Program Self-Study Report for Civil Engineering

Department of Civil and Environmental Engineering
University of Washington

April 30, 2001

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Chapter 1

Background Information

1.1 Degree Titles

The University of Washington awards a single civil engineering degree: the Bachelor of Science in Civil Engineering (B.S.C.E.).

1.2 Program Modes

The program in civil engineering is offered in a full-time day mode, requiring 180 quarter credits for graduation. For the typical student taking on average 15 credits/quarter with no coursework during the summer, this translates into a 4-year course of study to obtain the degree.

1.3 Actions to Correct Previous Deficiencies

No deficiencies or weaknesses were noted in the report from the 1995 Accreditation Visit, but there were some suggestions made for consideration:

- **Observation** "There appears to be an advising difficulty for the freshman and sophomore pre-engineering students. Information for the pre-engineering students appears to be available at the university; but the mechanics of getting it to students is a potential problem."

  Action Improved web access for students and a completely re-designed departmental web site should have solved most of the information availability issue. It should be noted that the 1995 report had no complaints about the pre-engineering advising, in general.

- **Observation** "The common junior course work appears to be difficult and demanding, but fair. However, there are no available "elective" engineering courses provided to give the students an opportunity to study their areas of interest."

  Action While the junior year remains largely common, difficult, and demanding (and fair!), there have been substantial changes made, including the addition of some flexibility. This is discussed in more detail later in this Self-Study.

- **Observation** "Students expressed satisfaction with the faculty but wished to have more control in the course evaluation process."

  Action This comment appeared to be related to students' desire to have other ways to provide feedback concerning course quality beyond the standard end of quarter evaluations. Since the 1995

visit, a Student Advisory Board has been formed, and this provides a formal mechanism for students to participate in the running of the department at many levels. This has included very useful input about course quality and content that would have been difficult to pick up with the standard evaluation process.

1.4 Overview of Major Developments since Prior Visit

The Department of Civil and Environmental Engineering (CEE) has undergone a great deal of changes since the prior ABET site visit in 1995. The reasons for many of these changes and their relations to the program objectives, etc. will be discussed in later sections of this Self-Study, but the nature and scope of the changes are such that it is important to be familiar with them in understanding the state of the Department. These changes include the following:

- The Department's name was changed from the Department of Civil Engineering to the Department of Civil and Environmental Engineering. The name change was intended to provide a better reflection of the department's activities for students, the university, and the profession. However, there was has been no change in the formal degree offered, which remains the B.S.C.E., as indicated in section 1.1.
- The Department was formerly organized into three distinct programs, with both administrative and curricular responsibilities partially distributed to these programs. The department has now been re-structured, and the former program structure has been abolished. Among other things, this required the renumbering of all the departmental courses, which used to have designations based on the these programs. This course numbering change has not yet propagated to all university publications, and so this can be a possible source of confusion.
- As part of the restructuring, two new academic administrative positions were created: (i) Director of Instruction; and (ii) Graduate Program Director. The Director of Instruction plays a central role in managing the undergraduate and graduate educational programs.
- The department staff was re-organized to reflect the removal of the separate program structure. This in particular led to a period of mild administrative chaos during the transition, but things have now returned to an even keel.
- The degree requirements were reduced from 192 credits to 180 credits.
- The junior year curriculum was overhauled to provide more efficient coverage of certain topics, and to give students additional flexibility in planning their program.
- The Department used to admit students twice a year, but this has now been changed to a single admission cycle per year.
- Master's degree requirements were revised to provide a more uniform set of options across the department. This included the addition of a new non-thesis degree.

One side effect of all these changes has been to hamper our ability to accumulate program evaluation data, since the program has not been in a steady state.

One additional interesting issue in regards to Civil Engineering, in particular, is the fact that the American Society of Civil Engineers has adopted the position that the master's degree should be the first professional degree. With a B.S.C.E. no longer representing an entré to the profession, the issue of what an accredited degree program should be trying to accomplish becomes a bit more cloudy.

Chapter 2

Accreditation Summary

2.1 Students

2.1.1 Departmental Admission

Students are normally admitted to the Department as juniors, with earlier admission available for a small number of outstanding students. Admission is competitive, with a 50-60% acceptance rate common. Applications are submitted using a standardized form, and admission is based on the following:

- Students must have completed the required prerequisite coursework.
- Students must satisfy a minimum GPA requirement.
- Academic achievement is characterized by overall and core GPA.
- Each student submits a written statement outlining their background and objectives in pursuing a CEE degree. This statement provides an opportunity for students to present a fuller picture of their abilities and circumstances beyond that measured by GPA alone. It also gives the admissions committee a sample of student writing to evaluate.

2.1.2 Advising

(Lynn is preparing this section)

2.2 Program Educational Objectives

2.2.1 Instructional Mission

The Department of Civil and Environmental Engineering seeks to provide the highest quality of undergraduate and graduate education available in the nation. At the undergraduate level, the Department's mission is to provide all students the opportunity for a broad-based educational experience, enabling students to address complex and multi-faceted civil engineering problems. Furthermore, the Department must provide students with the fundamentals necessary to evolve in the profession in response to changing technology and societal needs and expectations. Finally, the Department's undergraduate program should offer the preparation needed for graduate studies and research, and foster the necessary intellectual curiosity.

In graduate instruction, the Department seeks to impart the knowledge and provide the intellectual environment that will encourage the highest level of research and critical, innovative thinking. Master's students

are to be equipped for state of the art practice, while doctoral students are to be prepared for advancing the state of practice and understanding in their discipline.

This mission reflects a recognition of the diversity of our students' backgrounds, needs, and career aspirations.

2.2.2 Undergraduate Educational Objectives

To fulfill its instructional mission, the undergraduate program is based on specific educational objectives. In particular, upon completion of the undergraduate program our students will have:

A. demonstrated proficiency in applying fundamental mathematical, scientific, and engineering principles in formulating and solving civil engineering problems;

B. demonstrated sufficient mastery of core civil engineering topics suitable for entry into the profession and/or for graduate study;

C. gained significant experience in designing systems and components in civil and environmental applications in both individual and team contexts;

D. acquired up-to-date skills for analysis, data collection, modeling, project management, professional development, communication, and presentation;

E. developed an understanding of professional and social issues suitable for participation and leadership in their communities.

