Chapter 5: Advancement of Student Learning

5.1 Introduction

The opening phrase of Lehigh University’s mission statement (Appendix 2.1) draws attention to the centrality of learning at Lehigh: *To advance learning through the integration of teaching, research, and service to others.* Lehigh’s founder, Asa Packer, sought to promote the cause of the nation by educating people not only in technical skills but also in the broader areas of the liberal arts and sciences. He wanted the graduates of his new institution “to combine practical skills with informed judgments and strong moral self-discipline.” The first University Trustees committed themselves to several key principles, one of which was to uphold the practical value of both scientific and classical education. That principle remains fundamental to Lehigh’s overarching educational philosophy.

From the beginning, Lehigh students gained a reputation for seeking to learn. In the early years, that reputation might have been expressed as “earnestness,” and today is heard as “work hard and play hard.” The outcomes for Lehigh’s undergraduate students, who are highly sought by prospective employers and admitted to the strongest graduate and professional schools, speak to their preparation for work or further study through the challenging curricula they follow as Lehigh students (Appendix 5.1). Lehigh graduate alumni also enjoy excellent placement and professional advancement outcomes.

Many of Lehigh’s institutional strategies revolve around the centrality of student learning. For example, in order to maintain a low student–to–faculty ratio, increases in student–body size over the last 40 years have been accompanied by increases in faculty size. In addition, need–based financial aid for undergraduates has been greatly expanded in recent years to broaden the pool of admissible talented students under a need–blind admissions policy. That broader pool yields students of higher academic talent who are more able learners. Finally, despite substantial expectations for faculty scholarship and creative work, all Lehigh faculty members contribute to student learning by teaching.

Lehigh faculty and administrators take pride in Lehigh’s learning–centered heritage. Like the faculties in all modern institutions of higher education, however, the Lehigh faculty needs to respond to two issues that relate to undergraduate and graduate student learning.

1. As knowledge expands at a greater pace, as disciplines evolve and new disciplines emerge (often beginning in a cross–disciplinary setting), and as demands on scarce resources (including faculty time) grow, how can a faculty responsible individually and jointly for guiding student learning be sure that students are learning as effectively as possible? What are the best learning outcomes for students? How do we ensure that students achieve those outcomes? When they don’t achieve the outcomes, how can the faculty modify its methods to improve their achievement?

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2. How can the faculty demonstrate to its stakeholders (e.g., students, their families, alumni, instructors of sequel courses, corporate/foundation/individual donors, employers, the higher education community, the public) that students achieve the outcomes that faculty set for them?

If advancing student learning is one of Lehigh’s mission-critical goals, then the University must adopt assessment methods that probe the extent of student learning. Lehigh needs to (1) integrate those methods into the teaching processes so they do not become bureaucratic means unto themselves, but rather truly connect with course and curriculum objectives; (2) focus efforts on gathering high-quality information that instructors can use to improve their courses and programs; and (3) uphold high ethical standards in examining faculty responsibility to improve student learning and using assessment results towards that end. Because many learning outcomes do not become manifest until well past graduation, Lehigh must identify ways to assess at least some of those longer-term outcomes while also committing to scrutinize the near-term results.

Student learning outcomes assessment does not have a long and distinguished history at Lehigh, but many instructors have adopted processes for informing the decisions they make about course content and pedagogy, and many programs have adopted processes for informing decisions about curriculum content and process. This chapter reports on those developments in both conventional curricula (i.e., the typical discipline-based programs) and in cross-disciplinary and co-curricular programs. In addition, it examines movements to develop a culture of inquiry and evidence about student learning outcomes at Lehigh. Finally, it presents a summary of findings and a set of recommendations for future work.

Taken as a whole, this chapter also documents the extent to which Lehigh complies with Standard 14 on student-learning assessment.
5.II  Student Learning in Conventional Curricula

5.II.A Introduction
Two of Lehigh’s colleges follow student–learning assessment methodologies prescribed by their discipline–based accreditors. The College of Business and Economics (CBE) is accredited by AACSB (Association to Advance Collegiate Schools of Business), and the undergraduate curricula of the Rossin College of Engineering and Applied Sciences (RCEAS) are approved by ABET, Inc. The latter was, until recently, an acronym for the Accreditation Board for Engineering and Technology, but that organization has changed its name to ABET, Inc., reflecting the organization’s expansion into a broader range of leadership, quality assurance, and professional development activities than just accreditation.

In addition, the Pennsylvania Department of Education (PDE), the American Psychological Association (APA), and the National Association for School Psychology (NASP) accredit some of the programs in Lehigh’s College of Education (COE), and the student–learning assessment methodologies in COE reflect PDE’s and APA’s expectations.

The College of Arts and Sciences (CAS) is relatively new to student–learning assessment as a formal concept, yet many elements of assessment are scattered throughout its courses and programs. In very recent years, however, discussions of learning outcomes for both undergraduate and graduate students in CAS have become more purposeful, and the most recent version of the CAS strategic plan specifically addresses assessment needs.

At the University level, only recently have student–learning outcomes and the assessment of student–learning attainment become topics of interest and concern. Nevertheless, we can report on several initiatives that provide a concrete foundation for understanding how Lehigh can place student–learning assessment among its strategic objectives. In particular, all undergraduate programs have recently gone through an exercise in identifying learning outcomes, and Lehigh recently experimented with the Collegiate Learning Assessment.

5.II.B College of Arts and Sciences
One of the chief goals articulated in the current (January 2006 CAS Strategic Plan, Appendix 2.17) is:

Support, maintain, and develop high quality competitive programs. It is critically important that what we choose to do, we do well. We must define clear objectives for our programs and develop a process of assessment to make sure programs meet these objectives. We need to make sure our programs continue to evolve as disciplines advance. Strong core disciplines are essential for the research and educational mission of the institution and remain a necessary foundation for interdisciplinary endeavors. We need to provide an appropriate level of support for core programs to maintain excellence and competitiveness. We also need to recognize that focus is required given our size, and that sustainable support requires a willingness and a mechanism to trade in old programs for new ones.2

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2 College of Arts and Sciences Strategic Plan, January 2006, p. 8. (Appendix 2.17)
Assessment of student learning is, thus, located as a central element in a larger strategic goal of defining objectives for superior academic programs and subjecting those programs to ongoing critical scrutiny. A precondition to achieving that goal is the achievement of another goal in the CAS strategic plan, which is to establish a coherent identity for the College. That process began with a series of dinner meetings in spring 2004, in which college faculty members gathered to discuss their views of liberal learning at Lehigh. Those discussions focused on values and objectives for student outcomes.

During the 2004–05 academic year, the CAS Policy Committee, a standing committee of the College faculty, took the notes scribed during the dinner meetings and distilled them into three statements about the “liberal arts and sciences” at Lehigh. Each of those statements was composed in a long form and a short form. Far from reflecting an inability to come to closure on a single statement about liberal learning, the three statements reflect different approaches to articulating the same set of issues. In the end, the Policy Committee recommended using all three documents in any effort to understand or articulate the complexity and the breadth and depth of the liberal learning enterprise (Appendix 5.2).

During the following year, however, the Policy Committee did construct a single document that, in bullet form, captured the values and objectives of the liberal learning statements (Appendix 5.3). The purpose of that single statement was to prepare for subsequent discussions on the curricular implications of adopting a coherent and purposeful identity for the College. Those discussions were, in turn, imbedded in the discussions that led to the creation of the College strategic plan. The plan cites the results of the AAC&U LEAP project

3 to highlight the consensus among faculty and students as well as among leaders in industry, business, and government about the desirability of achieving liberal learning outcomes. In addition, the plan speaks to engaging students in seeking the desired outcomes as values for themselves and, again, “to develop clear measures to assess the outcomes of an education in the College of Arts and Sciences to ensure we deliver on our promise.”

Currently, the College is working on several fronts to implement and advance its strategic plan. Central to that plan is the recognition that teaching in the College is designed to facilitate “life–long learning.” The positive effects of a liberal arts education can best be observed only in the long run, as the creativity, critical thinking and ethical sensitivity developed by such an education are brought to bear on real–life problems and issues. The sort of education best designed to achieve such outcomes is necessarily interdisciplinary, experiential, and constantly evolving. The College Plan describes a variety of exciting new curricular initiatives intended to strengthen this kind of education for undergraduates.

The task of assessing such curricular initiatives, however, is a challenging one, precisely because the benefits of such learning can be measured only in the long term. Indeed, discussions about student–learning assessment among faculty members who work in a liberal education setting, such as CAS, often highlight the challenge of learning outcomes that are not manifest until long after students graduate from college. Examples of pertinent questions include:

- Do our students become good citizens?
- Do they become life–long learners?
- Do they have the intellectual capacity to adapt to changing circumstances?

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• Do they apply their critical thinking, analytical reasoning, and ethical reasoning skills to evaluating the consequences of their choices and weighing the effects on others?

It should be noted that colleagues in engineering and business disciplines also are interested in such questions, which are relevant to the two issues raised in section 5.1 (i.e., probing the extent to which students attain the outcomes of Lehigh’s academic programs and demonstrating to stakeholders that students learn what faculty claims to teach). While CAS does not now employ assessment methodologies to examine such questions, the College believes that appropriate methods can be developed and implemented for at least some long–term assessment. The LEAP project cited above and the College Board’s Education Pays series of publications provide examples of survey items that could be adapted to this use.

Another challenge for student–learning assessment in the College is the richness and diversity of the curriculum. The chief concern is that assessment should not become a hindrance to innovation or to sustaining a diverse intellectual experience. Addressing that concern requires a focus on the mission and goals of the different programs and on the adoption of assessment methods that respect the differences. With these factors in mind, College faculty members have worked at the level of specific programs and departments to determine the best methods for evaluating learning outcomes for each individual major. Just as the first–year experience is crucial to developing a sense of community and inculcating habits of inquiry and intellectual curiosity – all of which will be crucial to a students’ success as undergraduates – the “fourth year experience” can be the basis for testing those acquired dispositions by engaging in some form of focused, productive intellectual endeavor. The typical format for this is the senior capstone seminar, along with or as the primary context for the writing of a senior thesis or the completion of a senior project. The program review in fall 2004 (reported in more detail below in section 5.II.F.1.i) showed that 85% of CAS degree programs offered a capstone project course, a senior thesis or an honors thesis, 37% recommended that students complete such an experience, and 32% required it (Appendix 5.4). These seminars and projects are opportunities to test a student’s methodological sophistication, their ability to utilize the basic methods and perspectives within a discipline for the purposes of a particular inquiry. The successful completion of required courses within the major insures an appropriate breadth and depth of knowledge for each student in the major, but the senior capstone experiences are designed to evaluate skill level in the focused application of that knowledge. Such skill is largely methodological and specific to disciplines but also includes those general habits of mind and inquiry associated with training in the liberal arts.

In addition, the fall 2004 program review compiled learning outcomes for each degree program and the courses on which the curriculum relied to promote attainment of each outcome. This compilation was a preliminary form of curriculum mapping (Appendix 5.5). The individuals who completed the review survey for each program were instructed to respond on the basis of disciplinary objectives, but a review of the results shows many common elements.

• Across all fields in CAS, common themes include communication (oral and written), collaboration, analytical reasoning, problem solving, ethical reasoning, critical thinking, research skills, and practical application of knowledge.

