr>
<tr>
<td>• Cell phones</td>
</tr>
<tr>
<td>• Clickers</td>
</tr>
<tr>
<td>• Communication with Ph.D. committee members</td>
</tr>
<tr>
<td>• Ability to work in more varied locations</td>
</tr>
<tr>
<td>• Digital Media Studio for help with presentations and movie making</td>
</tr>
<tr>
<td>• Audio clips during class</td>
</tr>
<tr>
<td>• Laboratory technologies</td>
</tr>
<tr>
<td>• Language improvement</td>
</tr>
<tr>
<td>• Learning how to paint</td>
</tr>
<tr>
<td>• Learning to use Excel and Data Studio for physics lab</td>
</tr>
<tr>
<td>• LESN (Lehigh Educational Satellite Network) archived courses</td>
</tr>
<tr>
<td>• Audio recordings of lecture notes</td>
</tr>
<tr>
<td>• Note-taking software</td>
</tr>
<tr>
<td>• Online card catalog</td>
</tr>
<tr>
<td>• Online learning object libraries</td>
</tr>
<tr>
<td>• PDAs for organizing</td>
</tr>
<tr>
<td>• Practice problems online</td>
</tr>
<tr>
<td>• Safety in holding important information</td>
</tr>
<tr>
<td>• Supplemental PowerPoint presentations</td>
</tr>
<tr>
<td>• Taking mock tests</td>
</tr>
<tr>
<td>• Using multiple sources from International locations for thesis work</td>
</tr>
<tr>
<td>• Time flexibility</td>
</tr>
<tr>
<td>• Mathematical programs</td>
</tr>
<tr>
<td>• Virtual classrooms</td>
</tr>
<tr>
<td>• Televisions in lecture hall to improve visibility of experiments</td>
</tr>
<tr>
<td>• Wireless access</td>
</tr>
</tbody>
</table>
These lists give a sense of the many different areas in which students and faculty see technology as useful in their learning and teaching. However, in order to gain a more qualitative view of successful practices, faculty members were asked to share some of the most effective ways they use technology in their teaching (Question 6: “Please list a few of the most effective ways you use technology to support learning or list some of the reasons you believe technology has not been useful to you in your teaching.”).

Many faculty members described ways that technology is improving the way they teach in their classrooms:

“I have developed PowerPoint lectures that include mainly visual images used to illustrate points in my lecture. I used to present these images using standard format slides which was very clumsy and limiting. Now that I can use digital technology I can focus the students’ learning much better, and they understand and appreciate the imagery to a much higher degree.” (Associate Professor, CAS – Arts and Humanities)

“Animations are very useful for showing certain processes. Availability of high quality images is critical for connecting theory to real-world applications. Dissemination of documents with graphical content is easy, as is collection of things like Excel homework files.” (Associate Professor, RCEAS)

“As above, faster and more accurate delivery has transformed my lectures from teacher talking 100% to about 30% students working on problems in class.” (Professor, CAS – Natural Science and Mathematics)

“It’s very useful to bring in current material to the class and show them via projection from a current website. I’ve been able to use very short video clips on the spur of the moment, related to current events.” (Associate Professor, CAS – Social Science)

“I would use a document camera in every class if there was one in the room I teach in. It is great for disseminating information, my primary use other than PowerPoint presentations.” (Professor, RCEAS)

Others focused on the benefits derived from using the Blackboard course management system:

“I use Blackboard extensively for making my PowerPoint slides available, posting readings and discussion questions, and emailing students.” (Assistant Professor, CAS – Social Sciences)

“I teach 19th-century literature and now that there are searchable online databases of primary documents from the 1800s I can have my students conduct research that would have been unimaginable 5-10 years ago. I require class participation but I understand that some students will not want to talk in class. As such, I can assign these non-talkative students to post to Blackboard so that they can get the full credit that their otherwise talkative classmates receive.” (Assistant Professor, CAS – Arts and Humanities)
“I use Blackboard's quizzing and discussion features to engage students in course material outside of the scheduled class time and to provide feedback/information in a less stressful environment than in-class testing can be.” (Assistant Professor, COE)

“I use Blackboard for student writing assignments in a class of 135 students. I would likely not give these assignments if they were handed in on paper.” (Assistant Professor, CAS – Social Science)

A few faculty members focused on the availability of databases and software:

“Web of Science and Chem Abstracts is extremely necessary to connecting our research to the outside world.” (Assistant Professor, RCEAS)

Some focused on the ability to connect with distant students:

“Creating virtual groups with on-campus and international students who are overseas so that they work together on specific projects.” (Professor, COE)

“It is extremely valuable to link Distance students with those in the classroom. The preservation of classroom activities and information is most useful to students that must miss classes for sickness, business or sport reasons. Posting files enables coverage of a greater span of material, Discussion Board and Blogs assists with adjustment of class pacing and information exchange.” (Professor, RCEAS)

Other faculty highlighted uses that generally allowed them to enhance and extend their instruction:

“For economics homework answer keys, which involve math and graphs, I record the answers using Camtasia – voice-over-Powerpoint – and a graphics tablet. As I write graphs and equations using the graphics tablet, I talk through the analysis. I then post the answers on my Blackboard course page. Students like these answer keys much more than they like written keys. By my talking through the steps, they build a much better understanding of the material. Because students can pause the recordings and view them more than once, most students seem to prefer to recorded answers not only to written answers but also to going over answers in class.” (Professor, CBE)

“I have created Web-based modules that students complete prior to face-to-face meetings. My use of online exams frees up face-to-face class time for other activities.” (Associate Professor, COE)

“Using technology in a laboratory setting has given students knowledge of how cutting-edge techniques are being used in modern research.” (Assistant Professor, RCEAS)

“I use film, online conferencing, digital storytelling and digital projects to help students bring together themes and ideas from my courses.” (Professor, CAS – Arts and Humanities)
“I capture streaming videos of presentations and no longer use class time for initial presentation. I am much more likely to use class time now for review, application, and question-and-answer. Blackboard has also been very helpful for a much wider range of shared readings.” (Professor, COE)

The responses to questions in this area underscore the fact that Lehigh’s faculty, students, and staff are using an impressively wide range of academic technologies in pedagogically diverse ways. While not every faculty member and student had positive responses (this issue will be discussed below), the overwhelming majorities in both groups believe that technology is affecting the educational experience in a positive way. Also, from the responses to questions regarding the value of these technologies and faculty attitudes towards them, it is clear that in the past five years an increasing number of faculty members are finding their teaching enhanced by technology. Moreover, faculty members see themselves as more willing to adopt new technologies sooner. These responses should be seen as evidence that Lehigh’s model to promote change and encourage such uses is working well. Moreover, there is clear evidence that faculty, staff, and students are benefiting from the many forms of academic technology being deployed on campus and are doing so in ways that supplement in-class learning experiences, enhance communications, mitigate the distance between students, and help faculty achieve learning objectives specific to their disciplines.

4.II.D.3 Faculty Assessment of the Effectiveness of Academic Technology

When Lab staff work with faculty or promote new teaching tools, they encourage faculty members to measure the results in order to discern whether their new approaches are having the desired effect on student learning. In general, faculty members’ use of instructional technologies is more reliably effective when they explicitly attend to the effectiveness of the tools they are using. However, because faculty often do not have the time or resources to conduct rigorous research into the effectiveness of their teaching approaches, Lehigh’s approach to evaluating the effectiveness of technology has been to cultivate an attitude of assessment in which faculty members, at a minimum, seek informal feedback on how academic technologies are working in their classrooms, and then make modifications to their approaches as needed.

According to the new survey, a majority of faculty members have adopted this attitude. Most (60%) report that they conduct some form of assessment of the effectiveness of the technology they use. A small number (7%) report conducting a formal assessment (e.g., educational research, scholarship of teaching, etc.), but most (53%) take a more informal approach to assessment. Of the 106 who offered comments, the following were typical responses: Questions on end-of-semester evaluations (28), use of mid-semester surveys (26), informal conversations with students (26), observing impact on grades or other forms of student performance (25), paying attention to whether changes are working well or saving time (17), use of others’ research or expert opinion on the effectiveness of a tool or approach (5), tracking Blackboard usage statistics (5), and focus groups/TAs/exit interviews (4). See www.lehigh.edu/~infdli/teachtech for all responses.