2.2.3 Relation of Objectives to Institutional Mission

Institutional Mission

The University of Washington's mission statement is quoted below:

> Founded 4 November 1861, the University of Washington is one of the oldest state-supported institution of higher education on the Pacific coast. The University is comprised of three campuses: the Seattle campus is made up of sixteen schools and colleges whose faculty offer educational opportunities to students ranging from first-year undergraduates through doctoral-level candidates; the Bothell and Tacoma campuses, each developing a distinctive identity and undergoing rapid growth, offer diverse programs to upper-division undergraduates and to graduate students.
>
> The primary mission of the University of Washington is the preservation, advancement, and dissemination of knowledge. The University preserves knowledge through its libraries and collections, its courses, and the scholarship of its faculty. It advances new knowledge through many forms of research, inquiry, and discussion; and disseminates it through the classroom and the laboratory, scholarly exchanges, creative practice, international education, and public service. As one of the nation's outstanding teaching and research institutions, the University is committed to maintaining an environment for objectivity and imaginative inquiry and for the original scholarship and research that ensure the production of new knowledge in the free exchange of diverse facts, theories, and ideas.
>
> To promote their capacity to make humane and informed decisions, the University fosters an environment in which its students can develop mature and independent judgment and an appreciation of the range and diversity of human achievement. The University cultivates in its students both critical thinking and the effective articulation of that thinking.

As an integral part of a large and diverse community, the university seeks broad representation of and encourages sustained participation in that community by its students, its faculty, and its staff. It serves both non-traditional and traditional students. Through its three-campus system and through educational outreach, evening degree and distance learning programs, it extends educational opportunities to many who would not otherwise have access to them.

The academic core of the University of Washington is its College of Arts and Sciences; the teaching and research of the University's many professional schools provide essential complements to these programs in the arts, humanities, social sciences, and natural and mathematical sciences. Programs in law, medicine, forest resources, oceanography and fisheries, library science, and aeronautics are offered exclusively (in accord with state law) by the University of Washington. In addition, the University of Washington has assumed primary responsibility for the health science fields of dentistry and public health, and offers education and training in medicine for a multi-state region of the Pacific Northwest and Alaska. The schools and colleges of architecture and urban planning, business administration, education, engineering, nursing, pharmacy, public affairs, and social work have a long tradition of educating students for service to the region and the nation. These schools and colleges make indispensable contributions to the state and, with the rest of the university, share a long tradition of educating undergraduate and graduate students towards achieving an excellence that well serves the state, the region and the nation.

Board of Regents February 1981; revised February 1998

This statement includes a specific reference to the University's engineering programs, of which CEE is one. The mission of equipping students for service at state and local levels is consistent with our stated objectives, which has a clear professional preparation focus. The more general educational mission of preserving and disseminating knowledge via courses and varieties of instruction is reflected in the choice of educational objectives, which provide the framework on which our courses and instruction are based.

College Mission

The College of Engineering's mission statement is much briefer than the University's:

> Engineering leadership through innovative learning, world-class research, and responsible public service.

In a succinct fashion, this statement captures the basic instruction, research, and service aspects of the College of Engineering's mission. The Department's Program Educational Objectives support this mission implicitly, as they are the student-side manifestation of learning for leadership in Civil and Environmental Engineering.

2.2.4 Constituents

The program's constituents can be classified in two categories: direct and indirect. The direct constituents of the program can be identified as follows:

- Students (pre-majors, majors, and alumni)
- Departmental Faculty
- Departmental Staff

- Employers of CEE graduates

These groups and individuals have interaction with and participation in the undergraduate program that is an inherent part of its function and reason for existence.

The indirect constituents are further removed from the ongoing operations, activities, and outcomes of the department, but are nevertheless effected by or capable of influencing the Department's directions. These indirect stakeholders can be identified as follows:

- Washington State Legislature
- Students' Parents/Families
- University of Washington Administration
- UW College of Engineering
- ABET
- Professional Societies

In general, these indirect program constituents provide the framework of rules, policies, and constraints under which the program must operate.

2.2.5 Process for Establishing and Reviewing Educational Objectives

The establishment of the Program Educational Objectives was based on a gathering and formalizing of principles and initiatives that have evolved in an ongoing, ad hoc manner. For a mature program, it makes little sense to attempt to start from scratch in such an endeavor, and so our approach was to build on what we knew. In addition to building on our own local base of experience, program objectives from a variety of other programs were consulted for ideas and models. The Director of Instruction and the Department Chair together drafted a preliminary statement of objectives in February of 2001, which was then presented to the various constituent groups for review and amendment.

It would have been possible to establish these Objectives earlier, but it was decided that the Department's pre-existing Strategic Plan was providing an adequate framework for guiding our actions, and that the 2001 iteration of the Strategic Plan would incorporate the formal Mission/Objective statements. Henceforth, the Strategic Plan's undergraduate education components will be based around this now formalized Mission/Objective statement.

The Strategic Plan document has been part of an overall planning strategy similar in spirit to ABET's EC 2000, but with a scope encompassing all the Department's activities, and using a somewhat different vocabulary. The focus has been more on specific initiatives and activities, but within a mission-driven context. The framework of the strategic planning process can be outlined as follows:

- Statements of goals and objectives: what we are trying to achieve.
- Achievement mechanisms: what we are doing/planning to achieve these goals/objectives.
- Achievement metrics: what we will measure and monitor to track our progress.
- Assessment: how we measure and interpret data relative to our metrics.
- Outcomes: what our assessment tells us.
- Improvement: adjusting out mechanisms to improve our outcomes, as necessary.