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• Across the breadth of the natural (and many social) sciences, common themes include mathematical analysis, quantitative reasoning, and logical inductive and deductive reasoning.

• The humanities (and many social sciences) value placing knowledge in context, cultural (or global) awareness, engaged reading, negotiating difference, and imagination and creativity.

These findings suggest that there is considerable support among disciplinary practitioners for building student–learning outcomes that span the CAS curriculum or, in some cases, broad segments of it.

CAS also is undertaking an initiative to introduce assessment of graduate programs, which includes determining whether the teaching and training of students in those programs are effective. The objective is to establish a sustainable process for graduate program review, combining regular internal assessments by the program faculty with periodic review by external experts. Data is to be collected continuously and evaluated biannually by each program’s leadership team, so that half of the College’s programs produce review reports each year. The external reviews will take place on a six–year cycle. The external reviews will provide different perspectives on the program, both in terms of whether the program is performing optimally and in terms of identifying new directions the program should consider. The review process follows the recommendations of the Council of Graduate Schools, and is being implemented at the time of this writing (fall 2007). Half of the programs will produce self–assessments during the 2007–08 academic year, and external reviews will begin in the 2008–09 academic year (Appendix 5.6).

5.II.C College of Business and Economics
The chief principle of the CBE plan for student–learning outcomes assessment is to outline learning objectives for each course, the core curriculum, each major, and the College program as a whole. The faculty adopted a set of metrics for determining student achievement of the learning objectives at each level. Periodic reviews of the objectives evaluate both their current relevance and the extent to which students are achieving them. Decisions based on those reviews lead to modifications of the objectives, and of the course or program methods for achieving them. Appendix 5.7 documents the continuous improvement plan and its implementation.

The undergraduate core curriculum is an example of how the CBE plan is implemented. The faculty established nine learning objectives for the core curriculum:

1. Ability to communicate effectively.
2. A strong academic foundation in the functional areas of business.
3. Academic competence in the discipline of the student’s choice.
5. Leadership and professional skills.
6. Competency in the use of technologies.
7. The ability to think critically.
8. An understanding of the ethical implications of business decisions and behavior.
9. An understanding of and appreciation for the nature of personal as well as global diversity.
Objective 2 is actually a set of supplementary learning objectives that integrate across the disciplines, thus accomplishing one of the key goals of undergraduate education in CBE:

1. Acquisition of core economics knowledge (terms, decisions, concepts, markets).
2. Acquisition of core marketing knowledge (terms, decisions, concepts).
3. Understand and be able to analyze and use financial statements and make business decisions.
4. Understand the social, legal and political environment in which organizations operate.
5. Understand financial instruments, institutions and markets that provide short- and long-term financing for business decisions.
6. Understand the elements and functioning of the value chain.
7. Understand concepts, theories, and principles of management and organizational behavior.
8. Compute and interpret basic descriptive statistical measures including probability, hypothesis testing, correlation, and regression.
9. Develop an understanding of the processes of strategy and policy formulation and implementation in the firm in the context of its competitive environment.

The core curriculum learning objectives are derived directly from the mission statement for the program (Appendix 5.8). Each objective is linked to one or more of the required courses in the curriculum, a course(s) that provides at least partial coverage of the objective. A special case is objective 3, which is explicitly deferred to the major programs and their own sets of learning objectives. In addition to identifying the points in the curriculum (whether core courses or the major program) responsible for achieving each learning outcome, the manner of assessment is noted for each of these points. All of the information about learning outcomes in the core program is assembled in a matrix for the core curriculum’s primary objectives (Appendix 5.9; Appendix 5.10 is a simplified matrix used for a more compact presentation), and the supplementary objectives (Appendix 5.11). The two matrices become the guiding documents for assessing learning outcomes in the core program.

At the end of each year, the instructors in the core courses answer four questions about each course.

1. To what extent did you achieve this program learning objective? How well were students able to perform the task, integrate the knowledge, and demonstrate understanding of this objective?
2. Indicate the method(s) by which your response was measured.
3. Did you make any changes this year to better achieve the learning of this objective, and if so, were those changes effective?
4. In the spirit of continuous improvement, what changes will you make to better the understanding of this learning objective.

Qualitative answers are encouraged so that instructors have an opportunity to bring their judgment to bear on the measures of student success and focus the process on the information that they need to improve student learning (Appendix 5.12; Appendix 5.13 is an example CBE core curriculum learning outcomes summary from spring 2006).

For an example that illustrates how major programs link mission to learning objectives and learning objectives to courses (a process that flows from objective 2 in the core curriculum), refer to Appendix 5.14.
The CBE assesses student–learning outcome attainment in a very similar fashion in its graduate programs. Appendix 5.15a-c provides three examples of mission, learning objectives, mapping matrices, and learning–objective assessment (for the MS in Accounting and Information Analysis, the MBA, and the PhD).

The CBE Associate Deans for undergraduate and graduate programs are responsible for gathering the documentation that supports the CBE assessment plan and for convening the appropriate review committee meetings. If course or curriculum changes are recommended in response to the reviews, the Associate Deans are responsible for seeing the proposed changes through the University’s process for course and curriculum approval.

5.II.D College of Education

The COE faculty approaches instruction with a strong focus on pedagogy. Accordingly, there is an intrinsic emphasis on strong, embedded internal and external assessment. Embedded internal assessments in traditional courses take the form of course performances (tests, exams, papers, projects, et al.) that are aligned with clearly stated course objectives. In practica, embedded internal assessments take the form of performances (consultation, counseling, teaching, support, et al.), once again clearly aligned with stated objectives and desired outcomes for those practica. Appendix 5.16 illustrates the articulation of learning objectives and assessment methods in syllabi.

External assessment takes four main forms.

1. Students evaluate their courses using a standardized course evaluation form, which allows program faculty to compare student perceptions/ratings of course efficacy with actual outcomes. Based on these evaluations, instructors consider revised practice or improved communication of objectives and outcomes.

2. Because COE is a graduate college, many students are in the process of learning to complete research projects, make presentations, and publish their findings. The COE tracks all student presentations and publications in its annual report (Appendix 5.17) and uses this information to assess the extent to which students are developing skills to share expertise across the profession by attaining best practice standards in research conduct and communication, and a research–to–practice orientation. The College tenure and promotion guidelines explicitly recognize mentoring student presentations or publications (Appendix 5.18).

3. External accrediting agencies, including the Pennsylvania Department of Education (PDE), the American Psychological Association (APA), and the National Association of School Psychologists (NASP), require self–study reports and make periodic evaluation visits. The COE self–study reports include student artifacts that are examined by visitation teams and help to assess the extent to which program objectives align with nationally accepted standards of professional training and development and are accomplished by Lehigh’s instructional and training activities (e.g., PDE self–study, Appendix 5.19; NASP folio report, Appendix 5.20).

4. Some COE programs (like the Special Education program or the Counseling Psychology program) are competency driven. That is, they have a full set of competencies for all students; courses and practica assess the extent to which students have achieved the desired level of knowledge and performance through confirmation of competence. This assures students not only have a sufficiently high GPA, but also have demonstrated competence in the specified areas and are well prepared to practice in the area in which they have been trained (Appendix 5.21 and Appendix 5.22).
The reports corresponding to other accreditations speak directly to student–learning assessment. The PDE self–study (Appendix 5.19) sketches the assessment methodologies used in each of the College's programs and indicates the documentation used to demonstrate assessment. This assessment responds to the PDE’s question “Does the … institution have a system for recruiting and advising students, monitoring their progress, and assessing their competence to begin their professional roles upon completion of the program?” The NASP evaluation similarly requests a “Complete description of program’s system/procedures for assessing student performance and the means by which results are analyzed and used for student/program evaluation.” (Appendix 5.20)

The Special Education program competencies document (Appendix 5.21) addresses the objectives of the required internship and is essentially a blueprint that connects the student’s preparation for the internship to the capstone and integrating nature of the experience. Students develop a portfolio of critical experiences prior to the internship and continue adding to the portfolio throughout the program. The intern’s site supervisor (e.g., cooperating teacher, program supervisor) and the University supervisor (e.g., faculty member, internship supervisor) both evaluate the student’s mastery of the program’s competencies. The site supervisor provides a written evaluation that goes into the student’s graduate file and recommends a final grade. The University supervisor reviews the written evaluation, requests more information if needed, and assigns the final grade. The Counseling Psychology program’s protocols are similar (Appendix 5.22).

5.II.E Rossin College of Engineering and Applied Science
The process to accredit engineering programs, which does not accredit the College as a whole, is defined in the Accreditation Policy and Procedure Manual, available on the ABET website (www.abet.org). The policy reviews the responsibilities of each of ABET’s Commissions and the objectives of accreditation, as well as all of the policies. The evaluation process includes requirements for initial evaluation, the on–site evaluation, and the documents produced during the process.

Currently, ABET uses eight criteria, and the number will expand to nine in 2008. Each of the criteria is considered in a separate section of a self–study questionnaire–based report during the evaluation, as outlined below (Appendix 5.23):

1. *Students:* Includes information about admissions (regular and transfer), graduation requirements, enrollment and graduation trends, student advising, and evaluation of student performance.

2. *Program Educational Objectives:* These are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve three to five years after graduation. They include the program’s mission statement, educational objectives, constituencies, process for establishing educational objectives, and the assessment and evaluation process for documenting and demonstrating attainment of objectives.

3. *Program Outcomes:* Includes information about the process for establishing and reviewing program outcomes, how the objectives and outcomes are related, the relationship of courses in the program to the outcomes, documentation that demonstrates the relationship of course materials to outcomes, and the assessment and evaluation process for documenting and demonstrating attainment of the outcomes.
4. **Continuous Improvement** (*The new criterion to be added in 2008*): Includes information used in making decisions about program improvement (e.g., results from the processes that support criteria 2 and 3) and what actions were taken to improve the program since the last review.

5. **Curriculum:** Includes a description of the curriculum and how it prepares students for a professional career and further study; a demonstration of how the curriculum is consistent with the objectives and outcomes; a flowchart of prerequisites; a syllabus for each course that satisfies any of the curricular requirements; and a table that shows the frequency of offerings, the section size and the proportion of lecture, laboratory, and other instructional modes.

6. **Faculty:** Includes a description of leadership roles in the program; the authority and responsibility of individuals involved in creating, maintaining and evaluating courses; the size, credentials, experience and workload of program faculty; faculty involvement in student advising; and faculty development.

7. **Facilities:** Includes a description of space and the various resources for laboratory, computing, and support staff.

8. **Support:** Includes a description of the program budget and its adequacy; continuity of institutional support; sources of financial support; support for faculty development; and support for facilities, equipment, and support staff.

9. **Program Criteria:** Includes a description of how the program meets the ABET program criteria. The program criteria focus on minimum requirements and articulate them in the form of “All students must…” The program criteria also include a “professional component,” which outlines requirements in the key areas of mathematics and science, engineering design, general education, and the major discipline.

Several of the criteria address elements of student–learning assessment. Criterion 1 addresses student performance evaluation. Criterion 2 ensures that the program has a mission statement, articulates its objectives, and has processes in place for regularly establishing, assessing, and documenting how the program attains its objectives. Criterion 3 similarly ensures that the program has learning outcomes, links objectives and outcomes, links courses and outcomes, and has a process for regularly evaluating and documenting outcome attainment. Criterion 4 addresses the question of the feedback loop from assessment results to decision-making about program improvements.