Student responses support the faculty’s perspectives on this topic: 69% report that all (7%) or some (62%) of their instructors assess the effectiveness of the technology. Many said they are frequently asked directly for feedback, informally during class, in mid-semester surveys, and on end-of-semester evaluations. Some report that their instructors use exam
questions or assignments that reveal the effectiveness of the mode of presentation. Others said that they view faculty members as well qualified to judge whether new instructional approaches are beneficial or not, whether or not such assessment were being conducted in an explicit way.

Among the 21 faculty respondents who offered comments on why they did not conduct such assessments, reasons offered included a lack of time (8), a lack of expertise in how to assess (6), a view that the technology they use in their classes has simply become standard (5), and the difficulty in determining whether technology is the cause of improvements they see (2).

By combining the responses regarding usage and assessment, one can see that faculty members are, for the most part, inviting feedback on their approaches to technology. They are willing to try new approaches that look promising, put technology into place when they see a fit, and abandon technologies that aren’t helping them meet their course objectives. The University should recognize the value of assessment and plan to continue to encourage all faculty members to be attentive to the effects of their instructional practices. Lehigh Lab staff also plan to offer more tools and guidance for those faculty members who want to assess, but lack the time or experience to develop these tools on their own.

While the overall picture of faculty use of technology to enhance teaching and learning is positive, there are a small number of faculty members who have expressed concerns about technology and its role on campus. Those who were neutral (10%) or disagreed (2%) that technology was enhancing their teaching expressed a view that traditional tools and approaches are still sometimes better and that technology may be having an adverse effect on student learning. A few examples of this view follow:

“Students are far too willing to take the easy way out of research projects by relying heavily or exclusively on web content.” (Assistant Professor, CAS – Arts and Humanities)

“The main downside of “technology” use seems to be that students read less and, less importantly, expect to be entertained.” (Professor, CAS – Social Sciences)

“The pace of chalkboard work seems to jive better with soaking in ideas.” (Professor, CAS – Natural Sciences and Mathematics)

“Blackboard is clumsy, time consuming and does not allow some of the most obvious types of student collaborations in writing projects ... I just want an intuitive application that works easily and effectively.” (Professor, RCEAS)

One professor offered a reminder that computer-related technologies are not the only ones to be considered:

“I have used pencils (one of the greatest technological advancements in the history of civilization) to instruct students in a wide range of artistic expression. I also use all types of paints (oils, acrylics, enamels, etc.) to enhance my instruction in painting and expression.” (Associate Professor, CAS – Arts and Humanities)

A small number of students believe their learning (1%) or their instructors’ teaching (4%) has not been enhanced by technology. The following reasons were the most
commonly cited: Technology is used ineffectively by faculty, especially PowerPoint (13), problems with the technology itself (8), professors do not use technology/it is not relevant to their major (4), inconsistent usage – some professors use it well while others do not (3), it is better to have small classes and engage students in traditional ways (2), students are not taught how to use it (1).

While we are pleased to see that a relatively low number of faculty and students find that technology is not enhancing the educational process, we also recognized that such concerns need to be addressed. In some cases, the solution may be to continue to offer support and development opportunities so that when technology is used, it is used effectively. However, it is important to be cognizant of the fact that technology is simply not an appropriate solution in some areas. For this reason, it is recommended that Lehigh continue avoiding a “one-size-fits-all” approach to usage. Moreover, the campus community should continue promoting a culture in which faculty members do not feel pressured to use technology when their professional judgment sees such deployment as counterproductive. In short, the Lab should continue to follow its core values of promoting high quality teaching and research, never promoting technology for its own sake.

4.II.D.4 Information Literacy and Academic Integrity

One core purpose of this self-study is to look into how students are learning to study and research in a campus environment that is increasingly connected to a vast, ever-more-accessible sea of information. Technology, which brings this information so easily to students, also threatens to diminish their ability to find the best information in the most effective ways. Fortunately, technology also offers solutions for navigating this information and can be used in efforts to enhance students’ information literacy skills. Recent campus efforts to build such skills have included a concerted effort to promote information literacy and academic integrity, as mentioned in Section 4.II.B.2 above. To see how these efforts are working and learn where more might be done, we asked faculty members to explain their students’ information literacy skills and their own approaches to teaching these skills. In addition, we asked students whether, and how often, they were learning the kinds of skills they need to appropriately acquire, interpret, and use information. The results were mostly encouraging but revealed a few areas where the campus can improve.

As seen in the following chart, 86% of faculty respondents rated their students’ skill at searching the Internet as “excellent” or “good,” but the rating was sharply lower when it came to other information skills (See Table 4.11, below). Faculty most often rated students as “acceptable” in their capacity to evaluate sources, cite and paraphrase, and in their familiarity with electronic resources in their major. However, a worrisomely high number rated their students as “poor” in these areas. More confidence was expressed in students’ ability to use software important to their discipline.
Table 4.11: Faculty response to Q10: “Please assess the following information literacy skills of upper-level students in your discipline.” (%)

<table>
<thead>
<tr>
<th>Skill</th>
<th>Excellent</th>
<th>Good</th>
<th>Acceptable</th>
<th>Poor</th>
<th>No skills in this area</th>
<th>Don't know enough to judge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Searching the Internet</td>
<td>47</td>
<td>39</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Distinguishing between reputable and marginal sources</td>
<td>6</td>
<td>19</td>
<td>37</td>
<td>28</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Understanding citation and paraphrasing of sources</td>
<td>6</td>
<td>10</td>
<td>38</td>
<td>38</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Familiarity with databases, electronic journals, and other resources in the major</td>
<td>8</td>
<td>17</td>
<td>37</td>
<td>29</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Ability to use important software applications related to the major</td>
<td>17</td>
<td>29</td>
<td>31</td>
<td>7</td>
<td>2</td>
<td>134</td>
</tr>
</tbody>
</table>

Faculty members tend to teach students research skills several times a semester, but 33% indicated that they “never” design assignments that teach students how to distinguish between marginal and reputable sources, despite their recognition that students do not have strong skills in this area. Faculty members appear to be more proactive in teaching students about academic integrity, as seen in Table 4.12.

Table 4.12: Faculty response to Q11: “Please indicate how frequently you...” (%)

<table>
<thead>
<tr>
<th>Activity</th>
<th>At least 2-4 times a semester</th>
<th>At least once a semester</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>... help your students learn how to use the Internet for research.</td>
<td>50</td>
<td>75</td>
<td>17</td>
</tr>
<tr>
<td>... design assignments that teach students how to distinguish between marginal and reputable sources.</td>
<td>23</td>
<td>53</td>
<td>33</td>
</tr>
<tr>
<td>... teach your students how to use technological tools and software applications most relevant to your field of study.</td>
<td>61</td>
<td>81</td>
<td>9</td>
</tr>
<tr>
<td>... teach your students about academic integrity, including how to cite sources and avoid plagiarism.</td>
<td>50</td>
<td>89</td>
<td>6</td>
</tr>
<tr>
<td>... take measures to deter or detect plagiarism.</td>
<td>50</td>
<td>77</td>
<td>13</td>
</tr>
</tbody>
</table>

The correlation is striking between faculty assessment of student information literacy skills (especially the skill of distinguishing between marginal and reputable sources) and the acknowledgment by many faculty members that they do not teach such skills. In other words, many faculty members perceive this skills gap, but are not taking measures to fill it.

Student responses to a similar set of questions demonstrate that a very large percentage of students are learning about academic integrity (79%) and have instructors who reinforce
academic integrity (89%) in at least some of their classes (See Table 4.13). A similarly high percentage of students also responded that they are learning in class how to acquire, interpret, and use information in their field of study (87%) and how to use technological tools and software in their major (85%). However, a much smaller percentage is learning in class how to use online databases, electronic journals, and digital resources in the major (59%), or how to distinguish between marginal and reputable sources of information (56%). It appears that many students learn these skills, plus the ethical use of information, in only a few classes or outside of class.