Table 2.1: Curriculum Framework and Linkages to Program Educational Objectives A-E

Course	Title	Req'd	A	B	C	D	E
Prerequisites							
Math 124	Calculus I	x	x				
...							
Junior Year							
CEE 391	Computing Applications	x				x	
CEE 363	Construction Materials	x		x		x	
Senior Year							
CEE 440	Design Seminar	x			x	x	x
CEE 44x	Design Project	x	x	x	x	x	x
CEE 4xx	...						
Other							
various	Humanities					x	x
various	Social Science					x	x

The Strategic Plan is updated every two years, with the Chair providing interim updates at each fall's Faculty retreat.

Figure 2.1 illustrates the overall process by which program evaluation and outcomes assessment inform the strategic planning activity.

The two-year cycle of the Strategic Plan document provides a reasonable interval for reviewing the Program Educational Objectives, although it is unlikely that major changes to these global Objectives would occur within such a short time-frame. The process for constructing the Strategic Plan documents has been relatively Chair-centric, but with extensive input from the various direct constituent groups. The Chair meets formally with the Student Advisory Group, the Visiting Committee, the faculty-based Strategic Planning Committee, the Educational Assessment Committee, and staff working groups on a periodic basis as part of his or her normal activities. The Chair also tends to have the closest contacts at the College, University, and legislative levels. This puts the chair in the best position for setting a well-informed strategic direction for the department, and this is also the case with the Program Educational Objectives rolled into the Strategic Planning process.

The effectiveness of this process in regards to the overall improvement of the Department can be seen by reviewing the past iterations of the Strategic Plan, with the clear statements of focused objectives, actions taken, and progress achieved (See Appendix xx).

2.2.6 Program Curriculum

Courses

Table 2.1 presents an overview of the Civil Engineering curriculum, showing how courses map to the Program Educational Objectives. It can be seen from this table that the core of required courses ensure coverage of all Program Objectives.

Evaluation

The process for evaluating the program quality and effectiveness in meeting the Program Educational Objectives has several components and several different purposes. Each of these are described in the following sub-sections.

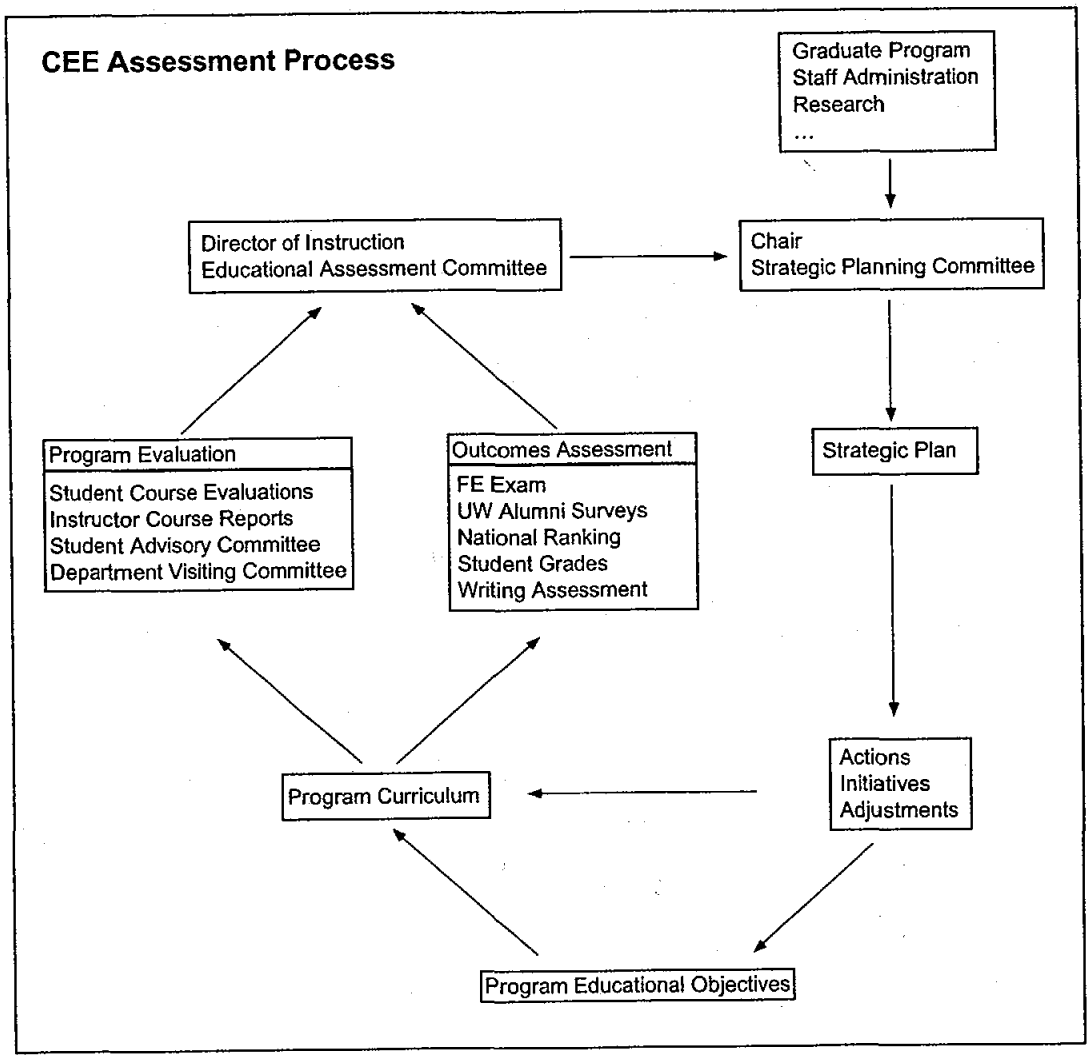


Figure 2.1: CEE educational assessment process as a part of departmental strategic planning

Course Quality and Content The principal unit of interaction of between students and faculty is the individual course, and so in many ways the quality and effectiveness of the program stands or falls depending on the quality of its individual courses. We have several mechanisms for tracking course quality and feeding this information back for continuous improvement:

Student Evaluations With few exceptions, each course taught by the Department undergoes a student evaluation. These evaluations are administered by the UW Office of Educational Assessment (OEA) and are composed of two principal parts: (i) numerical survey forms; and (ii) more open-ended comment sheets. Examples of these forms can be found in the Supplemental Materials Notebook. The OEA has long been a national leader in student evaluation of courses, and while no one believes such evaluations are without flaws, the system used here is very good. The numerical results of the course evaluations are made available to the Chair and the Director of Instruction, while the numerical scores and the comment sheets go directly to individual faculty members. The Chair and Director of Instruction use these data to keep tabs on how students are perceiving the quality of the courses, and to look for problematic patterns with certain courses or faculty members. Individual faculty members use the evaluations to monitor student perception of their courses, and to make improvements and adjustments as appropriate. These evaluations are also used for promotion and merit considerations, and so they are taken seriously across the board.