The evaluation of communication skills in Lehigh’s Civil Engineering program provides an example of the application of the ABET student–learning assessment process. The highlighted (bold, italics) passages locate communication skills in the Program Educational Objectives and the Program Outcomes for the Civil Engineering program.

**Program Educational Objectives, Civil Engineering:** The Civil Engineering Program seeks to prepare successful practitioners, innovators and leaders recognized by their:

1. Critical thinking and problem solving based on fundamental knowledge of mathematics, sciences, scientific methods, humanities and social sciences.
2. Knowledge of broad range of technical areas of civil engineering.
3. Knowledge in areas beyond civil engineering essential for understanding of global and societal responsibility.
4. Knowledge of advanced areas of civil engineering involving analysis, design and sustainability.

**5. Team building, communication and continued education/learning skills.**
Program Outcomes, Civil Engineering:

1. Provide our students with an education in the fundamental principles and scientific methods essential to contemporary civil and environmental engineering.
2. Provide our students the opportunity to study broad topics of civil, environmental, and other engineering fields.
3. Develop our students to be proficient in four areas of civil and environmental engineering: (a) environmental (b) geotechnical (c) hydraulic and (d) structural engineering.
4. Provide our students the opportunity to study advanced topics in one or more of our four proficiency areas of civil and environmental engineering: (a) environmental (b) geotechnical (c) hydraulic and (d) structural engineering.
5. Provide broad career opportunities for our students by integrating planning, economics and finance, management and organizational structure in the curriculum.
6. Provide opportunities for our students to develop and exhibit skills in teamwork, leadership, and continued education/learning.
7. Provide opportunities for our students to develop and use communication skills.
8. Develop opportunities, both inside and outside of the classroom, for understanding ethical responsibility and professional practice issues including political, international, historical, cultural, societal and diversity issues.

The program uses a curriculum map to identify which courses provide opportunities to develop and use communication skills (See highlighted courses in Table 5.1 below).

| Table 5.1. Civil Engineering Curriculum Map |
|-------------------|-------------------|-------------------|-------------------|
| Year 1            | Year 2            | Year 3            | Year 4            |
| **Fall**          |                   |                   |                   |
| **Engl 001**      | **Math 023**      | **Mat 033**       | **CEE 202**       |
| Math 021          | Mech 002          | **CEE 121**       | **CEE 203**       |
| Chm 025           | **CEE 010**       | **CEE 123**       | **CEAE(2)**       |
| Engr 001          | CEE 011           | **CEE 142**       | H/SS(3)           |
|                   | CEE 012           | CEE 159           | FE(4)             |
|                   | Eco 001           | ESE(1)            |                   |

| Year 2            |                   |                   |                   |
| **Spring**        |                   |                   |                   |
| **Engl 002**      | **Math 205**      | **CEE 117**       | **CEE 290**       |
| Math 022          | Mech 012          | CEE 262           | **CEAE**          |
|                   |                   | or 264            |                   |
| Phys 011          | Phys 021          | **CEE 222**       | H/SS              |
| Phys 012          | Phys 022          | **CEE 242**       | FE                |
| **Engr 005**      | CEE 170           | H/SS              |                   |
|                   |                   | H/SS              | **CEAE**          |

(1) ESE: Engineering Science Elective
(2) CEAE: Civil Engineering Approved Elective
(3) H/SS: Humanities or Social Science course
(4) FE: free elective

The program faculty members supervise the collection of indirect and direct measures of attainment. Direct measures include evaluations by instructors, industry partners, and peers of specific instances of student performance, instructor-evaluated samples of student work, and evaluations of student work in competitions (e.g., student research poster sessions) and
multidiscipline team projects. Indirect measures include senior exit surveys, alumni surveys (3–5 years post–graduation), and employer surveys. Constituent groups (students, employers, alumni) provide input on program components, including the program’s educational objectives. The program faculty members complete the loop of constituent feedback by evaluating the input for implementation, taking action to make improvements, and documenting their findings, recommendations, and actions taken to improve the program (Appendix 5.24). The program faculty can consult the external Civil Engineering Program Advisory Committee on important issues like the direct and indirect measures of attainment.

Like the CAS faculty, RCEAS faculty members are concerned with both the manifestation of student–learning goal attainment after graduation and the continued development of competencies in the course of professional employment or graduate studies. Toward this end, they are working to develop processes for surveying alumni and employers.

The RCEAS does not have an assessment plan, per se, for graduate programs or graduate student learning, but the College Dean and Associate Dean for Graduate Studies annually review a set of critical performance metrics in connection with the annual submission of data for the U.S. News & World Report ranking of engineering graduate programs. That review has influenced planning and resource–allocation decisions, such as the Dean’s decision to commit additional funding to graduate–student fellowships.

5.II.F University Initiatives and Current Status

5.II.F.1 University Committee on Assessment and Committee on Teaching Effectiveness

Lehigh’s 2003 Periodic Review Report (PRR) presented an evaluation of the readiness of the Lehigh faculty to move forward with the adoption of more intentional processes for assessing student learning:

According to a survey conducted in fall 2002, academic departments and programs employ a wide range of tools to assess their faculty. All use student course evaluations, an annual merit review, two–year reappointment review of assistant professors, and promotion and tenure evaluation. To assess student performance, a senior survey and graduate survey are used as tools most often. In addition, about half of all departments use student focus groups, a more personal method of assessing performance. Other methods to assess student learning included use of traditional course exams and course projects, student portfolios, observing results in downstream courses, and formal senior level exit interviews and informal faculty–student and/or faculty–alumni interaction.

In addition, faculty showed strong agreement with the AAHE report, “Nine Principles of Good Practice for Assessing Student Learning,” with more than 90% of Lehigh’s academic departments reporting that they agreed or strongly agreed with four of the nine principles.6

In response to the results of the survey cited in the passage above, the Provost (R. K. Yoshida) established two committees in the months immediately preceding the submission of the PRR. The University Committee on Assessment was formed as an ad hoc subcommittee of the standing faculty Committee on Educational Policy, and the Committee on Teaching Effectiveness was formed in spring 2002 as an ad hoc committee to advise the Provost on course evaluation policy.

5.II.F.1.i University Committee on Assessment
The University Committee on Assessment (UCA) was intended to develop “recommendations for the development, refinement, and implementation of best practices in the assessment of student learning across the campus” (emphasis in original) (Appendix 5.26). The UCA did not have a built–in mechanism for sustaining its membership, and it ceased to function after the 2004–05 academic year. It did, however, accomplish an extremely useful function by fostering assessment of student learning in undergraduate programs. In fall 2004, the UCA sponsored a comprehensive review of mission, goals, learning objectives, and assessment methods in each of Lehigh’s undergraduate programs (Appendix 5.27). A review of the learning outcomes shows, as expected, discipline–specific objectives that could only be achieved and assessed within the scope of the major. It does, however, show many common objectives, like communication, research, and critical thinking skills (Section 5.II.B reviews some examples of such commonalities in the case of the College of Arts and Sciences, Appendix 5.5).

In addition, the review showed that 74% of Lehigh’s undergraduate programs have some sort of continuous improvement mechanism, which was defined as an ongoing process to assess the quality of the program or measure the outcomes of student learning and use that information to improve the program (Appendix 5.28). Even if that self–reported result is overly optimistic, it nevertheless suggests significant program–based receptiveness to continuous improvement and a strong foundation on which to plan a University–wide assessment program.

5.II.F.1.ii Committee on Teaching Effectiveness
The principal goal of the Committee on Teaching Effectiveness (CTE) was to develop a course evaluation survey instrument that would have integrity and be administered uniformly across the University (Appendix 5.29). Until the Provost mandated the use of a single instrument beginning in the fall 2002 term, colleges and departments had not been able to produce comparable information based on student surveys of their courses. Prior–term survey results were not stored, which precluded any analysis of trends or a psychometric evaluation of the survey instruments in use. The Provost’s mandate also shifted responsibility for managing the survey and storing the results to the new Office of Institutional Research.

Prof. J. Gary Lutz of the College of Education performed a psychometric evaluation of the survey instrument based on surveys collected during academic year 2002–03 (Appendix 5.30). He concluded that the instrument is internally consistent and unidimensional. Thus, it does measure something, and it measures one thing, even if it is not obvious what it measures. Prof. Lutz hypothesized that, based on the content of the survey questions, the survey is essentially a “customer satisfaction” scale. As noted in Chapter 2, the results of course evaluations are used, with other materials, in annual faculty merit evaluations as well as in reappointment, tenure, and promotion cases. Generally, only the results of the first two questions on the survey (rate the course, rate the instructor) are used for faculty evaluations, while the results of the other questions, which may include additional questions added by the
instructor or the department, are intended for the use of the faculty member in making improvements to the course. Prof. Lutz’s analysis did find strong support for using the first two items as a proxy for the entire scale.

Like the UCA, the CTE has ceased to function, but at the end of the 2006–07 academic year, a member of the Committee on Educational Policy raised the question of whether it was time to review the course evaluation process and the use of the survey data. That issue is now on the agenda of the Committee on Educational Policy for the 2007–08 academic year, which is likely to stimulate the work of the standing faculty Committee on Student Appraisal of Instruction (the Committee on Student Appraisal of Instruction reports upward through the faculty governance structure via the Committee on Educational Policy).

5.II.F.2 Grading Standards

In fall 2005, the current Provost (M. S. El–Aasser) charged the Committee on Educational Policy with establishing a sub–committee to evaluate the use of grades across all academic programs and develop standards that relate grades to the achievement of course outcomes. That sub–committee has completed its evaluation of grade usage and benchmarked grading standards at other institutions. It plans to develop a proposal for grading standards during the 2007–08 academic year.

The first order of business for the grading standards sub–committee was to examine grading trends in different categories of courses. For example, Princeton University’s approach to the question of whether too many A’s were being awarded was to put a cap on the number of A’s. The sub–committee wanted first to determine if the University sensed that it had a similar problem. The sub–committee noted (1) a generally upward trend in grades, (2) a few anomalies in the trends with respect to time (significant changes from one year to the next), and (3) a few programs (e.g., music lessons and performance ensembles) that are dominated by A’s. However, there was no evidence of a general excess in A’s (Appendix 5.31). Due to other changes that were taking place over the same time period, even the observation of an upward trend in grades did not, in the sub–committee’s view, constitute evidence of “grade inflation.” These changes include, for example, students’ ability to drop a course as late as the 11th week of the 14–week term without receiving a grade and to repeat a course, thus replacing the grade, without constraint. In addition, academic support services have been substantially strengthened, and the academic credentials of incoming Lehigh students have been steadily increasing over the past 15 years.

The sub–committee also conducted a survey of faculty opinion about grading trends (Appendix 5.32). In general, faculty members report that they have not changed grading standards in their undergraduate courses over the past several years. They also report feeling that grade inflation is only somewhat of a problem nationally, at Lehigh, in their college at Lehigh, or in their department. They are about evenly divided on whether grade inflation is not a problem or is somewhat a problem in their own classes. The faculty survey suggests that about half of the Lehigh faculty does not favor developing strategies to address grading standards. The survey also collected valuable data on the variety of methods instructors use to evaluate student performance and assign grades.