Table 4.13: Student responses to Q9: “Please indicate the best answer for each of the following statements.” (%)  

<table>
<thead>
<tr>
<th></th>
<th>In all of my classes</th>
<th>In most of my classes</th>
<th>In some of my classes</th>
<th>Outside of my classes</th>
<th>Never</th>
<th>Not relevant to The classes I take</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am learning how to use online databases, electronic journals and digital resources in my major.</td>
<td>8</td>
<td>16</td>
<td>39</td>
<td>19</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>I am learning how to distinguish between marginal and reputable sources of information.</td>
<td>8</td>
<td>17</td>
<td>31</td>
<td>22</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>I am learning the principles of academic integrity, including how to cite sources and avoid plagiarism.</td>
<td>22</td>
<td>26</td>
<td>31</td>
<td>13</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>My instructors actively reinforce academic integrity and take measures to deter and detect plagiarism.</td>
<td>34</td>
<td>31</td>
<td>24</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>I am learning how to acquire, interpret, and use information in my field of study.</td>
<td>26</td>
<td>35</td>
<td>26</td>
<td>8</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>I am learning how to use the technological tools and software applications that are most relevant to my major.</td>
<td>20</td>
<td>32</td>
<td>33</td>
<td>9</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>I am learning the legal and ethical use of information, including the role of copyright, intellectual property, laws surrounding downloading music, etc.</td>
<td>13</td>
<td>19</td>
<td>27</td>
<td>20</td>
<td>12</td>
<td>8</td>
</tr>
</tbody>
</table>

To follow up on these quantitative results, faculty members were asked to provide a brief example or two of how they teach or reinforce information literacy and academic integrity skills in their classrooms. The 125 comments reveal considerable activity in this area. A number of faculty members cited the role of specific librarians in their courses, and others listed a wide variety of measures used to instruct students about plagiarism and other integrity issues. There were occasional expressions of frustration about insufficient class time to cover these topics, without neglecting other necessary course material. Examples of these comments include:
“In a technical class already stuffed with information, I do not have time to be going over how to search the Internet for reputable sources and [I have not time to provide more] than a brief statement on plagiarism.” (Professor, RCEAS)

“Set assignments using combinations of structured and Internet resources in response. Set formal case readings and ask students to update text with current history from web. Have students formally build and operate active websites to explain and communicate their achievements.” (Professor of Practice, CBE)

“I give my students a tutorial on literature searching; I demand full documentation (citation, etc.) in their reports, and I show them how to find journal articles/use Web of Science/PubMed in my class(es).” (Assistant Professor, RCEAS)

“Give them a plagiarism assignment and quiz so they know (and they know I know they know) what it consists of.” (Associate Professor, CAS – Social Sciences)

“I have developed an exercise using Wikipedia to demonstrate the potential and pitfalls of online sources. I have several PowerPoint slides I show every class that show proper and improper ways to use outside sources in their own writing.” (Assistant Professor, CAS – Social Sciences)

“I should do more, particularly in the area of evaluating the relative importance of different sets of data or sources of information.” (Professor, CAS – Natural Sciences)

“Reserve a computer room to teach students use of MLA for research assignments that require them to find articles and summarize and report on them; usually do it two days with them; then expect them on later research project to work on their own; design assignments so that they become familiar with other tools useful in the discipline (online OED). Explain plagiarism first day of class. Don’t usually have trouble with it – but it has become harder to detect. Thus I design assignments in which plagiarism is difficult – very specific ones that require stages or steps, all handed in.” (Professor, CAS-Humanities)

“Post and discuss current guidelines on fair use of multimedia resources in educational projects. Discuss the use of appropriation in contemporary art and the transformation guideline used in copyright cases. Photography students and animation students produce original material in my classes and are discouraged from mining the Internet for visual content. Proposals for independent work must include a bibliography and the resources must be varied (i.e., not all from the Internet).” (Associate Professor, CAS – Arts and Humanities)

In addition, students were asked to elaborate on how their instructors reinforced these skills in their classrooms. The majority of comments dealt with classroom activity related to preventing plagiarism and support of academic integrity. Many felt that they were clearly informed of enforcement practices and the likelihood of sanctions. A number of students mentioned guest lectures by librarians. Some indicated that these topics rarely come up.
“All of my professors stress the importance of not plagiarizing in papers.” (Junior, CAS)

“In most classes that involve research, instructors go over how to use databases. Also, they frequently remind students of ways to avoid accidental plagiarism” (First Year, CAS)

“My instructors require that we always cite any sources used. They do not penalize for incorrect citation but rather assist us in citing information the correct way. Instructors also require copies of the articles or documents that we have cited to ensure academic integrity.” (Graduate, Masters, COE)

“Academic integrity statement included on syllabus. On each programming assignment, the statement is repeated as well as with common scenarios that are considered cheating…” (Senior, RCEAS)

“Professors often give examples of how to access information in online databases and emphasize filtering information to make sure the sources used are valid.” (Fifth Year, CAS)

“Teachers bring in librarians to help explain how to use online sources and the library.” (First Year, CBE)

“We’ve just been threatened with severe consequences for plagiarism since day one of freshman year.” (Sophomore, CAS)

The views of staff in the Office of Student Conduct, which handles academic integrity violations, reinforce the opinions of faculty and students. Although there is no simple way to track academic integrity cases, the impression of the Office staff is that the kinds of conduct cases are changing. For example, there appear to be fewer cases of students “not knowing how to cite.” Most cases now involve more intentional acts of academic dishonesty (i.e., cheating on quizzes or exams, falsifying information, etc., as opposed to unintentional plagiarism and careless research). The Office staff also has observed that the efforts of the campus to promote academic integrity and information literacy (mentioned above in Section 4.II.C.2) seem to be having an impact. The Office has noticed an increase in faculty members who use Turnitin as a resource and refer to the Information Literacy information provided by the Library. Future discussions in this area should focus on how to continue these promising trends (fewer students committing unintentional plagiarism and careless research), while also helping faculty members address the persistence of those more intentional acts of academic dishonesty.

Overall, these quantitative and qualitative results revealed that the campus is, for the most part, effective at helping students gain the skills, attitudes, and behaviors that are necessary for working with information in a digital age. Web resources, classroom visits, and efforts to help faculty develop effective approaches to teaching and reinforcing skills all seem to be working well. However, work in this area will need to continue. For example, the number of students who indicated that they are learning these crucial skills in only some classes indicates that the number of classes that explicitly teach information literacy skills and reinforce academic integrity should be increased. Also, as the numbers above make clear, more could be done to help faculty design assignments that teach students how to
distinguish between marginal and reputable sources. Work being done by the Information Literacy Group and Writing Across the Curriculum Program are aware of these trends and are already doing more in this regard. In addition, the University must ensure that incoming students and new faculty are made aware of Lehigh’s policies and the many helpful resources available to them. The new student and new faculty Orientations are the logical places for this to happen. Lastly, the Information Literacy Working Group is planning not only to create tutorials for incoming students that allow them to immediately receive help with skills gaps that are revealed in the assessment they take upon arrival to Lehigh, but also to continue to work with departments to design discipline-specific tutorials for students that will help teach these skills in a consistent, reliable, and time-effective manner.

4.II.D.5 Quality of Support and Effectiveness at Promoting Technology in Teaching

Lehigh Lab staff members, and LTS staff in general, place a high value on the quality of support they provide. They conduct regular surveys to measure user satisfaction with existing facilities, tools, and service. They survey faculty members periodically regarding classroom technology, invite faculty and students each spring to complete a Blackboard survey, and ask students annually about their satisfaction with the WIRED (Worldwide Information Resources in Every Dorm) computing support program. The results of these surveys drive decisions related to staffing, approaches to end-user support, purchases of equipment, software, and library resources, and upgrades to classrooms and computer labs. An inventory of the various surveys can be found in Appendix 4.30.

The most recent survey (the focus of the current section), shows a strong endorsement of the level of support that Lab and LTS staff provide its faculty (Table 4.14).