Course Reports For close to a decade, the College of Engineering has required that upon the completion of each course, the instructor is to prepare a reflective statement overviewing how the course went. These statements become part of a faculty member's portfolio for promotion, but there has been little in the way of enforcement or use of this process for the faculty as a whole. To address this and related issues, the CEE Department has been worked on developing a web-based reporting mechanism that can make reflective statement preparation and recording more convenient, structured, trackable, and useful. The course reporting system is also tied in to the Program Educational Objectives, so that each course offering can be dynamically related to these objectives, and at any point in time, an accurate snapshot of the program can be obtained. A sample course report can be found in the Supplemental Materials Notebook, and the database can be browsed live at

`http://octavia.ce.washington.edu/CourseManager/report_entry.php`

The online version of the system provides different views of the data to different users, and so can serve several purposes. With respect to program evaluation and improvement, the data from these reports can be used to provide improvement feedback across and within courses, help identify best practices, and in general make it feasible to keep an up-to-date picture of the curriculum as a whole.

Student Achievement Entry into the program is competitive, with roughly 50-60% of the applicants in a given year ending up in the program. The faculty are used to having good students, and they set high standards both in regards to the quality and quantity of work they expect from students.

Program Quality and Content There are various mechanisms we use to track the quality and appropriateness of our program relative both to outside metrics and student expectations:

National Rankings Like student evaluations, national rankings can be abused, but at the same time they do provide a useful measure of program performance. In this regard, the UW Civil Engineering undergraduate program is ranked 14th among public universities by U.S. News and World Report

(http://www.usnews.com/usnews/edu/college/rankings/eng/coenps04.htm). The undergraduate engineering rankings are based primarily on reputation–at the graduate level a fuller set of criteria are used, and here our program is ranked 8th among public universities and 13th overall.

Graduate Student Quality and Preparation The CEE Department has a world-class graduate program, and so the faculty works closely with students from across the nation and around the world on a consistent and on-going basis. We also have a fair number of our own students continue on for graduate degrees, which means we have frequent opportunities to see how our own students' preparation compares with that of students educated elsewhere.

Visiting Committee To help locate points of possible weakness in our program, during our annual meeting with the Visiting Committee we do a short exercise that goes as follows: each board member is given a listing of the Program Outcomes, and is asked to choose whichever two they would identify as being outcomes for which there is the biggest gap between what our students can do, and what they would like them to be able to do. We then go through the list, having people raise their hands if the outcome was on their list of two. This is illuminating for all of us, and we look for any patterns that are apparent. When there is a pattern, we have a discussion about the nature of what they would like to see, and how we might work together to achieve a closer match to their needs.

Student Advisory Committee In addition to the course-by-course feedback we receive from students via the course evaluation forms, the Student Advisory Committee (SAC) provides more general programmatic feedback. The members of the SAC are selected by the chair and the departmental advisor with the express purpose of getting students who are both representative of their class, and who are likely to be vocal about their experience in the program. This committee has been an excellent source of information and suggestions, and many changes have been implemented as a result of its input. See section A.6 in the appendix for a summary of the student committee's spring 2001 input, along with a corresponding action plan/response for each issue raised.

2.3 Program Outcomes and Assessment

2.3.1 Outcomes

As a result of achieving the Program Educational Objectives, our students will possess each of the following characteristics as required by ABET:

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

(c) an ability to design a system, component, or process to meet desired needs

(d) an ability to function on multi-disciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context

Table 2.2: Linkages between UW Educational Objectives and ABET Outcomes

UW Program Objective	ABET Outcomes
A.	a, e
B.	a, e, k
C.	c, d
D.	b, g, i, k
E.	f, h, i, j

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The mapping between these outcomes and our Program Educational Objectives is presented in Table 2.2. This table shows that all ABET outcomes can be related to one or more of our Program Educational Objectives.

2.3.2 Assessment Plan

Our overall strategy is to gather many different kinds of information, including quantitative and qualitative data both from internal and external sources. With our assessment we seek primarily to confirm that our students are achieving the desired outcomes, but we also look for quality measures. We have an Educational Assessment Committee to oversee and manage this process on an annual basis. For the 2000-2001 year, the following set of outcomes assessment mechanisms were used:

Fundamentals of Engineering Exam The FE exam is taken by the majority of our students as it represents a necessary step for most into professional practice. As an independent external metric, it can provide one important measure of our success in providing students with fundamental engineering knowledge. We include the results of this exam in our annual program assessment, specifically focused on tracking Program Educational Objectives A, C, and some aspects of D.

Student Grades For those outcomes that are closely matched to specific course content, student grades provide an excellent measure of satisfaction of outcomes. Grades result from careful consideration of several measures for each and every student, and when multiple courses are involved for a particular outcome, there is participation by multiple faculty members. As relative measures, grades do not reflect program quality in and of themselves, but they do ensure minimum standards are met. In effect, if a student receives a passing grade in a course (> 2.0), the student can be judged to have satisfied the outcomes around which the course is structured. The curriculum map in Table 2.1 indicates which outcomes are associated with which course. More detailed information for particular courses can be obtained via the on-line course reporting system.

University Surveys The State of Washington instituted accountability measures for the University some time ago, and so there is a significant amount of data available gathered from students following their graduation. The nature of the questions asked in these surveys are general, but there are many close linkages to ABET criteria as shown in Tables 2.3 and 2.4. These data provide useful longitudinal information (currently short-term), and are particularly helpful in measuring those outcomes less directly related to specific courses. Extensive technical information about these surveys is available at `http://www.washington.edu/oea/reports.htm`.