5.II.F.3 Tutoring Effectiveness

The Center for Academic Success, a component of Academic Support Services in the Dean of Students Office, is committed to helping students reach their full academic potential and succeed academically at Lehigh. The Center opened in fall 2005 as a centralized facility to allow Academic Support Services to reach a greater number of students than ever before. It houses both Lehigh’s pre–existing Peer Tutoring Program and a Study Skills Assistance
Program. The Center’s tutoring services, which cover many first- and second-year courses, and the study skills assistance program, are both free of charge to all Lehigh students. Both programs offer subject-specific tutoring and general learning and study skills support with the ultimate goal of giving Lehigh students the skills they need to become successful, independent, and self-confident learners. Prior to the fall 2005, requests for tutoring were less than 300 per semester but now exceed 500 per semester.

Because of the increasing importance of the Peer Tutoring program, Lehigh initiated a study to assess its effect on student learning. This study concentrated on the areas of accounting, economics, finance, mathematics, chemistry, physics, and mechanics—the subjects with the greatest peer tutoring program participation. The study was based on data for all students enrolled in 20 individual courses in these subjects over three academic years, 2003–04 through 2005–06. Because some, but not all, of these courses are offered in both the fall and spring semesters, this study yielded 83 courses with a total enrollment of 18,000 students. Because the empirical model used to estimate the effectiveness of the peer-tutoring program includes a measure of each student’s grade point average (GPA) at the beginning of a semester, the study excluded first-semester students, thereby reducing the sample to 13,385 observations.

The study takes into account within its statistical model the voluntary self-selection characteristic of participation in the peer-tutoring program. The key result is that each hour of tutorial participation leads to an expected increase of about 0.025 in a student’s course grade on a 4.0 (A–F) scale where a plus (minus) grade constitutes an increase (decrease) of 0.3 from any letter grade. This result suggests that a student must participate in the program for a total of 12 hours (or about an hour per week over a 14-week semester) for the program to produce sufficient results to raise her/his grade in a course (Appendix 5.33 and 5.33a).

The Center for Academic Success used the results of the study to (1) encourage students to seek tutoring early in the semester, (2) make students aware as part of its tutoring contract (on the tutor request form) that it strongly recommends that students meet with their tutor on a regular, weekly basis, (3) educate tutors during training to encourage their tutees to meet with them weekly, and (4) add a statement on its web site indicating that tutoring is most effective when used on a regular, weekly basis. This effort is already producing results. In the fall 2007 semester, early requests for tutors increased substantially. At the end of the semester, the Center will be able to determine how many students sustained their meetings with their tutors at the recommended level and the effect these meetings had on their grades.

5.II.F.4 Collegiate Learning Assessment
Lehigh University experimented with the Collegiate Learning Assessment (CLA) during the 2005–06 academic year. Early in the fall term, the University administered the long form (three hours, consisting of both critical thinking and analytical reasoning tasks) of the CLA to approximately 100 first-year students. Later in the spring term, the CLA short form (1.5 hours, consisting of either a critical thinking or an analytical reasoning task) was administered to approximately 100 graduating native7 seniors.

The experience with the CLA was determined to be unsatisfying. It was very difficult to get participation, despite the use of incentives. For first-year students, the goal had been 300 students out of a class of approximately 1,200, but in the end, all 1,200 were invited in order to get 100 participants. For seniors, the goal was only 100, but most of the class had to be

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7 students who started as first-time students at Lehigh, i.e., excluding transfer students
invited to fill the seats. In addition, the CLA must be proctored, which makes the administration less convenient for both those administering it and those taking it. Finally, Lehigh does not have large computer labs, so administration had to be broken into multiple sessions in labs with a capacity of 20 to 25 students.

In retrospect, it is clear that the University attempted to use the CLA in an environment in which it was ill prepared to use it:

- There was a lack of faculty engagement in the process leading up to administration, with a consequent failure to place the CLA in the context of learning at Lehigh. The CLA’s measures were not located in Lehigh’s priorities.
- Lehigh had not established a systematic or resourced infrastructure to integrate the CLA with the curriculum.
- Participants self selected, so while there was a reasonable cross-section of participants from the three undergraduate colleges, there was no assurance of a cross-section of demographic groups or student abilities.
- Students had no stake in the outcome, a fact that probably undermined their motivation to do their best.

As a result, the CLA’s findings could have little impact in providing information that could be used to improve instruction or programming. Lehigh would not aim to “teach to the CLA,” but if the University decides to use the CLA or any other instrument, the faculty should be sufficiently committed to the goals measured by the instrument that the faculty would teach to those goals. Furthermore, the faculty should know how it would use the instrument’s results to improve some aspect of the curriculum. Those conditions were not in place when we used the CLA.

5.II.G Lessons Learned

Most of Lehigh’s academic program faculties think about student learning outcomes, and many have established explicit methods for assessing student achievement of those outcomes. Before proceeding with a review of assessment practices in some cross-disciplinary and co-curricular programs, it is valuable to examine lessons learned from programs that have adopted student–learning assessment practices.

1. **Student–learning assessment must be linked to mission and planning so that learning objectives and strategic planning mutually reinforce one another.**

While many instructors are collecting student achievement information, a single point of accountability is needed at each level, whether program or college, to ensure continuity and maintain ongoing documentation of the process. Documentation is essential for instructors of sequel courses and external stakeholders and also serves as a foundation for strategic planning and resource allocation. In fact, Lehigh’s experience with the CLA (See Section 5.II.F.4) suggests that a sustainable planning process is a prerequisite for successful student–learning assessment, especially across programs in a college or across the institution. Peterson et al.\(^8\) clearly showed that an institutional environment that values planning provides a healthy setting for assessment. This work was a case study of

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planning and assessment at Wake Forest University, which is similar to Lehigh in many ways, notably in its size, learning–centered mission, and decentralized planning and assessment culture.

2. *Fit the means of assessment to the learning outcomes being assessed, and let the scope of the assessment plan be appropriate to the curriculum.*

It seems self–evident that programs need to set their own learning objectives, but it is also important for programs to prioritize those objectives according to the needs and norms of the discipline. Assessment techniques should be appropriate to the outcomes to be assessed, and programs should align assessment plans with the relative importance of the various outcomes. Furthermore, programs should adopt methods of sufficient sophistication to answer the critical questions. For example, the investigation of peer–tutoring effectiveness (See Section 5.II.F.3) examined the specific hours of tutoring in relation to its effectiveness.

3. *Address goals at different levels: course, program, college, or university.*

Academic programs institutionalize a collaborative approach to educational objectives that span several courses. Each course has its own objectives, but also plays a role in achieving the goals of the program. Similarly, when a significant number of programs identify a common outcome, the programs should collaborate on developing the means to help students achieve that outcome and to assess their achievement, thus avoiding a fragmented approach. A College or University framework for fostering learning across the disciplines, including appropriate assessment plans, can be useful in addressing the outcomes that transcend the program level. For example, Lehigh recently developed a Writing Across the Curriculum (WAC) program to respond to the universal need across all programs to foster better student learning through better writing. The WAC program will assess its outcomes through focus groups and interviews, surveys, digital portfolios, and department–level faculty evaluations.

4. *The faculty needs support in adopting substantive student–learning assessment plans.*

The faculty, with its overarching responsibility for educational progress and attainment in the institution, needs to set the agenda for student–learning assessment. However, faculty need:

- A framework within which to work on assessment.
- A clear sense of how assessment fits into the overall strategic plans of the institution.
- Assurance that effort expended on assessment is valued in merit, tenure, and promotion evaluations of faculty effort.
- Infrastructural support for carrying out assessments and maintaining documentation.

It is critical to acknowledge that student–learning assessment takes faculty effort, and in order to minimize the disruption of faculty work, assessment should be integrated into the regular work of teaching and should yield high–value information that instructors
can use to improve their courses or programs. The effort of assessment should be recognized appropriately as effort that advances student learning. Faculty members should be encouraged to go beyond simplistic quantitative assessments and engage their professional judgment through qualitative assessment and critical reflection.

5.III. Student Learning in Cross-Disciplinary and Co-Curricular Programs

5.III.A Purpose of This Section
The focus of this section of the self-study report is the assessment of student learning in two specific areas that reflect key mission priorities for undergraduate learning at Lehigh. The first is a set of three cross-disciplinary programs: Computer Science and Business (CSB), Integrated Business and Engineering (IBE) and Integrated Product Development (IPD). These programs were developed over the past decade and all emphasize analytical problem solving within a team environment. Together, these programs represent Lehigh’s commitment to move to the forefront of higher education in offering students opportunities that bridge the gaps between traditional disciplines.

The second area is student learning in venues typically associated more with co-curricular learning than with classroom, lecture-based instruction. This dimension of student learning is critical to Lehigh’s commitment to view students holistically from their admission to graduation. To evaluate the assessment of student learning in this critical dimension of the Lehigh experience, this report focuses on music — both as a major program of study and also as an area of serious interest to students majoring in other disciplines — athletics, and study abroad programs.

Lehigh’s view has been that student learning should be measured through both individual student performance assessments and assessment of overall program efficacy. In what follows, the methods used by each program to assess and evaluate both aspects are documented.

5.III.A.1 Student Performance Assessment
Instructors commonly assess individual student learning by grading tests, written and oral reports, and class/lab/homework assignments, as well as by evaluating overall progress in a given course. It is especially challenging to assess the learning process in less structured, portfolio-based, or experiential courses and programs like CSB, IBE, IPD, DA, Music, Athletics, and Study Abroad. The assessment tools used in these types of courses and programs should represent all meaningful aspects of that performance, as well as provide equitable grading or other evaluative standards. Additional issues that complicate assessment include cross-disciplinary teams, project variability, and the involvement of external experts, such as industry mentors, guest lecturers/artists and consultants. Each of the programs discussed in this section uses different methods of evaluating Grade-able materials or events that are directly related to their stated course or program objectives.

5.III.A.2 Program Assessment
Assessment of student learning should create a clear picture of what students have learned, what level of competency they have achieved, and what they are now capable of doing as a result of completing the course or program. Identifying desired program outcomes is the first step in the assessment of overall program efficacy. By using individual student
performance assessments along with course evaluations, exit interviews, external participant surveys, and professional expert reviews, each program collects the information needed to assess the efficacy of the program.

5.III.A.3 Feedback Loop
The final aspect covered here is how each program employs a regular feedback loop for the purpose of continuous course or program improvement. Each program collects student performance and program outcome information, evaluates that information against program objectives, and then makes decisions to improve various aspects of the program. This feedback process is often the last one to be “normalized” in assessment practices and may be already occurring in a way that is best described as “just in time” rather than organized, scheduled, and standardized.

5.III.A.4 Overview
The following pages present a brief account of how each of the CSB, IBE, and IPD programs assess their learning objectives and accomplishes the feedback mechanism for continuous improvement. Following the narrative presentations, a summary matrix is presented. It should be noted that each program has expressed its objectives in its own way without a common template. This section closes with a compilation of the lessons learned from this self–study exercise.