<table>
<thead>
<tr>
<th></th>
<th>Very effective</th>
<th>Effective</th>
<th>Neutral</th>
<th>Ineffective</th>
<th>Very ineffective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very</td>
<td>63</td>
<td>94</td>
<td>20</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>ineffective</td>
<td>35</td>
<td>52</td>
<td>11</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

When asked, “In each of the following areas, how effective is Lehigh at promoting the use of technology to enhance teaching and learning,” faculty offered high praise for classroom technology (88% very effective or effective), electronic library resources for students (83%), faculty development programming (74%), software resources (69%), and technology life cycle (67%).

These numbers represent an impressively high level of faculty satisfaction with library services, classroom and instructional technology support, computing and support, and faculty development efforts.

The following views are representative of faculty opinion in this area:

“The library is great; the Blackboard people are great. Blackboard has made my life so much easier. I can now get articles, etc., electronically through the library so easily, and then so easily upload them to Blackboard, that last semester one of my reading lists was
much more focused on examples of course material seen in current events. One student wrote on their evaluation that they now read the paper and followed the news with much greater interest.” (Associate Professor, CBE)

“LTS personnel is very responsive and their help and solutions comprehensive and to the point. Maintenance of technology is superb.” (Professor, RCEAS)

“I have found campus support to be pleasant and eager to help. In addition, they offer a variety of frequent opportunities for faculty to inform themselves about new technologies.” (Assistant Professor, CAS – Social Sciences)

“The support for integrating clickers into my lecture course has been fantastic at every step from design to training to implementation.” (Professor, CAS – Social Sciences)

“Librarians are always willing to make a class presentation, and have a good one that uses clickers on plagiarism. They will make a customized presentation and class-specific web page on primary sources for a term paper assignment. IMRC played a major role in getting my slides scanned for PowerPoint.” (Professor, CAS – Arts and Humanities)

“Resources have improved dramatically in the last 10 years and on-line access to library materials is now excellent.” (Associate Professor, CAS – Social Sciences)

“I am a HUGE fan of the IT folks – they are helpful, encouraging, and very knowledgeable. I wouldn't have been able to do any of the things I've done without them. I consider myself an early adopter; without them, I'd probably be a non-user.” (Associate Professor, CAS – Natural Sciences and Mathematics)

“It is incredibly helpful to have LTS staff ‘embedded’ in the colleges. Our team in the COE is outstanding ... both from the standpoint of being responsive as well as from the standpoint of being proactive through seminars and suggestions.” (Assistant Professor, COE)

“I think the institution takes a very proactive role in technology adoption through the Lehigh Lab Forum.” (Assistant Professor, CAS – Natural Sciences and Mathematics)

“I can go into any multimedia classroom and be confident I can be ready to use the computer and the classroom display within a few minutes.” (Professor, RCEAS)

The following comments represent some of the views of those who judged the support to be overall neutral (11%) or ineffective (3%):

“Effective: Campus support staff are well trained and eager to help. Ineffective: Campus support is stretched WAY to thin; support staff can be difficult to get a hold of and even more difficult to get time with.” (Assistant Professor CAS – Social Sciences)

“Our students are graduate students who take classes from 4-10 p.m. Our support staff works only from 9-5. It would help to have some night support available for students.” (Associate Professor, COE)
The comments in this area indicate that the things Lehigh supports well, it supports very well. Nevertheless, there is always room for improvement. For example, many faculty members commented on the excellent classroom technology, while others pointed out specific areas where the classroom technology is not meeting their needs. Similarly, in the areas of electronic library resources, software resources, and computer replacement, most faculty members believed that Lehigh supplies the necessary resources, but the comments reveal some gaps. The nature of these deficits suggests that they can be addressed by using existing channels for aligning faculty needs with the allocation of resources (e.g., software committees, Library Users Committee, Library Liaison Group, etc.). Nevertheless, it may be helpful to better inform faculty of the procedures for requesting new resources and to invite more frequent input into whether these existing procedures are meeting their needs.

Because change in instructional practice sometimes requires more than quality resources and effective support, faculty members also were asked for their views on the question of how better to encourage or reward faculty effort in the use of technology in their teaching. On this question, the faculty seems divided. When asked how effective Lehigh is at promoting the use of technology to enhance teaching and learning through faculty incentives, 62% of respondents with an opinion on the matter found that such incentives were ineffective (43%) or very ineffective (19%) and only 25% thought these policies were effective (37% of respondents reported that they weren’t familiar enough with these processes to judge). Similarly, when asked how effective Lehigh is at promoting the use of technology to enhance teaching and learning through tenure and promotion policies, 54% of those with an opinion on the matter found that such policies were ineffective (35%) or very ineffective (19%) in this regard (49% said they did not know enough to judge).

In the comments area of this question, faculty members offered a range of ideas. Several (7) pointed out that Lehigh does not sufficiently reward teaching or use of technology (consistent with the quantitative values above). Several others made specific recommendations, specifically regarding incentives, rewards, and promotion:

“It is unclear to me that using technology in innovative ways is part of the way faculty are assessed either for annual raises or for promotion and tenure. But I would like it to be at least a modest factor.” (Professor, CAS).

“I would love to spend more time developing my technological skills, including using video clips, podcasts, and such to support and deepen my teaching. I find, however, that I mostly continue to do what I can (rather than develop new things) because of the extreme limits on my time and lack of recognition for developing technology (not that I need to be rewarded for doing this, but that the tenure system looks at my publications and not whether I'm using innovative technology-assisted techniques or traditional teacher-fronted lectures).” (Assistant Professor, COE)

“The tenure and promotion process has no obvious way of including the use of technology to enhance learning and scholarship in its criteria, though it should. The current criteria tend to overemphasize archival journal publications and student teaching evaluations.” (Associate Professor, RCEAS)
“Blogs, online publishing and journals, and other non-traditional ways of putting out work need to be recognized and supported by departments, since this is an important direction for publication.” (Professor, CAS)

“There is no area on the PAR [Professional Activity Report] that specifically addresses learning new technologies. Professional development funds for attending conferences where we learn about new technologies are limited (This is even worse for staff who support high-tech environments). Software resources may be generally effective but budgets are too restrictive for adopting technologies early enough for evaluation when the technology is new.” (Associate Professor, CAS)

“I think there is little recognition and reward for innovation in teaching as part of faculty merit review. This might encourage more faculty to take risks and put in the effort.” (Professor, CAS)

“Provide course release time for developing Web-based and Web-enhanced courses. I could do much more to integrate more pedagogically sound technology in my courses if I had time to do so. At Lehigh, innovative teaching is not really rewarded compared with research and scholarship.” (Associate Professor, COE)

“[T]here is no incentive for me to take the learning curve for new technology, as my time is better spent doing research.” (Associate Professor, RCEAS)

“My general sense is that any aspect of instruction is a distant second to research.” (Professor, CAS)

A number of faculty members felt that Lehigh should avoid adding more pressures on faculty, arguing that tenure and promotion shouldn’t be a considered as a tool in this effort:

“I would not want to see the use of technology in the classroom tied to tenure/promotion/pay increase, etc.” (Associate Professor, CAS)

“The tenure and promotion decision does not need to become more demanding. The problem with faculty development is the lack of faculty incentives, not the staff. There is only so much time in the day.” (Assistant Professor, CBE)

“Tenure and promotion is not an area that should be used to promote the use of technology.” (Professor, CBE)

Based on these viewpoints and the subcommittee’s deliberations on this topic, it appears that including a measure of technology usage in the tenure and promotion processes would not be effective (or well received), principally because doing so would place additional undue pressure precisely on those faculty members who would not benefit from it. Policy in this area should be directed at removing obstacles, at recognizing the time and effort required to innovate, and at rewarding successful innovations that have demonstrated improvements in student learning, all without being punitive of those who judge that their efforts are best directed elsewhere. There are two areas where specific changes would help.
First, because methods of research and publication are changing in the digital age, faculty and administration should seriously consider what such changes mean for the future of tenure and promotion practices. If the University wants its faculty to help define new forms of scholarship for the 21st century, practices need to be adjusted so such scholarship is seen for what it is: Serious work presented in new formats that often eclipse previous forms of publication in terms of presentation, direct connection to primary sources and data, and scope of dissemination (See G. Reihman, “On Digital Scholarship: A Visit with Ed Ayers” at www.lehigh.edu/~inllnote/issues/issue6/FD_Ayers.htm, Appendix 4.31).