Table 2.3: Relation between 1997 UW Outcomes Survey questions and ABET criteria.

Survey Outcome	ABET Outcome										
	a	b	c	d	e	f	g	h	i	j	k
Writing effectively							X				
Speaking effectively							X				
Critically analyzing written information							X				
Defining and solving problems					X						
Learning independently									X		
Working cooperatively in a group				X							
Understanding and appreciating the arts								X			
Understanding and applying scientific principles and methods	X	X									
Understanding and applying quantitative principles and methods	X	X									
Understanding differing philosophies and cultures				X				X			
Understanding the interaction of society and the environment								X		X	
Readiness for advanced education	X	X	X	X	X		X	X	X		X
Readiness for a career	X	X	X	X	X	X	X	X	X	X	X
Recognizing your responsibilities, rights and privileges as a citizen						X			X		

Table 2.4: Relation between 1999 UW Outcomes Survey questions and ABET criteria.

	ABET Outcome										
Survey Outcome	a	b	c	d	e	f	g	h	i	j	k
Writing effectively							X				
Speaking effectively							X				
Critically analyzing written information							X				
Defining and solving problems					X						
Working and/or learning independently									X		
Working cooperatively in a group				X							
Using a foreign language								X			
Understanding and appreciating the arts								X			
Understanding and applying scientific principles and methods	X	X									
Understanding and applying quantitative principles and methods	X	X									
Understanding and appreciating diverse philosophies and cultures				X				X			
Understanding the interaction of society and the environment								X		X	
Working effectively with modern technology, especially computers		X									X
Locating information needed to help make decisions or solve problems			X		X						
Using knowledge, ideas, or perspectives gained from major field	X		X				X				X
Using knowledge, ideas, or perspectives from outside major field			X							X	
Using management/leadership capabilities			X	X							
Recognizing your responsibilities, rights and privileges as a citizen						X				X	

Table 2.5: Recent F.E. Exam results for CEE Department compared to state and national averages.

	General Afternoon Session			CE Afternoon Session		
	UW	State	National	UW	State	National
April, 2000						
Number taking exam	26	67	1560	15	32	2162
Number passing	25	54	1196	15	28	1633
Pass Rate	96%	81%	77%	100%	88%	76%
October, 2000						
Number taking exam	18	31	902	19	42	1664
Number passing	17	28	626	18	31	1341
Pass Rate	94%	90%	69%	95%	74%	81%

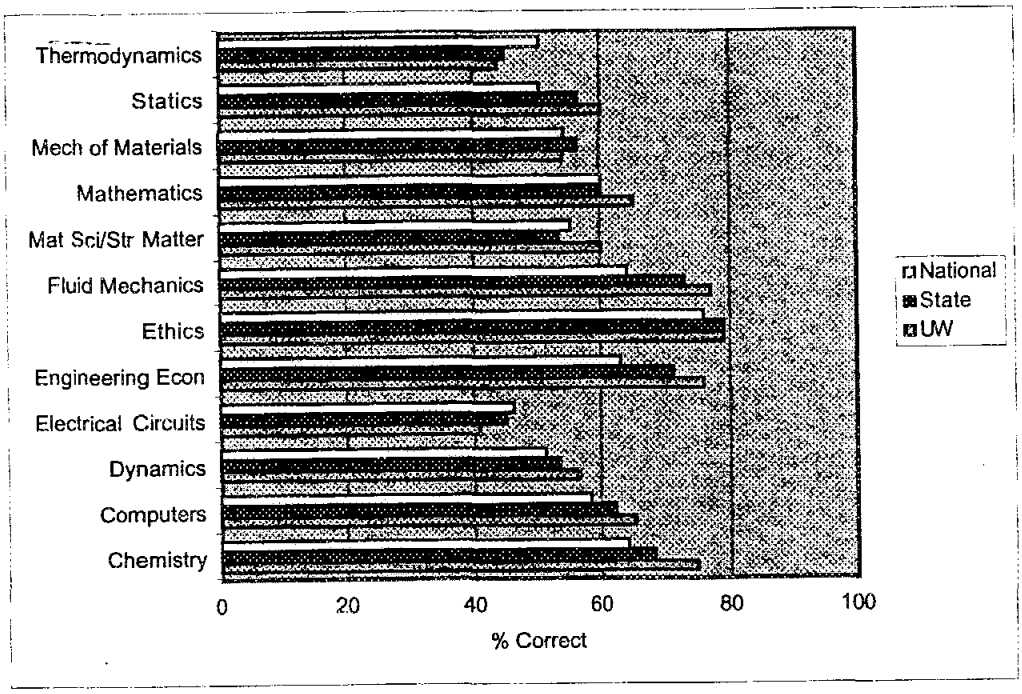
Writing Assessment Students are required to complete courses in which writing is the principal focus, but there is general consensus within the College that this does not provide a general reflection of the writing students do throughout the curriculum. To address this, a College-wide set of writing standards were developed, and a process put in place to assess student writing performance at a programmatic level, i.e., outside the scope of any particular course. Working with the Department of Technical Communication (TC), each department supplies a set of writing samples that are assessed against the writing standards. This assessment is performed by a team of departmental and TC faculty using a scoring rubric appropriate for outcome assessment. See section A.4 in the appendix for additional details.

Professional Practice Seminar We have a professional practice seminar course (CEE 440) that is required for all seniors. In the fall of 1999 we began working with College of Engineering's Center for Excellence in Learning and Teaching (CELT) to make the framework for the course align with the ABET definitions of preparation for professional practice, and to engage the students in some interesting and innovative development and assessment activities. In brief, the course was structured around the question of what it means to be prepared for professional practice relative to an ABET (a)-(k) type of framework in a civil engineering context, and how one can determine whether one is indeed prepared. As a final project, students were asked to prepare some kind of representation of how they define civil engineering and professional practice, and to build a case outlining the quality of their preparation. This proved sufficiently interesting that papers have been written (see Supplemental Materials Notebook) and additional studies of the data are ongoing.