5.III.B Computer Science and Business (CSB)
5.III.B.1 Program Overview
The Computer Science and Business (CSB) Program is offered jointly by CBE and the Department of Computer Science and Engineering (CSE). Unlike other programs where students have a dominant college, the CSB program is so balanced that the students are simultaneously in both CBE and RCEAS. The CSB program integrates computing technologies and business topics at an unprecedented level, providing the skills and training needed to understand business functions and business–related problems, to analyze business–user information needs, to design computer–based information systems, and to implement systems solutions within business organizations (Appendix 5.34).

Graduates of the program are ideal candidates for placement within large consulting firms, small consulting teams, and start–up companies. This program also lays the foundation for students who will eventually become the CIOs, decision makers, and general managers of information age corporations. It is not just a preparation for a career in business computing; rather it is a full–fledged technological computer science degree, approved by ABET’s Computing Accreditation Commission along with Lehigh’s computer science degree programs. It also is a full–fledged business degree, accredited by AACSB. Indeed, it remains the only four–year program accredited in both computer science and business at any institution.

The CSB program began in fall 2002. About 35 students enter the program each year. The average (math plus verbal) SAT for the class entering in the fall 2006 was 1323.
5.III.B.2 Learning Objectives
Table 5.2 outlines the learning objectives of the CSB program:

<table>
<thead>
<tr>
<th>Objective</th>
<th>Description</th>
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<tbody>
<tr>
<td>Objective 1</td>
<td>Provide a strong foundation for further formal and informal study in Computer Science</td>
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<tr>
<td></td>
<td>a. Principles of</td>
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<td></td>
<td>i. Programming</td>
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<td></td>
<td>ii. Data structures</td>
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<td>iii. Computer architecture</td>
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<td></td>
<td>iv. Compiler design</td>
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<td></td>
<td>v. Software engineering</td>
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<td></td>
<td>b. Design algorithms and apply complexity</td>
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<td></td>
<td>c. Principles of design of computer language</td>
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<td></td>
<td>d. Principles of operating systems</td>
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<tr>
<td>Objective 2</td>
<td>Provide a firm basis of science and mathematics</td>
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<td></td>
<td>a. Apply mathematics to CS problems</td>
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<td></td>
<td>b. Perform experiments and analyze data</td>
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<td>Objective 3</td>
<td>Provide exposure to projects that have the elements of those the students will encounter on the job</td>
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<tr>
<td></td>
<td>a. Fluency in a computer language</td>
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<td></td>
<td>b. Experience in a second language</td>
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<td></td>
<td>c. Analyze substantial problems in terms of software solutions</td>
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<td>Objective 4</td>
<td>Educate the students in the moral and ethical issues that arise in Computer Science</td>
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<tr>
<td></td>
<td>a. Recognize moral and ethical issues arising from creation of software and using the computer</td>
</tr>
<tr>
<td></td>
<td>b. Make sound moral and ethical choices when creating software and using the computer</td>
</tr>
<tr>
<td>Objective 5</td>
<td>Integrate the Business and Computing Science components of the program</td>
</tr>
<tr>
<td></td>
<td>a. Understand relationship between internal control and key business processes</td>
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<td></td>
<td>b. Apply computer technologies to the construction and control of business information systems</td>
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<tr>
<td></td>
<td>c. Work on a team to develop software for a business environment</td>
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<tr>
<td></td>
<td>d. Design a database</td>
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</tbody>
</table>

5.III.B.3 Measuring Attainment
Each semester, the Curriculum Committee of the Computer Science Department meets to review the regular program self–study reports provided by the instructors of each course taught in the CSB program. Specific exam questions, homework assignments, and team projects are linked to course objectives and assessed in terms of how they contributed to their respective objective(s). Some of the assessment is subjective and some is objective (e.g., performance statistics on exam questions).

In addition to the self–study reports, the committee reviews the results of exit interviews with students (conducted by the program directors) and exit interviews with project sponsors of capstone courses (conducted by professors of practice). See Appendix 5.35 for
examples of the continuous improvement documents used for measuring attainment for the integrative courses CSB 311 and CSB 312/313.

5.III.B.4 Feedback Mechanism
The curriculum committee annually makes specific recommendations to each course instructor, the department, and Co–Directors of the CSB program. The recommendations are formally recorded in the minutes of the meeting (See Appendix 5.36 for an example of this feedback mechanism in the case of CSB 313).

5.III.C Integrated Business and Engineering (IBE)

5.III.C.1 Program Overview
Lehigh University offers a state–of–the–art honors degree program leading to the Bachelor of Science in Integrated Business and Engineering (IBE). The very demanding IBE Honors Program is a carefully planned integration of courses in business and engineering with additional requirements in mathematics, sciences, English, and the humanities. In addition, students are required to demonstrate proficiency in a foreign language and maintain a minimum GPA of 3.25. Graduates of the IBE Honors Program emerge with a unique set of skills and competencies, prepared to lead the corporate world in the 21st century. The IBE Program is offered jointly by RCEAS and CBE.

After four years and a minimum of 137 credits, students receive a single Bachelor of Science Degree in Integrated Business and Engineering. This program meets the accreditation standards of the AACSB (American Assembly of Collegiate Schools of Business, the organization that accredits business degrees). Students enrolled in the program in satisfactory standing are able to transfer to a dual–degree program at any time and still stay within the honors program cohort. With an additional semester or two of study in the dual–degree program, the student may obtain a second BS degree in an engineering or business program. The additional time necessary to complete the second degree depends on the curriculum selected and the number of advanced placement credits. The number of additional credit hours is typically in the range of 20–30 or between one and two semesters.

The IBE program’s initial matriculating class entered Lehigh as first–year students in the fall 2000 semester. The size of each year’s cohort normally ranges from 40–50 students. In 2006 and 2007, the average SAT of admitted first–year students has been 1417 and 1431, respectively.

5.III.C.2 Learning Objectives: Evaluation, Analysis and Action
The IBE program has six learning objectives outlined below. For each objective, the program faculty has developed a set of evaluative methods and a feedback process through which the evaluation results affect decisions about content or pedagogic methods.

Learning Objective 1: IBE seeks to provide students with a mastery of concepts and procedures taught in courses from traditional areas in each college, including math and science (33 credits), business and economics core (32), engineering core (20), humanities and social science (16).

- Evaluation: This objective is evaluated primarily via grading on examinations, projects and lab assignments as deemed appropriate by the respective individual course faculty.
- Analysis and Action: IBE relies on the individual course faculty to make changes to their course’s pedagogy where appropriate.
Learning Objective 2: IBE seeks to provide students with the ability to make decisions related to technology, product and process development, in a way that combines technical, financial, marketing and strategic dimensions.

- Evaluation: The IBE Freshman Workshop and the IBE Capstone Project I and II courses are all based on projects that require students to develop either a technology, or a product or process that involves technical, financial, marketing, and strategic decisions.

- Analysis and Action: The IBE Freshman Workshop and the IBE Capstone Project I and II courses involve considerable participation by sponsoring businesses. These real-world professionals provide a portion of the final assessment by helping to evaluate student projects and providing comprehensive feedback. In addition, all three courses end with a “tiger” session in which the student teams need to present their business plans to an independent panel of experts trained to evaluate actual entrepreneurial proposals. An acid test of whether IBE is meeting this objective is measured by the acceptance of the business plans by the panel of venture capital experts. Another method of measuring whether IBE is satisfying this learning objective is the continual evaluation by Professors of Practice Pat Costa and Lisa Getzler–Linn who have developed considerable practical experience in the field of innovation, having supervised student innovation courses for many years. Following each project cycle, the IBE Co-Directors meet with Costa and Getzler–Linn to make changes to the courses where necessary. The pedagogy of the Capstone Project courses has been changed each of the past four years.

Learning Objective 3: IBE seeks to provide students with the ability to make design decisions based on related to target costs and forecasted rates of return on capital.

- Evaluation: The IBE Freshman Workshop and the IBE Capstone Project I and II courses are based on projects that require students to make design decisions based on target costs and forecasted rates of return on capital. In addition, the IBE Sophomore Lab, using a series of four small projects, and the IBE Junior Lab, using a semester-long simulation game, require student teams to make design decisions based on target costs and forecasted rates of return on capital.

- Assessment and Action: See Learning Objective 2 for a description of assessment and action as they relate to the IBE Freshman Workshop and the IBE Capstone Project I and II courses.

The IBE Sophomore Lab is a project-oriented course with evaluation being made by four different members of the Lehigh faculty. The four instructors (currently including the Dean of the RCEAS at Lehigh, the former Director of Corporate Finance at Hershey Foods and a Lehigh finance faculty member, the director of Lehigh’s Iacocca Institute and former Lucent executive, and a middle manager from Ingersoll–Rand and currently a Penn State doctoral candidate) evaluate the student projects and they, in turn, are evaluated by the IBE Co-Directors using student exit interviews. The IBE Co-Directors makes changes to the instructor line-up and projects based on this student feedback.

The Junior Lab is a computer simulated, competitive game, evaluated by one faculty member (currently Chair of the Department of Industrial and Systems Engineering) based on the relative amount of “profits” earned by each team. Again,
the IBE Co–Directors make changes to the course and its game based on feedback from exit–interviews. Each year, the game has been improved by remedying different shortcomings in the underlying software.

**Learning Objective 4:** IBE seeks to provide students with the ability to perform economic analyses for new products, technologies and processes.
- **Evaluation:** The IBE Freshman Workshop and the IBE Capstone Project I and II courses are all based on projects that require students to perform economic analyses for new products, technologies and processes.
- **Assessment and Action:** See Assessment and Action for Learning Objective 2.

**Learning Objective 5:** IBE seeks to provide students with the ability to prepare detailed business plans that include financial as well as operational details related to the production cycle.
- **Evaluation:** The IBE Freshman Workshop, the IBE Junior Lab and the IBE Capstone Project I and II courses all are based on projects that require students to prepare detailed business plans that include financial as well as operational details related to the production cycle.
- **Assessment and Action:** See Learning Objective 2 for a description of assessment and action as they relate to the IBE Freshman Workshop and the IBE Capstone Project I and II courses and the final part of Learning Objective 3 for a description of assessment and action as they relate to the IBE Junior Lab.

**Learning Objective 6:** IBE seeks to provide students with the ability to communicate effectively both orally and in writing.
- **Evaluation:** All IBE students are required to take Comm 130/160 Public Speaking. In addition, all of the integrated IBE courses involve written projects and several oral presentations. Assisting the course instructors in the evaluation of the presentations is a faculty member from Lehigh’s Department of Communications.
- **Assessment and Action:** At end of each year, the IBE Co–Directors and the communications faculty member meet to discuss if the students are able to communicate effectively in their presentations. Recently it was decided to have the communications faculty member offer a number of workshops to prepare the students for the presentations. A subjective evaluation is made of the progress the students make in their written work and oral presentations from the Freshman Workshop to the Capstone Project courses. Having the Communications instructor give mandatory workshops and having her critique “dress rehearsals” of the presentations are both direct results of the end of the course evaluations.

### 5.III.C.3 Additional Assessment and Action

The IBE Council, consisting of roughly three students from each cohort group chosen by their peers, also participates in the program’s assessment. IBE students, by their nature, are very high–achieving and demanding of themselves and their academic courses and programs. If the IBE Council feels a particular course is not meeting its (and their) objectives, they are very vocal about it. Naturally the Co–Directors take the Council’s views into account when making changes to the integrated courses. Examples of student feedback that produced significant changes to the integrated courses include
1. Freshman Workshop: Varied the chosen industry each year and allowed students to design and prototype their own products rather than reverse engineer existing products.
2. Capstone Design Project: Switched from large companies to smaller start-ups to allow for more integration of the business and engineering aspects of Learning Objectives 1–5.