Second, Lehigh’s colleges and departments should recognize and reward those faculty members who undertake innovative teaching ventures, educational research, or projects in the scholarship of teaching and learning. Such activities are valuable contributions to higher education and disciplinary advancement, but because of the extraordinarily high value placed on publication in well-established, high-impact journals, faculty need assurances from their departments, colleges, and administration that time devoted to such projects is time well spent. Such assurances might take the form of public recognition, funding for course development or training, and acknowledgment during annual reviews of accomplishments in these areas. Additional specific recommendations on this topic are offered below, in Section 4.IV.

While it is hoped such faculty members are rewarded through traditional channels such as those just discussed (tenure, promotion, recognition, awards, etc.), Lehigh’s faculty development program also should work together with colleges and departments to implement new ways to reward and recognize faculty work in the areas of academic technology innovation, educational scholarship, and the adoption of new teaching practices.

4.II.D.6 Vision of the Future
Section 4.II.C.1 above described the process (See Figure 4.1) whereby the Lehigh Lab selects which technologies will receive focus and support. In that same section, it was recommended that this process be expanded to include efforts to better discern areas of faculty and student interest. To help facilitate this change and shape recommendations for the direction the Lehigh campus might take in the near future, faculty and students were asked to identify their perspective (already using; not using, but want to; unsure; or will not use) on nine different areas where technology is having, or might have, the most powerful impact on education. Respondents were then asked to describe their own vision of how technology might impact teaching and learning on campus.

Capturing an entire campus’s view of education’s future is difficult, but a few trends emerge from the responses to the questions, specifically the areas where faculty and students see a common future. Thus, the results presented in Figures 4.5, 4.6, and 4.7, and reviewed in the subsequent narrative focus primarily on the “not using, but want to” and “will not use” responses. It should be noted that responses in the “already using” category mirror, and supplement nicely, the conclusions in the earlier section on current uses of technology on campus.
Figure 4.5: Faculty responses to Q17: “The following list includes some areas where technology is changing or may change the way we teach. Which of these are you using, or do you hope to use, in your teaching?”

![Bar chart showing faculty responses]

Figure 4.6: Student responses to the Q11: “The following list includes some areas where technology is changing or may change the way you learn. Which of these are you using, or do you hope to use, in your learning?”

![Bar chart showing student responses]
Virtual Reality and Enhanced Visualization (defined in the survey as “the use of technology to create simulations, display complex data or detailed maps, etc.”): Not many faculty and students are currently using such forms of technology in teaching and learning contexts, but 35% of faculty and 61% of students report that they want to use such forms in the future. This is indeed an area of great educational promise and should be a focal point in the coming years. For example, one faculty member observed the possibility of using “simulations for specific lab instrument training (offline), including ‘expert’ database type information. This would make the actual lab time working with the instrument more valuable.” (Associate Professor, CAS – Natural Sciences and Mathematics)

To bring about these possibilities, Lehigh first needs to address several obstacles, some of which were pointed out by other faculty respondents. First, physical spaces need to be developed that can accommodate visualizations and simulations that require equipment more robust than a desktop computer. One faculty member (CAS – Arts and Humanities) wrote, “I would like to have access to a lab that would enable me to run simulations,” implying that existing facilities may be inadequate. The other limitation is related to the time and effort needed to develop such resources, as one faculty member in RCEAS observed: “Impressive examples, e.g., simulations and animations, that I’ve seen on various websites appear to have involved extraordinary effort by the professor to create.” In sum, if this as an area that Lehigh wants to explore, adequate physical resources and staff support need to be provided for faculty members who commit to the creation of such resources. A simpler starting point would be to help faculty members discover existing simulations, virtualizations, visualizations, etc., that have been developed by other universities as shared learning objects. A recent Lehigh Lab Forum (“OpenCourseWare: MIT, MERLOT and
More”) started this conversation and Lab staff is available to help faculty locate such resources and incorporate them into their teaching.

*Context-Aware Environments and Devices* (“classrooms and other spaces that respond to users, ‘smarter’ classrooms, clickers, etc.”): Currently, there is a growing level of interest in audience response systems and Lehigh should continue with its plan to offer a recommended clicker system for the campus spring 2008. Other new devices promise to simplify faculty manipulation of classroom technology by improving user interfaces, making classroom controls more portable, and customizing classroom settings to individual users. However, as there is no clear consensus on what devices will become the next set of standard equipment in Lehigh classrooms, the Lab should use its experimental classrooms to test the usefulness, usability, and scalability of these devices. Also, as the next generation of classroom technology is identified and as current classrooms need upgrades, the University should develop a clear plan for how it will roll out new technologies and then communicate this plan to faculty and staff. Doing so will help ensure that faculty members have an opportunity to become familiar with their teaching environments— an important step because when classroom technology requires long setup or prolonged attention during class sessions it can lead to frustrations, a point made by several professors:

“In the ideal world, we will not ‘see’ the technology. Does any common citizen know how a phone call gets routed? Not likely. The same transparency should apply to technology. We will benefit from its use, but not be acutely aware of its presence.”

(Assistant Professor, CAS – Natural Sciences and Mathematics)

“Right now I think we need a massive and urgent overhaul of all classrooms to consistent and modern standards. Tech should be an invisible but nontrivial part of this, but getting rooms that are climate controlled, comfortable visually, have flexible seating is desperately important.”

(Professor, CAS – Natural Sciences and Mathematics)

In light of such considerations, the University should act on the promise of these technologies, but also continue to follow good practice by ensuring that such classroom enhancements serve to reduce the barriers between faculty and student, not increase them.

*Online Learning* (“a class with no face-to-face component”): Nearly half of the faculty and student respondents share the view that they do not want to be involved in fully online courses. However, a number (17% of faculty and 15% of students) already are involved in such classes, and there are others (14% of faculty and 22% of students) who are not, but would like to be. These numbers reinforce the view that Lehigh, as a primarily residential University, has niche uses for online learning, particularly in some graduate and professional settings (where distant and online courses maximize flexibility – Appendix 4.6), and for select undergraduate courses offered during the summer (helping students meet requirements while working, thus allowing faster progression to upper division courses in their major). While clearly there is still more room for growth in such courses (offered and taken by those in the “not using but want to” category), there also appears to be a clear upper limit on how much of a Lehigh student’s education should be online. These facts should be part of Lehigh’s planning for the future and should be taken into consideration by the Office of Distance Education and the Distance Education Steering Committee.

*Blended Learning* (“a class with a face-to-face AND a significant web-based component”): Almost a quarter of faculty and students reported that they already use blended learning approaches, and another quarter reported that they are not but would like to. A smaller
number (20% of faculty and 17% of students) reported that they would not use this approach. A third of each group is unsure. As stated earlier, blended learning seems to be an excellent area of growth for Lehigh, because it entails an application of technology that can directly enhance the ability of students to learn actively in the presence of faculty. The potential for such use is stated well by one faculty member who said:

“I see technology primarily as a way to enhance communication or the flow of information among class participants (including myself). We can continue discussions, post additional reading, examples, websites, etc. It gets them to continue their thinking beyond the 50 or 75 minutes we have together. When this can be done without being cumbersome, it greatly facilitates learning.” (Associate Professor, CAS – Social Science).

Another faculty member pointed out that such approaches

“… could help deliver content and free up class time for interactive activities” but also added that this approach “does not simply require technology, it requires a change in how students are asked to learn. [...] Students are reluctant to go out, search and learn content on the web and spend the class time interactively.” (Professor, CAS – Natural Sciences and Mathematics).