2.3.3 Assessment Data and Discussion

Fundamentals of Engineering Exam Table 2.5 summarizes recent FE results for UW students relative to overall state and national norms. In all recent exams, UW students performed well above state and national norms, both in the case of those taking the General afternoon session and those taking the CE-specific afternoon session. Figures 2.2-2.5 provide more detailed breakdowns of these results by subject area and exam session. The FE Exam is administered such that all students take a common morning session, but the students have the option in the afternoon session of either additional general questions, or specialized questions for their discipline. In virtually all cases, UW students outperformed or matched closely national and state averages, and this is particularly pronounced in the case of the CE-specific afternoon session. Taken together, we interpret these results as demonstrating that our program is meeting Program Objectives A, B, and parts of those parts of D and E that can be measured by a standardized exam.

Student Grades Talk about degree audits, etc..



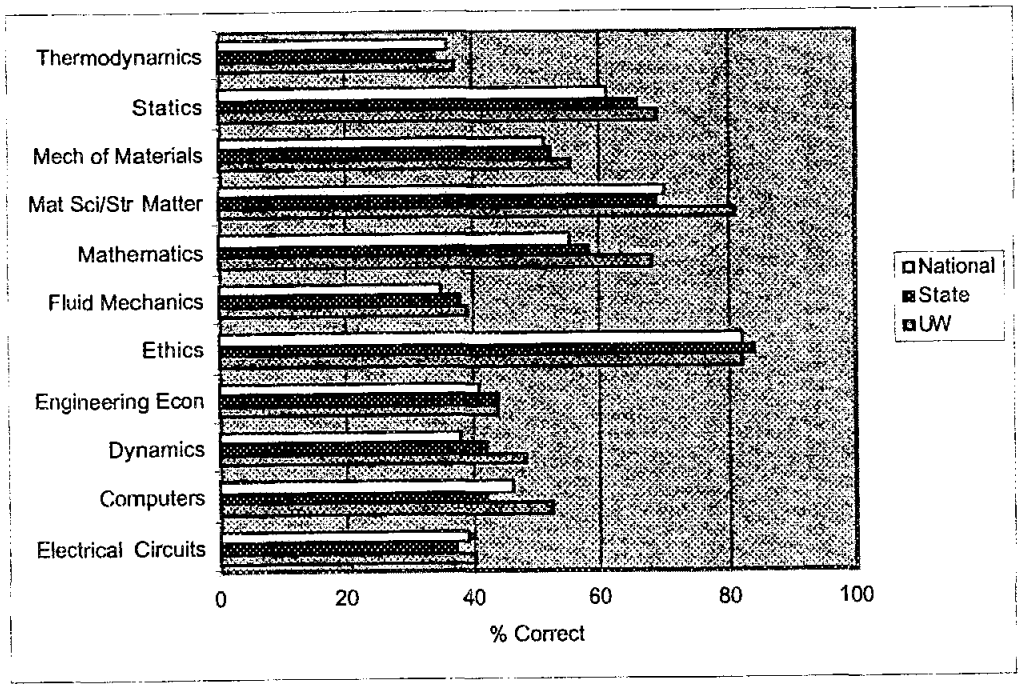
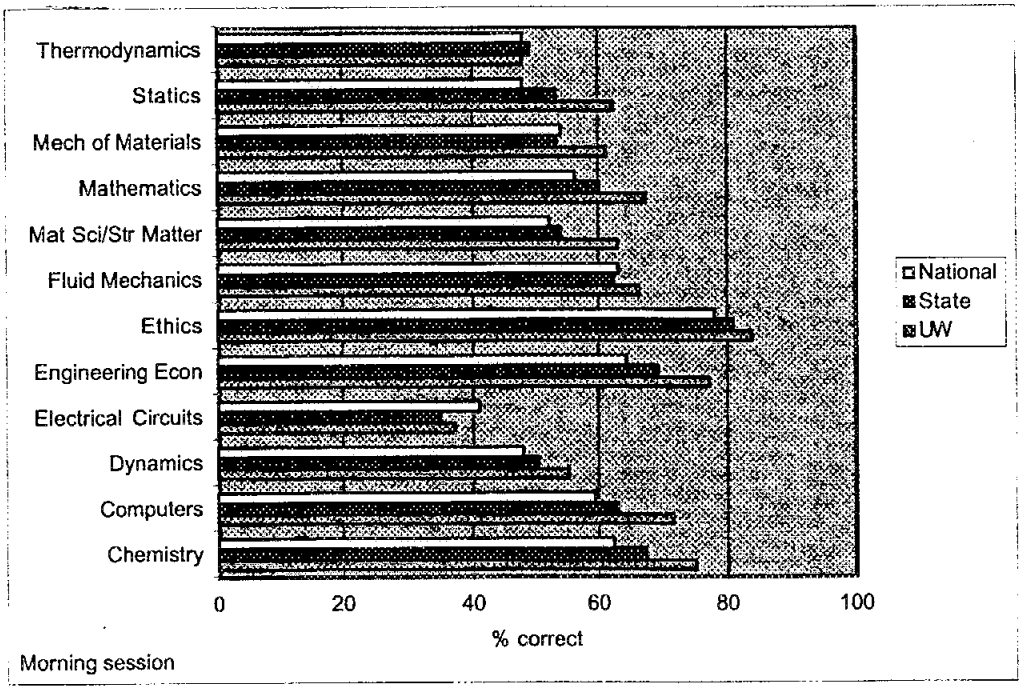


Figure 2.2: Detailed breakdown of FE exam results for students taking the General afternoon session, April, 2000