5.III.D Integrated Product Development (IPD)

5.III.D.1 Program Overview
The Integrated Product Development (IPD) focuses on technical entrepreneurship through experiential learning. The program uses the new product development process as a means to the end of preparing Lehigh students to lead companies in innovation, creativity, and the commercialization of intellectual property. IPD’s mission is to develop and promote a truly cross-disciplinary entrepreneurial environment and culture at Lehigh.

The IPD Capstone courses are the culmination of student experiential learning where they work in cross-disciplinary teams with faculty and graduate student mentors, as well as with mentors from both established and local start-up companies. These industry-sponsored partnerships form the backbone on which IPD establishes the interdisciplinary teams and the undergraduate and graduate curricula focused on experiential learning through industry projects. The award-winning IPD program is now in its 12th year with more than 250 industry-sponsored projects and more than 1,000 student participants. Each year, IPD offers this two-course sequence for a total of 5 or 6 credits that are listed under engineering, business, and design.

5.III.D.2 Learning Objectives
After completing the IPD Capstone Project course sequence, students should be able to:
- Work effectively on a cross-disciplinary project.
- Understand technical entrepreneurship through the product realization process.
- Participate in and lead a product development team.
- Effectively communicate through oral, written, and graphic presentations.
- Understand engineering design in a broad global business and social context.
- Understand aesthetics and ergonomics issues in product development.
- Develop a business case for a product under development.
- Perform basic technical and financial feasibility studies.
- Manage a team project including people and time resources.
- Apply analytical, computer, and physical modeling to engineering and business problem solving.

5.III.D.3 Measuring Attainment
Given that objective measures are not readily available and considerable time is needed to fully evaluate attainment of course objectives, it is difficult to assess the experiential learning process. This problem is perhaps exacerbated in team-based product development courses, where a large part of the learning is unstructured, and the body of knowledge students are expected to learn varies. As a result, IPD has developed assessment techniques to evaluate the learning that occurs during the IPD Capstone Project course sequence.
The tools used to assess a student’s performance should represent all meaningful aspects of that performance as well as provide equitable grading standards. What are the “Grade–able” moments? Which are the appropriate assessment tools for each segment of the technical entrepreneurship/product development process? What about a student’s understanding of the underlying process and their willingness and ability to immerse themselves in the entrepreneurial/product development “journey”? IPD has developed a toolset of seven rubrics to address this need (Appendix 5.37). The rubrics change from semester to semester as the instructors adapt the rubrics to the projects, but the deliverables remain the same.

Grade–Able moments captured through the use of rubrics are:

- Tackboard #1 and #2
- Individual Lab Notebook
- Poster/Poster Presentation
- Individual Contribution to Team Effort
- Oral Presentation
- Written Report

In order to conduct a 360–degree program assessment, IPD requires self, peer, and course/faculty/facility evaluations from students, and exit questionnaires from project sponsors. Additionally, focus groups are held each spring as a follow up to the previous year’s projects.

5.III.D.4 Feedback Mechanism

At the one–third and two–thirds points of each semester, the faculty advisors of each IPD team review the team tackboards, notebooks, and peer evaluations in order to more fully understand the team’s dynamics and evaluate their performance. At the end of each semester, individual grades are tabulated based on team and individual performances, as assessed by the rubrics. The IPD course leaders use the overall team/individual grades, and self, peer, and course evaluations to determine what changes are needed to improve the student experience in the upcoming semester. At the end of the two–semester Capstone Project course sequence, the course leaders hold a two–day retreat to review and evaluate the data collected from all assessments. This portfolio of data includes grades, course artifacts, questionnaires and focus group transcripts and is used to determine the course of action necessary to continuously improve the IPD experience.

IPD maintains files of all assessment instruments. Programs that use IPD’s project courses as their capstone experience are invited to harvest whatever information they need to fulfill their department or program assessment requirements.

5.III.E Music

5.III.E.1 Program Overview

The Music Department at Lehigh offers two degrees: a Bachelor of Arts in Music with concentrations in Composition/Theory, Performance, Jazz Studies, Conducting, and History, and a Bachelor of Arts in Music Composition. The Department has 20–25 majors at any given time and is most successful preparing students for entrance into highly regarded graduate programs in music composition. A smaller number of history, jazz studies, and performance majors also continue study in graduate school. Much of the Department’s
effort, however, is devoted to providing a rich learning and performance experience for Lehigh students who love music but are not planning a career in the arts.

A fundamental element of the Department’s educational philosophy is that the skills students learn during musical activity generalize to all of their academic and vocational pursuits. For both majors and non–majors, the Department provides a wide range of ensemble and individual instruction. There are four department–sponsored choral groups, a complete symphonic orchestra, two jazz ensembles, two wind ensembles, a marching band, a contemporary music ensemble, classical and jazz chamber music groups, and private instruction in all instruments and voice. Together these provide an opportunity for more than 600 Lehigh students to participate in University sponsored music performances during each academic year. The department produces more than 40 concerts a year, making a significant contribution to the cultural life of the campus and the broader community.

The Music Department’s mission statement reads: “…to instill a love for music, to foster the discipline it requires, to promote musical literacy and to develop creativity.”

5.III.E.2 Learning Objectives
Because the music department services so many different kinds of students, its learning objectives for each subset of student are spelled out separately. Music department majors have a choice of five concentrations or the composition major. Also included are learning objectives for the minor program in Music Industry and for non–majors who participate in the department’s ensembles and programs. These learning objectives are outlined in Table 5.3.

Table 5.3: Music Department Learning Objectives

<table>
<thead>
<tr>
<th>All music majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• a strong foundation in music theory at a level required for admission to graduate school</td>
</tr>
<tr>
<td>• substantial exposure to Western music from the Middle Ages to the present in historical context</td>
</tr>
<tr>
<td>• meaningful public performance experience on an instrument or using the voice</td>
</tr>
<tr>
<td>• appreciation of fine performance as a result of attendance at top level concerts given through the Music Department and the Zoellner series</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Composition/theory concentrators or composition majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• experience in writing music in standard Western forms before the 20th century</td>
</tr>
<tr>
<td>• exposure to common twentieth–century compositional techniques</td>
</tr>
<tr>
<td>• knowledge of orchestration for all standard Western instruments</td>
</tr>
<tr>
<td>• produced idiomatic writing for solo instruments, chamber music groups, and symphonic orchestra</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jazz studies concentrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>• knowledge of the basic jazz repertoire</td>
</tr>
<tr>
<td>• fluency in all the major jazz styles both in small and large ensembles</td>
</tr>
<tr>
<td>• the ability to improvise coherently</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vocal performance concentrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>• proficiency in singing in the four major languages with exposure to peripheral languages</td>
</tr>
<tr>
<td>• exposure to repertoire from the Baroque to the present</td>
</tr>
<tr>
<td>• public presentational skills</td>
</tr>
<tr>
<td>• proper vocal technique in terms of sound, intonation, rhythm, and expression</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instrumental performance concentrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>• exposure to repertoire from instrument appropriate musical eras</td>
</tr>
</tbody>
</table>

• solid technique to allow for good intonation, reliable rhythm, clean articulation, beauty of tone, and musical expression
• learned proper maintenance of instrument and accessories
• public presentational skills
• skill in performing with others in small and large ensembles

**Conducting concentrators**
• basic conducting technique for both choral and instrumental ensembles
• score sight-reading and analysis skills
• broad knowledge of Western art music literature
• direct experience preparing and presenting concerts

**Music industry minors**
• knowledge of career choices in the music industry often overlooked
• fluency in music, business and technical language
• direct familiarity with the music industry through an internship with a major music industry

**Non–majors**
• exposure to a varied and broad array of Western art music through performance and concert attendance
• increased proficiency in individual performance in voice and/or instrument as well as heightened ensemble playing skills
• a respect for the discipline and commitment it takes to perform and write music

5.III.E.3 Measuring Attainment
The Music Department has several unique modalities for assessing how students are fulfilling learning objectives.

1. **Recitals:** One of the concentrations in the music major is “performance.” All performance majors are required to perform a half recital (approximately 30–40 minutes) as a junior and a full recital as a senior. Three faculty members including the student’s primary teacher attend the recital, write comments, and assign a grade. These assessments are shared with the student and the rest of the department. Of course, and this is the case with almost everything in the Music Department, there is the larger “assessment” by the public attending the concert. Feedback includes, as a witty staff colleague quipped, the “applauseometer,” but also the usual informal critiques that happen after any concert.

2. **Juries:** Every student taking private lessons in instrument or voice (about 325 per semester) has an end-of-the-semester jury where the entire faculty in that instrument (or related instrument) or voice hears each student perform a brief piece. The student receives comments, and faculty then has a chance to assess the effectiveness of instruction and learning. Oftentimes, for example, the “woodwind” faculty hears all the woodwinds, or the entire piano faculty hears all the pianists.

3. **Noon recitals:** Each semester, the Music Department devotes four noon hours to public performance by students taking private lessons. This is not required of each student, but it is a mechanism for both evaluation by the teacher and the public.

4. **Master classes:** Some private instructors will have a master class each semester where all students in their studio play for each other and receive comments from both the teacher and their peers.

5. **Concerts at Lehigh:** The most tangible and traditional way of assessing the learning that takes place in the large curricular and co-curricular ensembles is public performance. All of the department’s large ensembles give at least one (and often more) concert
each semester. At least one senior faculty member who is not the director of the
ensemble attends each of these concerts to evaluate the effectiveness of the
instruction and the achievement of the students. Some of these concerts are
reviewed in the local press, and, of course, copious informal feedback comes from
the “applauseometer” and from audience members.

6. **Concerts of Music by Student Composers:** At the end of each academic year, the
department’s largest cohort of majors (composers) has a concert at which the Lehigh
University Philharmonic plays orchestra pieces written during the year and other
performing groups play any creation of new music by senior, College Scholar, or
independent study project students. This is a chance for both professorial and public
evaluation of the music being created by students.

7. **Concerto Competition:** Each year, advanced Lehigh student performers choose to
compete for the opportunity to play a concert with the Lehigh University
Philharmonic at its April concert, making it another way to assess the performance
skills of advanced students.

8. **Concerts outside of Lehigh:** the department’s largest and best student ensembles (Choir,
Philharmonic, Jazz Ensemble) regularly tour within and outside the United States.
Their reception and the outside venue’s willingness to have them back are indicators
of quality. Similarly, student groups often are asked to play at University functions
and local community events (e.g., First Friday). As with performances in other
venues, the reception the student performers receive, as well as repeat offers for
performance, are indicators of their proficiency and artistry.

9. **Student awards:** Each ensemble has a set of awards given to students for meritorious
performance as a leader or as a musician. In addition, the Braddick Prize is a
composition prize used to acknowledge outstanding achievement in writing music.
There also are Williams Prizes designed to honor musical performance and
composition that includes text.