This observation hits the mark, but it should be noted that the recommended approach also requires a change in how an instructor teaches, for effective blended courses require a different course design, well-structured online activities, and a rethinking of how to work with students during class meetings in order to capitalize on the work done online. As one faculty member observed:

“My courses are primarily social-constructivist in nature. Course content materials are often presented through online readings, Web-based interactivities, simulations, data collection activities, and Web-based presentations. Face-to-face class time is used to engage in inquiry-based activities and discuss educational issues that are raised in the readings and Web-based materials. My goal in class and through Web-based discourse is to create an intellectually stimulating atmosphere where students are engaged in critical thinking about authentic pedagogical issues. I use a variety of questioning strategies to challenge students to delve deeper into critical education issues that teachers encounter in their classroom situations. I am always interested in trying out new technology tools to meet these goals.” (Associate Professor, COE)

Other faculty members expressed interest in enhancing in-class time by moving items such as simulations, tutorials, discussions, homework sets, and peer review into the online setting. Recent successes in developing blended courses indicate that Lehigh is already well situated to support course changes of this kind, and significant development in this area are expected in the future.

Personal Publication and Broadcasting (“the use of computers to publish or broadcast text, audio, or video, e.g., ePortfolios, online journals, blogging, podcasting, video podcasting, YouTube, video blogging, etc.”): Providing venues for students to disseminate their work to audiences beyond the classroom often raises the quality of student work, because students benefit from a heightened sense of accountability (as their work becomes public) and a diminished sense of alienation (as their work can begin to have real significance in the world
beyond the campus). Faculty members at Lehigh are exploring the publication possibilities by, for example, developing class websites that organize and present student work, creating and sharing audio and video, publishing student award-winning papers in a digital form, and inviting students to contribute to University digital libraries. The new survey showed that many more (34% of faculty and 36% of students) of those who are not already doing so are nevertheless interested in moving into this area.

Lehigh already provides extensive support for faculty members who wish to create websites capable of showcasing student work. And, in spring 2007, Lehigh became an iTunes U campus, providing both public and private areas for the collection and distribution of audio and video podcasts. This is a promising area of development, as 64% of students have a portable MP3 music player, and others can access such content on their personal computers. One faculty member pointed out this possible application:

“One area of growth I see is the sharing of performances and compositions by our students and faculty with the rest of the world via iTunes or other network sharing devices.” (Professor, CAS – Arts and Humanities).

Another described the potential in this way:

“I would someday like to teach an Early American literature class that uses a wiki to help students sort through the primary documents from the colonial period. There is a wealth of material from the Early American period, but I have found that there are relatively few exemplary texts that really excite students about the study of Early American literature. Instead, I believe, the real excitement of the period comes from immersing oneself in the many different texts of the period. I think that a wiki would help students to have this experience. Students could research a variety of primary documents (which are already on the web) and then work together as a class to organize and structure those documents into a wiki database that would then reveal the exciting points about the Early American period.” (Assistant Professor, CAS – Arts and Humanities)

Visions such as these are educationally exciting and faculty members who see student work moving in this direction should receive support to make such visions a reality.

In addition to podcasts and websites, Lehigh Lab also will soon announce a campus-wide ePortfolio system that will allow students to post and share their work, both in access-controlled groups and on the Internet at large. Such a resource should change the way students think of their classroom work and co-curricular activities – as this work becomes more public and perhaps even part of what students share with prospective employers. The Lab should work closely with other campus units such as the Dean of Students Office and Career Services to ensure that students use these resources appropriately and effectively.

Another application of personal publication and broadcasting is increased faculty publication and broadcasting. Several faculty members already are active bloggers, and others are beginning to explore podcasting more seriously. Several professors already are using such resources to share content, provide more frequent verbal feedback to students, and give students a voice in the classroom. Others recognize that new technologies may enable them to do more easily what was more burdensome in the past. For example, a faculty member (Professor, CAS – Natural Sciences and Mathematics) wrote, “Years ago I tried successfully to videotape classes and have them broadcast in the evening for students who missed class. I found little effect on classroom attendance and students did use that
resource. But the effort involved in doing it and the quality of the videotaping eventually caused me to stop. I’d like to see that supported but clearly it is a major undertaking.”

Newer technologies of vodcasting and webcasting may simplify this process and allow this professor to regain the benefits found from capturing class sessions. If Lehigh wishes to adopt a resource for recording and broadcasting lectures, such technologies exist to simplify the process.

*Educational Gaming* (“the use of computer games to promote learning, enhance engagement, etc.”): Although very few faculty and students are currently using computers in this way (5% and 8% respectively), students, in particular, view this as a promising direction, with 43% expressing interest in using this in the future. Faculty members who have experimented with such uses report increases in student engagement. For example, one Assistant Professor in CBE reports: “It is my belief that effective learning in my Marketing Strategy course occurs when the students actually experience the strategic market planning process. A large portion of the course involves The Marketing Game!, a computer-simulated business game in which teams of students manage their own firms competing with one another in an industry. The game gives them a ‘hands-on’ opportunity to analyze markets, competitive forces, and target market needs, plus practice in forecasting and budgeting.”

The Lehigh Lab recently held a Forum on “Educational Uses of Gaming,” which it is hoped has started a conversation about the benefits of such uses. However, more needs to be done if Lehigh wishes to move seriously in this direction. The next steps will include learning more from faculty members who are using such games and working with faculty from the COE and the Computer Science Department who are knowledgeable about the theory behind the creation and academic deployment of educational games.

*Mobile Educational Content and Services* (“communication or delivery of educational content and services via cell phones, portable audio players, etc.”): This content and service has a similar profile of interest on campus – very few are using technology in this way (3% of faculty, 9% of students), but 17% of faculty and 34% of students report that they would like to start doing so. Part of the existing use in this area was captured in the previous discussion of personal broadcasting, specifically the use of iTunes to podcast content to students in a flexible manner. But this area holds an additional promise, especially given the near ubiquity of cell phones (approximately 98% of Lehigh students carry one), which move with students throughout their day and carry the potential for instant, individualized communications or information delivery. Lehigh, like other campuses, only recently has begun seriously countenancing the possibilities for communication with students using text messaging. Several campus organizations (especially in Athletics and Student Services) have started to collect information from students on how, and whether, to contact them in this manner.

Also, in spring 2007, President Gast convened a task force to examine how campus announcements are made and how to take advantage of text messaging and other technologies for this end. This effort resulted in a request to the entire campus to provide instant messaging contact information for use in emergency circumstances. Little is being done, however, in terms of educational delivery, and the Lehigh Lab could experiment productively with various educational uses of this promising approach to communicating with students.

*Social Computing* (“technology-facilitated interaction and collaboration, including virtual conferencing, group work on shared documents, online communities, Facebook or MySpace as learning communities, etc.”): While faculty are less familiar with these phenomena than students, there is clearly room for growth in this area, as approximately a quarter of faculty and students expressed interest in finding a way to use social computing educationally (we
assume that more students are engaged in social computing, but are not yet using this space as part of “the way they learn,” as the question asked). Some campus groups, such as the Global Citizenship Program, are already using social computing in this way, but this is an area where more can be done to promote various learning communities among students and faculty. It may make the most sense to start with some other small to mid-sized groups to see if such groups can benefit educationally from the powerful effects of social computing.

*High-Performance Computing* (“using high powered, networked computers to solve complex computational problems”): About a sixth of Lehigh’s faculty and students report that they already use computing in this way and 20% of faculty and 46% of students report that they would like to do so (though we suspect that many interpreted the question to mean more ordinary computing on networked machines, not true high-performance computing as the term is typically used). Lehigh has made great strides in expanding high-performance computing facilities and is unusual among colleges in the extent to which facilities are available to graduate and undergraduate students. However, it is clear that more faculty and many more students would like to get involved. One event that should help is the High-Performance Computing Day, held each spring since 2006, which spotlights current practices and aims to raise awareness of the kinds of projects faculty and students can undertake using computing facilities. Through this and other outreach activities, the trend should continue toward additional activities and a broader base of users. The best avenue for exploring expansion, both of resources and of users, is through Lehigh’s High-Performance Computing Committee, which will receive the data gathered through this survey and be asked to consider strategies and future directions. Also, because many high-performance computing uses involve the creation of new simulations and visualizations (discussed above), it is clear that teaching and research advances in these two area will be tied together closely.