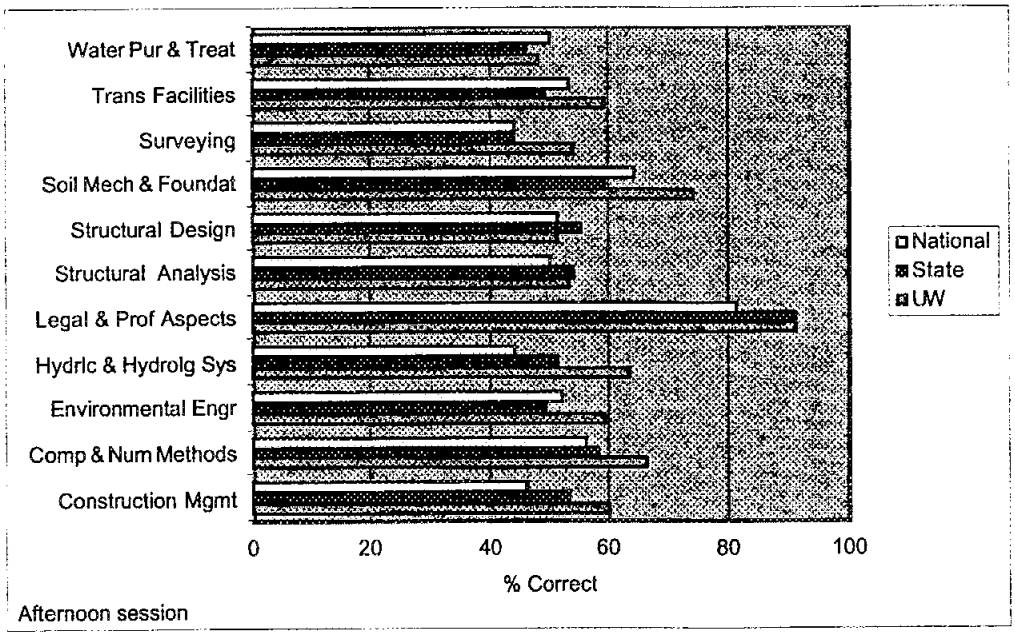


Figure 2.3: Detailed breakdown of FE exam results for students taking the Civil Engineering afternoon session, April, 2000

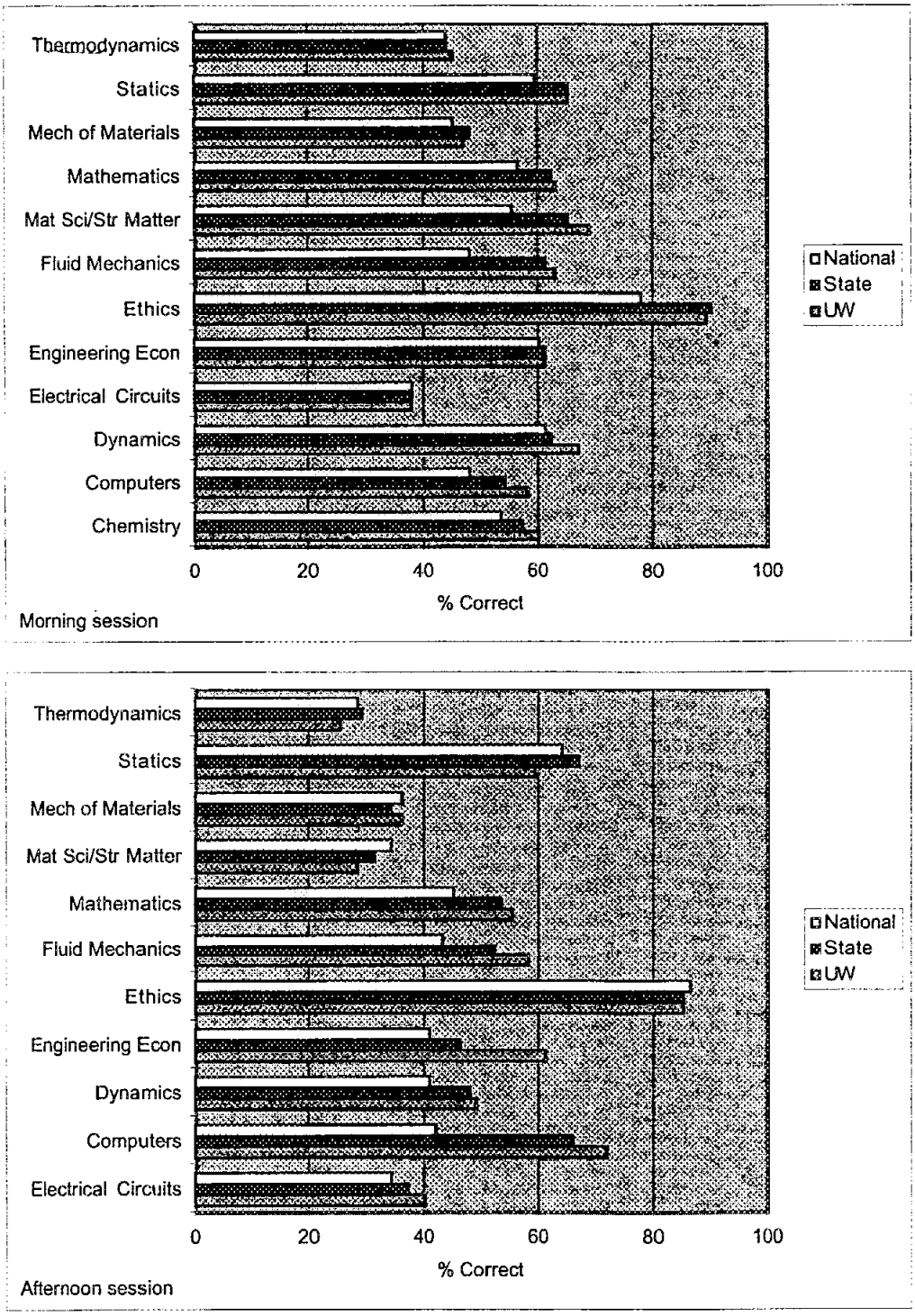


Figure 2.4: Detailed breakdown of FE exam results for students taking the General afternoon session, October, 2000