10. **Exit interviews:** Every graduating major is asked to fill out a written exit interview and
then sit down with the Chair of the Department to discuss the responses given in the
document.

11. **Informal feedback:** Because much of the instruction in the Music Department is very
personal and requires considerable contact time in rehearsals, in the private studio, or
on tour, students often form strong bonds with their faculty mentors. As a result,
feedback about the success of a program or the teaching ability of a colleague tends
to be shared rather freely on an informal basis.

**5.III.E.4 Feedback Mechanism**

Since much of what is learned in both a curricular and co–curricular fashion in the Music
Department happens in public performance, the department has installed a system that
insures that at least one senior professor attends each student ensemble concert, and, if that
attendee is not the Chair, he/she reports back to the Chair on the quality of the
performance. All students in performance ensembles, whether taking that ensemble for
credit or not, have an opportunity to evaluate the learning experience in that ensemble.
Faculty observation plus the feedback received from student evaluations give the
Department a good sense of how each performance ensemble is progressing. Those reports
and evaluations are part of the evidence the Chair uses in merit evaluations and annual
reviews, and as such, are important elements in the conversations the Chair has with each
ensemble director during the review process. Those conversations are the department’s most
consistent mechanism for guiding changes both in curricular and co–curricular activities. Once every 10 years, the Music Department has a daylong retreat where it reexamines its mission statement and the progress of curricular and co–curricular activities. Since the department has expanded so quickly in recent years, it is thought that it would benefit greatly from making these retreats more frequent.

5.III.F  Athletics

5.III.F.1 Overview
Lehigh University has had a long athletics tradition. The Department of Athletics was most recently certified in 2007 through the NCAA Self–study Second Cycle (Appendix 5.38). This review incorporates a thorough and comprehensive study of all areas of intercollegiate athletics and is a standardized requirement of membership within the NCAA Division I program.

Lehigh University Athletics currently has 25 varsity sport programs and approximately 650 student–athletes participating per year. The breakdown reported in the 2005–2006 EADA (Equity in Athletics Disclosure Act) Report was ~57% men and ~43% women (Appendix 5.59). The men’s programs have a tradition as long–standing as that of the University. The addition of women to the University also opened the doors for the incorporation of women’s athletics. Lehigh athletics consistently remains a top program among its peers in graduation rates and is honored annually by the recognition of many of its student–athletes at all levels of competition.

In addition to varsity programs, Lehigh incorporates intramurals and club sports within the athletics department. Participation rates (~60%) for intramurals remain higher than the national average (35%–50%). Recently, there were approximately 100 scheduled intramural contests and 300 club contests each year.

Lehigh Athletics focuses its mission and programs on the ideals of inspiring the true student–athlete. It is important that Lehigh provide an athletic experience that helps a student learn and grow toward distinction, graduation, and a future beyond the University.

5.III.F.2 Learning Objectives
The learning objectives in athletics are broadly encompassed in four guiding department documents that include the Mission, the Vision, the Values, and the Challenges/Priorities (Appendix 2.25, 2.27, 2.26, and 5.40). The objectives are also communicated in the Student-Athlete handbook (Appendix 5.41). The following is a summary of the key objectives distilled from the department’s guiding documents.

Student–athletes who participate in Lehigh intercollegiate athletics programs should achieve:

• An understanding of, and a capacity to exercise, leadership.
• An appreciation for evidence of a commitment to serving others.
• The capacity and will to function effectively as a member of a team.
• The capacity and will to exercise self–responsibility in academics, athletics, and social life.
• A commitment to ethical behavior (honesty, integrity, good sportsmanship).
• A strong desire and the emotional capacity to compete, but also the emotional capacity to win with humility and lose with dignity.
• An understanding and awareness of, and the perspective necessary to, embrace humility, diversity, and loyalty as enriching personal values.
• The desire to sustain an active lifestyle, a commitment to good health and nutrition, and the ambition to promote involvement in sports as part of Lehigh’s educational and learning systems.

5.III.F.3 Measuring Attainment
The Department’s assessment and feedback are driven by trying to provide the best experience for student-athletes (varsity, club, and intramural) through constantly reviewing and changing programs to meet their needs. The fundamental assessment goal is to “evaluate our effectiveness by assessing achievements relative to potential, personal growth of participants, and levels of involvement, support, and fulfillment.” The reviews entail a portfolio of approaches and activities:

• The NCAA Self-Study, a decennial process that evaluates plans, improvements, and many areas on a long-term basis.
• Specific metrics are reviewed and used as discussion points for meetings and program plans. The metrics include retention and graduation rates, academic performance data, competitive results, service records, and honors and achievements.
• Each program (whether an administrative program or a sport) creates an annual Program Plan that includes priorities, goals, measurements, assessments of personal growth, and yearly assessments from program reviews, meetings, and performance appraisals.
• Regular meetings throughout the Department provide opportunities to review activities. These include full department meetings; Student-Athlete Council meetings; Faculty Athletics Council meetings; Administrative, head coach, and support staff meetings; and committee meetings (e.g., administration, facilities, events, awards).
• “Game day experience” provides a “test” (for the team and individuals) to meet many goals (e.g., critical thinking, communication, self-discipline, leadership).
• Feedback from faculty, campus staff, parents, community members, and employers.
• Student-athletes provide formal feedback in a “Perceptions of the Head Coach” survey at the end of every season.
• Senior Exit Survey (written instrument).
• Senior Exit Interviews, conducted by the Athletic Director or Assistant Athletic Director.
• Fulfillment of and loyalty to objectives are evaluated by exit interviews as well as through alumni involvement levels.
• Meetings with coaches for goal setting and a season wrap-up enable head coaches to regularly assess each student-athlete on a bi-annual basis.
• Because Athletics coaches and administrators spend an extensive amount of time traveling, at practices, and at the office working with student-athletes, informal meetings occur at any time and provide information that is shared freely and used in further planning.

9 Lehigh University Athletics Department, Mission Statement, Appendix XX
5.III.F.4 Feedback
The Athletics Department has program reviews, performance appraisals, and program planning, which includes perception surveys from student–athletes and administrators, student–athlete senior exit interviews, game day experiences, and assessments made during meeting discussions and other venues.

Senior administrators in the Department review all assessments and help make sure formal discussions take place (group settings, individual) where applicable, and that the assessments are included in planning documents where needed.

In addition, department meetings include feedback from the review and summaries of assessments (summary of senior exit interview surveys, summaries of NCAA Self–study, and discussion summaries). These meetings include full department meetings and weekly and monthly committee meetings.

5.III.G Study Abroad
5.III.G.1 Program Overview
Lehigh University is devoted to the principle that international education is necessary in today’s global society. The Study Abroad Office is committed to providing quality study abroad programs that offer academic environments, immersion in host cultures, and opportunities for personal growth. Students should return to Lehigh with an enhanced ability to appreciate global concerns.

Lehigh faculty members have reviewed and approved more than 60 programs in more than 50 countries in order to provide the highest quality educational opportunities inside and outside the classroom. Each partner program/university provides academic opportunities that fit with Lehigh majors and minors, and allow for a high degree of integration into local culture and life.

Since 2000, the total number of Lehigh students studying abroad has risen 45%, from 286 students in the 2001–02 academic year to 416 students in 2006–07. Of the most recent 416 students studying abroad, 166 participated in a semester–long study, while 250 studied on a Lehigh faculty led program during the winter break or summer. The highest concentration of students studying abroad (77%) was in Western Europe, while 9% studied in Asia, 6% in Latin America, 5% in Oceania (Australia and New Zealand), and 3% in Africa. Of the 2006 University graduating class, 25.6% have studied abroad.

During the spring 2007, a committee of faculty and staff produced an extensive report, “Getting to Global Lehigh,” that laid out a series of comprehensive recommendations to build a more globally aware culture at Lehigh (Appendix 5.42). Implementation of those recommendations is expected to result in significant increases in the numbers of students taking some form of study abroad experience. Accordingly, it is anticipated that there will be changes in policies and procedures relating to study abroad and an even greater need to assess program effectiveness and the attainment of learning objectives.

5.III.G.2 Learning Objectives
Education abroad programs available to Lehigh students vary widely in their nature, goals, academic foci, and duration. Lehigh runs and thus controls some programs completely, while others are not controlled at all. Thus, learning objectives vary substantially.
In general, Lehigh expects that students who have studied abroad, whether through Lehigh–led programs, programs provided by third parties, or direct enrollment at an institution in another country, should be able to

- Demonstrate discipline–specific learning (through tests, papers, projects, and/or other graded assignments).
- Appreciate a field of study in its host–country context.
- Appreciate the context of the host country, including cultural, political, social, economical, and where appropriate, linguistic aspects of host country.
- Return to Lehigh with an enhanced ability to appreciate global concerns.

In addition, Lehigh expects students who have studied abroad on Lehigh–led programs should be able to develop confidence in their own abilities and resilience, particularly with respect to career orientation and careers in a global context.

5.III.G.3 Measuring Attainment
Upon return from abroad, all students, regardless of the program they attend, are sent a comprehensive survey–evaluation, which includes questions about co–curricular and extra–curricular experiences, as well as questions about their level of engagement in internationally oriented activities, and opinions about global citizenship. In general, assessing the experiential learning process is difficult because objective measures are not readily available, and the programs vary widely in their scope, duration, and goals.

Many Lehigh students enroll in universities abroad where academic systems and assessment methods are quite different. The purpose of survey–evaluations in these cases is not to scrutinize the particular classes students take but to inform Study Abroad staff and the Study Abroad Faculty Policy Board of the experiences and opinions of individual students and to identify particular perceived strengths and weaknesses of host institutions. The survey–evaluation results aid staff and faculty in their reviews of programs and in advising prospective study abroad students.

Students who study abroad on Lehigh–run programs are asked about aspects of program functioning, to assess program effectiveness. Professors are expected to assess content learning abroad in ways that are similar to on–campus methods.

Whether on Lehigh–run or non–Lehigh–run programs, the rate of return of surveys varies dramatically from program to program, term to term, but is generally below 50%. Completion of survey–evaluations is not mandatory, and student identities are not tracked. Frequent organizational change and resource (staff) constraints in Study Abroad make the collection of survey–evaluations a challenge, and indeed, data have only been collected consistently for four years. Besides having the resources to carry out data collection, the office requires appropriate training and expertise on the part of those administering survey–evaluations, as well as a clear purpose for the use of data.

Informal data collection occurs through

- Exit interviews, which are conducted sporadically, generally in cases where students feel compelled to share information about their experiences (whether positive or negative, and whether on Lehigh–run or non–Lehigh–run program). The best predictor of whether an exit interview will be conducted is the strength of the relationship a student has with a member of the Study Abroad staff prior to participation in a program.
- *Faculty focus groups*, which are conducted sporadically to gauge faculty satisfaction with the level of support and service provided by Study Abroad, as well as satisfaction with student selection and other processes.
- *Internship host site commentary*, which allows faculty to more fully understand the strengths and limitations of internship host sites, as well as the students they place.

### 5.III.G.4 Feedback Mechanism
Study Abroad maintains files of all student survey/evaluations and sends aggregate surveys/evaluations to faculty program directors. Study Abroad Office and faculty program directors use student feedback to design courses, trainings and orientations, and other offerings, which improve student experiences inside and outside the curriculum. In the case of non-Lehigh-run programs, Study Abroad uses student feedback in advising prospective study abroad students.