4.III Conclusions

The preceding section offered an analysis of Lehigh’s approach to providing technology support for Lehigh’s learning-centered mission, including a description of current academic uses of technology on campus and a study of the practices and procedures for deploying and supporting such technologies. This analysis has revealed a number of strengths and weaknesses in our campus’s current approach. In this section, we outline the major conclusions drawn from this analysis. These conclusions will, in turn, help frame the recommendations offered in the following section (Section 4.IV, Recommendations).

4.III.A Current Strengths of Technology Support for Learning-Centered Mission

1. Lehigh’s library and technology planning and budgeting system is agile, responsive, and strategic. Its processes allow Lehigh to respond to new opportunities while meeting the current needs of faculty and student constituents and preparing for the near-term future.

2. Faculty development programming takes many forms at Lehigh, including individual consultations, group workshops, assistance with short-term troubleshooting, and guidance on long-term projects. Such work is done by many individuals, including the Director of Faculty Development, the Faculty Fellow, the Writing Across the Curriculum Coordinator, college-embedded support teams of technology, computing,
and library consultants, and a host of other LTS staff members who support the infrastructure that make it all possible. The many opportunities offered by these individuals have helped empower faculty to use technology in appropriate and effective ways.

3. The overwhelming majority of Lehigh faculty and students have a remarkably positive view of the value that technology adds to their educational practices, with 88% of faculty and 94% of students agreeing that technology is enhancing teaching and learning on campus. Both groups highly value many uses of technology, including presentation, collaboration, course management, and access to records. Faculty and student opinion appears to diverge when it comes to the value of certain other uses, such as library research, writing, assessment, and students’ sense of control over their learning. The vast majority of specific uses contribute to Lehigh’s goal of promoting a learning-centered approach to instruction and adding value to face-to-face instruction.

4. The campus has undergone a significant change in attitude and practice in the past five years, with more faculty members viewing technology more positively and many shifting towards a greater willingness to use technology in their teaching. An ever-increasing number of faculty members are becoming involved with projects that rely significantly on the adoption of new technology in their teaching and research. The organizational model of the Lehigh Lab effectively unifies a wide variety of support and consulting services, which has helped create a campus culture ever more willing to experiment with and adopt new technologies. The model is most effective at helping faculty become aware of technology uses and supporting those wishing to adopt new technologies to meet pedagogical challenges.

5. Campus units primarily involved in co- and extra-curricular student activities (such as Admissions, Athletics, and Student Services) are putting technology to use in interesting and effective ways.

6. Most Lehigh faculty members conduct informal assessments of the efficacy of their educational practices, including direct and indirect measures of how new uses of academic technology affect student learning.

7. A very large percentage of students are learning about academic integrity (79%) and have instructors who reinforce academic integrity (89%) in at least some of their classes. A similarly high percentage of students are learning in class how to acquire, interpret, and use information in their field of study (87%) and how to use technological tools and software in their major (85%). Campus efforts to promote such forms of learning – including efforts by instructors, outreach by campus librarians, orientation activities for faculty and students, and resources prepared by the information literacy working group and academic integrity task force – appear to be having a positive impact in this area.

8. Most faculty members report that at least once a semester they help their students learn how to use the Internet (75%), teach students to use tools and software in the major (81%), teach about academic integrity (89%), and take measures to deter or detect plagiarism (77%). About half of faculty members do these things even more often, at least two to four times a semester.
9. The Lehigh Lab staff is well respected on campus, and faculty and students both have a high degree of satisfaction with classroom technology, and library and computing resources. The Lab helps maintain such satisfaction by following practices such as following high service standards, conducting and responding to user satisfaction surveys, and keeping close connections to the colleges via the embedded college-support teams. The work extensive efforts on campus by the Director of Faculty Development, the Faculty Fellow, and other Lab staff also is a crucial contributor to success in this area.

10. Many faculty members feel more should be done to recognize and reward faculty members who put time and effort into innovative teaching practices. However, most who have an opinion on the matter believe that it would not be appropriate to encourage universal changes to tenure and promotion policies in order to encourage more use of technology. Nevertheless, many others argue (and this self-study agrees) that as methods of research and publication change in the digital age, Lehigh would be well served to seriously consider – in individual cases where a faculty member’s priorities and focus point in this direction – applying tenure and promotion criteria in ways that recognize new forms of digital scholarship, disciplinary educational research, and serious work in the scholarship of teaching and learning.

11. While there are numerous areas where technology might further improve teaching and learning on campus, five areas emerge as those that most capture faculty and student interest: Virtual reality and enhanced visualizations, context-aware devices and smarter classrooms, personal publication and broadcasting, social computing, and blended/hybrid courses. There also is enough interest in other areas (high-performance computing, educational gaming, fully online courses, and mobile educational content and services) to warrant further exploration, albeit in more niche applications.

12. As Lehigh pursues these and other technology initiatives, it is imperative that its campus culture be kept in mind. Faculty members want to be supported at many different levels of technology usage and, for the most part, they want the main uses of technology to, in some way, promote (or at least help preserve) Lehigh’s strengths as a residential University of learners. In some areas, however, such as graduate and professional education, or in creating curricular flexibility for undergraduates, there are possibilities for increased uses of educational technologies that do not tie directly into this goal.

4.III.B Current Weaknesses of Technology Support for Learning-Centered Mission

1. While Lehigh has seen a growing number of faculty members use technology to enhance teaching over the past five years, the campus will face ongoing challenges as faculty attention and time are drawn to other campus priorities, including increased emphasis on faculty and student research. Unless the Lehigh Lab proceeds in ways that connect with these other priorities, it will find itself competing for faculty attention and time with other initiatives in ways that prove unproductive for the Lab and unduly stressful for the faculty.
2. Although a large number of faculty members at all ranks and across all colleges are involved in projects related to technology enhanced teaching, the campus is not as effective at encouraging students, teaching assistants, teaching fellows, and adjunct professors to get involved in these projects.

3. Lehigh helps faculty adopt proven technologies (mainstream users) and creates many opportunities for faculty to test new technologies (early adopters). It is, however, less effective at supporting true innovators (i.e., those faculty members who create these technologies or those who wish to develop truly new applications of existing technologies). While a small group of faculty, including past Faculty Fellows, fall into this category, this group could grow larger if more were done to provide financial and staffing support for such individuals.

4. Faculty and students are successfully using a broad range of technologies to enhance teaching and learning, but there are areas of great promise that are not yet being used very broadly. Such areas include assessment (primarily formative assessment) of student learning, basic research and analysis, teaching to diverse learning styles, publication of student work, and increasing students’ sense of control over learning.

5. While most faculty members are willing to informally assess the efficacy of new teaching approaches, they generally believe that there is neither time nor support for more formal approaches to educational assessment. Hence, most are unwilling to commit more time to such practices. The Lab could do more to shape campus culture in this area by sharing effective approaches to assessment, supporting faculty members interested in conducting more rigorous assessment, and helping to reward those who do so.

6. Too few students learn in class how to use online databases, electronic journals, and digital resources in the major, or how to distinguish between marginal and reputable sources of information. These skills, plus the ethical use of information, are most often learned in only a few classes or outside of class. Too few faculty members are purposefully designing assignments that explicitly teach students how to distinguish between marginal and reputable sources (53% once a semester, 23% more often, and 33% never), a core skill students need if they are to emerge from college with appropriate information literacy skills. Lehigh Lab staff, particularly the information literacy working group, Librarians, and Writing Across the Curriculum Coordinator, have their focus on the right areas, and ongoing efforts, including focus groups with departments, should help to identify ways that even more can be done to prepare students to work effectively and appropriately with information. The survey information, especially when analyzed more carefully to discern trends in colleges, majors, and student year, will be useful in directing future campus efforts in these areas.

7. End-users satisfaction is not universal and so Lehigh needs to ensure that faculty members remain involved in planning, continue to serve on advisory bodies, and take advantage of existing mechanisms for feedback.

8. The Lehigh Lab support model is flexible, robust, and effective. However, the model itself ensures that, as it succeeds, faculty demand will begin to outstrip the support capacity of existing staff. When this happens (likely quite soon if not already, as
discussed above in Section 4.II.D.5), the response will need to be either a change in approach toward less customized support, an increase in the numbers of support staff, or some new approach to supporting students and faculty.