Informal data collection has led to faculty training on specific topics/issues and a crisis prevention and communication plan. Exit interviews have led to enhancements in advising, as well as changes in content delivered in pre-departure orientations.

### 5.III.H Lessons Learned
Table 5.4 summarizes salient features of the student–learning assessment processes for the programs reviewed in this section. In particular, the first three columns highlight the different means adopted by the programs to achieve similar ends.

1. **The assessment of student learning is not a “one size fits all” process. It is critical to allow activity– or program–specific characteristics to determine the method of assessment that occurs.**

   It is critically important to acknowledge the differences in the fundamental natures of varied programs and to allow these differences to mold the measures that are employed to assess student learning. A striking example of this lesson presents itself in the assessment practices employed in music. Those practices derive from the music profession itself. The use of recitals, juries, and the market measure of “repeat offers for performance” are natural methods to assess learning by students of music.

2. **The assessment of student learning will never accomplish its purpose if it is imposed as an under–resourced mandate.**

   The assessment of student learning cannot be accomplished in a meaningful way without substantial investment of time and energy. Perhaps the most striking example of this comes from Lehigh’s Athletic Department. In addition to using “Perceptions of the Head Coach” surveys by all team members at the end of every season, the Athletics Department administers a written survey instrument to every graduating student–athlete and follows this up with an individual exit interview by either the Athletic Director or the Associate Athletic Director. These surveys and interviews constitute a time commitment by the two senior administrators in this department of 30–40 hours each May.

3. **Program assessment is best accomplished by the involvement of individuals beyond the instructors with primary responsibility for individual courses.**
While individual course instructors, music mentors and athletic coaches can – and at Lehigh do – engage in a careful evaluation of student learning in their respective roles, the assessment of student learning in activities that are cross-disciplinary, team-based, and experiential learning requires the active involvement by third parties. The music department requires that three faculty members (including the students’ primary teacher) attend the recital, write comments, and assign a grade. The IBE, IPD and CSB programs proactively involve Professors of Practice who have experience in business and engineering in the assessment of team projects. The Director and Associate Director of Athletics conduct the exit interviews for graduating student-athletes.

4. There is no substitute for direct and candid personal input by students in the assessment of learning.

The best way to assess how much students learn is to talk to them. As detailed in the individual summaries above, all six of the programs studied engage in this to varying degrees and its importance is manifest. In some programs, informal interactions with students are so extensive that they also take on a critical role.
### Table 5.4. Summary of Student–Learning Assessment Processes

<table>
<thead>
<tr>
<th>Comprehensive Evaluation</th>
<th>External Input</th>
<th>Student Input</th>
<th>Feedback Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CSB</strong></td>
<td></td>
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</tr>
<tr>
<td>Instructors of all courses in CSB program submit self–study reports annually to CSB Curriculum Committee</td>
<td>Interviews with Capstone project sponsors by program's Professors of Practice</td>
<td>Exit interviews of graduating seniors by program co–directors</td>
<td>The curriculum committee makes specific recommendations to each course instructor, the department, and Co–Directors of the CSB program on an annual basis</td>
</tr>
<tr>
<td><strong>IBE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IBE Freshman Workshop; Capstone Projects I &amp; II</td>
<td>Sponsorship and evaluation of these by businesses; evaluation of these by Professors of Practice Costa &amp; Getzler–Linn</td>
<td>Exit interviews by Program Directors for Sophomore Lab; IBE (student) Council</td>
<td>The IBE Co–Directors meet at least once each year with course instructors and outside evaluators for each of the program's curriculum elements. These meetings have led to annual changes in key components of the program's curricular structure</td>
</tr>
<tr>
<td><strong>IPD</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>360 degree assessment protocol includes student performance and program efficacy</td>
<td>Exit interviews by project sponsors; sponsor project review 4 times annually; external faculty review twice annually</td>
<td>Peer evaluations 6 times annually; end of semester (written) survey twice annually; focus groups once a year</td>
<td>At the end of the two–semester Capstone sequence, the course leaders hold a two–day retreat to review and evaluate the data collected from all assessments. This portfolio of data includes grades, course artifacts, questionnaires and focus group transcripts; and is used to determine the course of action necessary to continuously improve the IPD experience.</td>
</tr>
<tr>
<td><strong>Music</strong></td>
<td>Ensembles (choir, jazz, philharmonic)</td>
<td>Recitals, concerts, juries, competitions</td>
<td>Peer evaluations, written exit interview for all senior music majors followed by discussion with Department Chair about responses given.</td>
</tr>
<tr>
<td><strong>Athletics</strong></td>
<td>NCAA Decennial Certification Self–study Report</td>
<td>NCAA Decennial Certification; game day experience; Faculty Athletics Council; game day Fans; alumni; other University staff</td>
<td>Student Athlete Council; &quot;perceptions of Head Coach&quot; annual survey; Senior (written) Exit Survey; Individual exit interview of every graduating senior by Athletic Director (AD) or Assistant AD; informal interviews/goal meetings</td>
</tr>
<tr>
<td><strong>Study Abroad</strong></td>
<td>Lehigh–run program evaluation summaries sent to faculty program directors</td>
<td>Topic–specific focus groups with Lehigh faculty–led program directors (e.g., crisis plan development; supports &amp; services development); trainings delivered by topic–area specialists (e.g. Risk Management, Counseling Center, Academic Support Services, etc.); Feedback from some programs' internship hosts</td>
<td>Program surveys &amp; evaluations; selected exit interviews</td>
</tr>
</tbody>
</table>
5.IV  Findings and Recommendations

Lehigh is well poised to become a culture of inquiry and evidence about student learning. Learning is central to Lehigh’s mission, and all faculty members are engaged in teaching. In most programs, faculty members are clear about what they expect students to learn and have explicit student–learning outcomes. Many programs have adopted explicit methodologies for probing and demonstrating the extent to which students achieve the learning objectives set for them and for using the resulting information to make decisions about course content, pedagogy, or other aspects of the program. In addition, the University has set student–learning objectives for co–curricular programs (e.g., athletics, study abroad, Student Affairs) and assesses against those objectives. Lehigh also is committed to assessing technology support for student learning and to using the results to guide faculty development programming and technology adoption (Chapter 4).

Purposeful effort and specific commitments will, however, be required to achieve the goal of an institutional culture that expects and values assessment. While student–learning assessment is nearly ubiquitous at the course and program level, documentation and regularization of the processes are inconsistent and often incomplete, especially the processes of using assessment results in making decisions about programs, their objectives, and their means of ensuring attainment of objectives. Furthermore, only the College of Business and Economics has a plan for assessing student–learning outcomes at the College level, spanning all of the programs in the College. There is no plan for the institution.

1. The findings of the investigation of student–learning assessment (Standard 14) parallel the findings on institutional assessment (Standard 7), which are reported in Chapter 2 (Section 2.II.F). Within Lehigh’s decentralized planning and resource–allocation culture, programs have responded to external stimuli for student–learning assessment (e.g., accreditation) or their own motives to examine the achievement of learning outcomes. The opportunity is at hand to establish an overarching institutional program consisting of appropriate, transparent, and widely understood expectations for developing learning outcomes at all levels, assessing attainment of learning outcomes, and using assessment results to inform academic decision–making.

Recommendation: Develop a University–wide, sustainable process that integrates and documents unit–level educational mission, student–learning objectives, and assessment of learning outcomes for undergraduate and graduate students. The structure of the process should be visible, and documentation should be readily available to demonstrate the existence of the program, its findings, and its recommendations for change.

Recommendation: Develop a streamlined and thoughtful approach to assessment that combines administrative leadership for institutional assessment and faculty leadership on student–learning assessment. While different needs and sets of outcomes warrant different assessment methodologies or approaches, the overarching institutional view of assessment should be unified and hold consistent expectations for assessment across all activities.
2. The University also lacks an institutional vision for student–learning outcomes or outcomes assessment, and the absence of a coherent institutional strategic planning process, noted in Chapter 2, is a significant contributing factor to that lack of vision. Each of the programs discussed in Section 5.III referred to a disconnect between program–level student–learning assessment and methods for continuous improvement and institutional strategic planning, which should be informed by or take into account the realities of student learning.

Recommendation: While implementing the recommendations from Chapter 2 for an overarching institutional planning process that ensures ongoing integration of unit plans, include (1) student–learning assessment as a planning element that warrants prioritization against other elements as well as consideration in resource–allocation decisions, and (2) what is learned from student–learning assessment as a source of input for planning and resource–allocation decisions.

3. An effective and sustainable approach to student–learning assessment will require adequate resources, including funds as well as faculty and staff time. Funds will be needed, for example, to manage documentation and surveys and to secure the assistance of external reviewers. Faculty time is needed to set and prioritize the objectives, execute the assessments, and evaluate the results. Staff time is needed to collate documents, coordinate processes, and support faculty development. In addition to the resource needs, if assessment of student learning is a category of faculty effort that the University values, it must be recognized adequately in faculty merit, tenure, and promotion processes and taken it into account as a regular component of every faculty member’s workload.

Recommendation: When developing plans for assessment processes, make realistic appraisals of resource needs and give explicit attention to budgeting appropriately to meet those needs.

Recommendation: Deans, department chairs, and faculty members should work together to develop transparent processes for recognizing faculty effort to develop and implement student–learning assessment methods.

4. Student–learning assessment has two fundamental purposes. Its primary purpose is to foster improvements in student learning, but it also serves the purpose of demonstrating to stakeholders that students learn what the University claims to teach. Lehigh’s ethical standards should preclude assessment practices that do not provide information that faculty can use to improve courses or curricula (assessment for the sake of assessment). In addition, elements of a portfolio that demonstrates student–learning attainment should be selected very carefully to correspond to high–priority outcomes at the program, College, or University level and to resonate strongly with the intended design of the curriculum.

Recommendation: Engage faculty members in student–learning assessment to meet their needs in monitoring and improving their courses and curricula and in identifying the elements of student learning that Lehigh needs to demonstrate to
stakeholders. Also, consult appropriately with stakeholders to ensure that the elements selected for demonstration are aligned with their interests and priorities.

5. This chapter demonstrates that Lehigh faculty and staff have developed numerous successful models for student–learning assessment in a wide range of settings. Those faculty and staff members are a valuable resource for faculty in other units as they develop their own discipline–appropriate methods and for faculty working to establish College– and University–level processes. They also can speak to the value of learning assessment in advancing student learning and serve as advocates while helping to disseminate best practices.

*Recommendation:* Call on faculty and staff with learning–assessment experience to facilitate development of new learning–assessment processes, using the lessons learned during the development of processes, as cited in this chapter. In doing so, remain mindful of the different assessment needs in different settings and focus on adopting methods that are appropriate to the needs.

6. There are significant outcomes of a student’s Lehigh experience that should be assessed after graduation. This issue is important for liberal learning goals, which is found in nearly all curricula and which reference intellectual skills and developmental competencies that transcend disciplinary boundaries. It also is important for discipline–specific and professional learning goals that link to needs for work–related competencies.

*Recommendation:* Engage faculty members, Student Affairs staff, Career Services staff, Alumni Association staff, and Institutional Research staff in a process to plan for periodic alumni and employer surveys designed to assess attainment of goals for students.