9. Thanks to the placement of the support teams in the colleges and the outreach efforts of the Lab’s co-directors, the Lab does a good job of keeping abreast of specific faculty needs. However, there is room for more faculty input into the selection of areas of focus, and better alignment of Lab priorities with those of other campus units, such as colleges and departments.

4.IV Recommendations

Lehigh has undergone a remarkable transformation in the past 10 years in terms of technological infrastructure and faculty deployment of technology in teaching. Since its founding, the Lehigh Lab has played a central role in this change. Its general structure and processes are sound and effective and so, based on the deliberations and analysis of this self-study, this self-study recommends that Lehigh continue using the Lab model. However, to improve the effectiveness and reach of the Lab, Lehigh should consider several recommendations for improvement.

4.IV.A Faculty Recognition and Reward

The University must do more to recognize, reward, and support faculty members who commit to changing their teaching practices. The Lehigh Lab can do more in this area, but such reward and recognition counts most when it comes from a faculty member’s peers, Chair, Dean, Provost, and President.

Recommendation: As faculty projects begin and end, the Lehigh Lab should do a better job of spotlighting faculty efforts by improving communication with chairs and departments. Starting in fall 2007, the Lab also should host an annual “Lehigh Lab Teaching, Learning, and Technology Symposium,” highlighting each year’s most interesting and successful innovations.

Recommendation: By fall 2008, the Provost should appoint a “Task Force on Rewarding Innovative Teaching and Scholarship,” which will investigate ways to improve rewards, recognition, and support for faculty members who adopt innovative approaches to their teaching and scholarship (including those who explore new forms of digital scholarship, disciplinary educational research, scholarship of teaching and learning, and innovative instructional practices), without inadvertently creating an environment where faculty feel pressured to change or rebuked if they do not. This Task Force, which should include the Deputy Provost for Faculty Affairs, representatives from the colleges, and the Director of Faculty Development, should report its findings and recommendations to the campus by spring 2010.

Recommendation: The Lehigh Lab should support faculty work in this area by operating more like an actual lab – conducting research and producing scholarly work. Lab staff should investigate what resources are needed to accomplish this goal and begin making plans to support such activity. More specifically, over the next two years, it should begin
issuing campus-wide calls for research projects by faculty members who want to engage more deeply in the scholarship of teaching and learning, and help develop tools that simplify assessment and clarify the path to publication.

4.IV.B Setting Priorities

Lehigh should continue to explore a broad range of new technologies, but the Lehigh Lab should do more to help the campus focus on a smaller number of the most promising instructional innovations, such as those listed in Section 4.II.D.6, Vision of the Future. As the Lab goes about identifying future areas of focus and developing new programming, it should rely on a two-way conversation between the Lab and academic leaders so that Lab initiatives and programming more reliably align with institutional goals and vice versa.

Recommendation: Starting in spring 2008, the directors of the Lehigh Lab should, on an annual basis, use recommendations from Lab staff, combined with survey data about campus interest, to select one or two specific areas of focus each year. These areas should receive a higher priority, greater publicity, and intensified support.

Recommendation: Starting in spring 2008, the directors of the Lehigh Lab should meet with campus leaders to help the campus set its instructional priorities and policies. Such interaction should truly operate both ways: As the Lab does more to solicit input from campus leadership, it also should do more to strongly advocate for its own vision when institutional goals are being set.

Recommendation: In order to be ready to deploy innovative approaches to teaching and learning, Lehigh must commit to a strategic financial plan for improving its information technology infrastructure (especially the campus network, classroom technology, and high-performance computing resources) and must strategically hire staff to support faculty projects in high-priority areas. Such planning will initiate from LTS, in close connection with emerging University-level strategic planning processes.

4.IV.C Outreach and Communication

The Lehigh Lab should continue seeking new ways to involve more individuals in its projects and programming by: Developing programming for individuals at all levels of technology preparedness, involving more adjunct professors, graduate students, and teaching assistants, and doing more to support uses of technology in co- and extra-curricular settings.

Recommendation: In the next two to three years, the Lab should develop programming that more directly acknowledges the five technology adoption categories described in this self-study (i.e., Innovator, Early Adopter, etc.), or some similar measure of faculty readiness to change. In order to keep programming aligned with changing faculty needs, it also is recommended that the Lab conduct a biennial campus survey starting in spring 2009, which invites faculty members to identify the technology adoption category that best describes their approach to teaching with technology.

Recommendation: Starting in fall 2007, the Lehigh Lab should begin maintaining a more accurate and regularly updated list of instructors (beyond regular tenure-track professors) so that all can be invited to events. Also, more programming should be developed to
support graduate student teachers on campus. The Graduate Teacher Development Program, which began in fall 2007 for just this purpose, is the logical place to focus such efforts.

Recommendation: The Lehigh Lab should improve and perhaps formalize its relationship with units such as Admissions, Athletics, and Student Affairs. The participation of the Director of Faculty Development in a recent Student Affairs retreat, and the instructional technology team’s work with Admissions and University Relations, are both steps in the right direction. More interaction of this sort is needed so that these units can build on their recent successes.

Recommendation: The Lehigh Lab should develop some new forms of communications with faculty and administration, including a start-of-the-year presentation at a faculty meeting, an end-of-the-year report, and, as mentioned earlier, an annual “Lehigh Lab Teaching, Learning, and Technology Symposium.”

4.IV.D Information Literacy and Academic Integrity

Lehigh must continue working to improve its students’ information literacy skills and further promote academic integrity across campus.

Recommendation: The Information Literacy Working Group should continue its processes of conducting focus groups with individual departments and using information gleaned from these meetings to develop discipline-specific resources for students in these departments. Similarly, more work should be done to connect student performance on the Information Literacy Assessment with the work done by the librarians and faculty in this area.

Recommendation: Faculty should be prepared to work with librarians to promote the adoption of technological tools (such as Refworks) that facilitate appropriate research and citation methods. Faculty members also should take greater advantage of “embedded librarians” available for chats or other online consultations within Blackboard.

Recommendation: The resources on the Fostering Academic Integrity webpage (including information on using anti-plagiarism software and related information literacy programs) should be more regularly promoted, especially to new faculty and new students when they arrive on campus.

4.IV.E Student Involvement, with Disciplinary Focus

Lehigh must find new ways to involve students in the process of integrating appropriate, effective uses of technology into the campus culture. In the process, Lehigh also should seek to improve students’ discipline-specific research, writing, and communication skills. As President Gast noted in her 2007 inaugural address, undergraduate involvement in research is an excellent vehicle for initiating students into the scholarly information environment (see www3.lehigh.edu/inauguration). One promising way to accomplish these ends is the Technology, Research, and Communication (TRAC) Fellows Program, currently being
developed by the Writing Across the Curriculum Program in coordination with the Faculty Development Program, the First-year Writing Program, librarians, and instructional technology consultants. The TRAC program, which will train a group of select undergraduates in the areas of writing, pedagogy, information literacy, and instructional technology, promises to improve student research, writing, and communication skills, while also providing a new tier of discipline-specific support for faculty. This program also will build a stronger link between the first-year writing program and writing in the disciplines, mitigate Lab staff overload, help faculty reconsider the role of multimedia and new technology for communication, and involve students directly in Lehigh Lab initiatives.

**Recommendation:** Lehigh administration and faculty should support the TRAC Fellows program. A pilot of this program should begin working with students and faculty in fall 2008 so that TRAC Fellows can begin working together with faculty and mentoring their peers (in the second semester writing course and beyond) by spring 2009. If the pilot is successful, Lehigh will need to adequately fund this program to ensure it can meet campus needs.

**Recommendation:** Lehigh should seek other means to involve students in research. Faculty members have recognized that the development and use of unique digitized library resources and digital historical archives create engaging opportunities to produce original work. Similarly, Lehigh’s advanced computing and laboratory resources create many opportunities for students to engage in scientific research and discovery. LTS should strive to make even more of these resources available and faculty should aim to redesign course assignments so students can engage in such research frequently throughout their careers. Lehigh Lab staff also should connect with other units on campus that promote undergraduate research, such as those that organize and promote the Undergraduate Research Symposium.