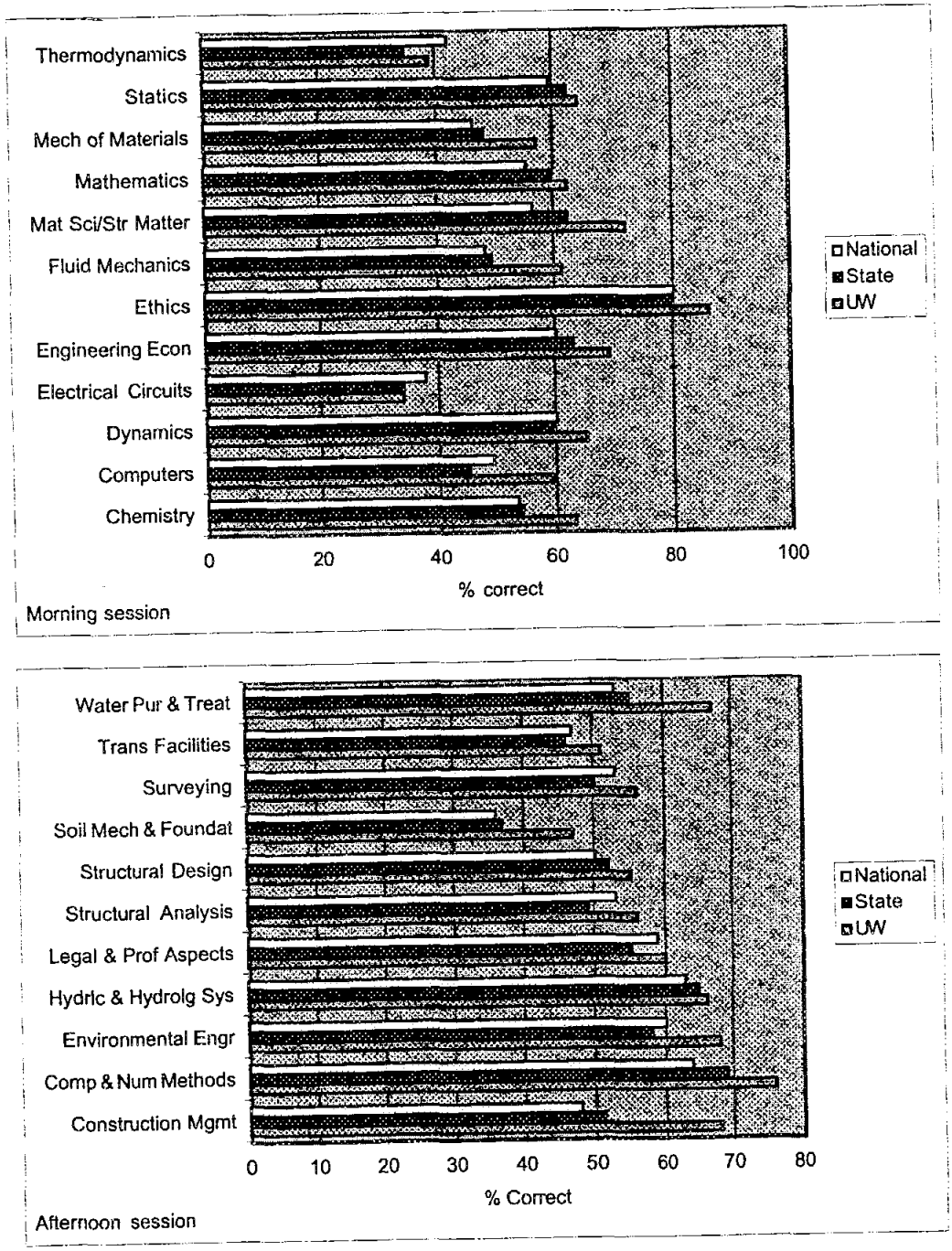


Figure 2.5: Detailed breakdown of FE exam results for students taking the Civil Engineering afternoon session, October, 2000

Table 2.6: 1999 1-year alumni survey results: skill rating, importance, and mismatch

Outcome	Skill rating	Importance	Mismatch
Writing effectively	3.47	3.78	0.08
Speaking effectively	3.06	3.65	0.16
Critically analyzing written information	3.84	3.78	-0.02
Defining and solving problems	4.12	4.52	0.09
Working and/or learning independently	4.02	3.87	-0.04
Working cooperatively in a group	3.86	4.09	0.06
Using a foreign language	1.66	1.27	-0.31
Understanding and appreciating the arts	2.5	1.33	-0.88
Understanding and applying scientific principles and methods	4.06	3.78	-0.07
Understanding and applying quantitative principles and methods	4.02	3.93	-0.02
Understanding and appreciating diverse philosophies and cultures	2.85	2.04	-0.40
Understanding the interaction of society and environment	3.35	3.26	-0.03
Working effectively with modern technology, especially computers	4.1	4.28	0.04
Locating information needed to help make decisions or solve problems.	4	4.22	0.05
Using knowledge, ideas, or perspectives gained from major field	3.88	3.76	-0.03
Using knowledge, ideas, or perspectives gained outside major field	3.37	3	-0.12
Using management/leadership capabilties	3.35	3.58	0.06
Recognizing your responsibilities, rights, and privileges as a citizen	3.71	2.96	-0.25

University Surveys Discuss figures like Figure 2.6 and tables like Table 2.6 .

2.4 Professional Component

Consistent with our overall program objectives, preparation for professional practice is one of the principal themes of our educational program. This is reflected in the structure and content of our curriculum, in the design experiences and professional exposure we ensure each of our students has, and in the additional opportunities that are available for students to participate in professionally-focused activities. Each of these aspects of the Professional Component of our program is described in the following sections.

2.4.1 Curriculum

Undergraduate engineering students at the University of Washington generally do not enter departmental programs until their junior year. The state of Washington also has one of the heaviest investments in 2-year junior college institutions in the nation, and so a significant number of our students come into the department from outside the university. This leads to a relatively easily identified two-part split to the curriculum structure: a largely prerequisite-oriented preparation during the first two years of study, followed by a largely discipline-oriented course of study during the final two years. This should not be interpreted to mean that there is no discipline-oriented study during the first two years, nor that students take nothing but departmental courses in their final two years, but the majority of work does tend to follow these patterns.

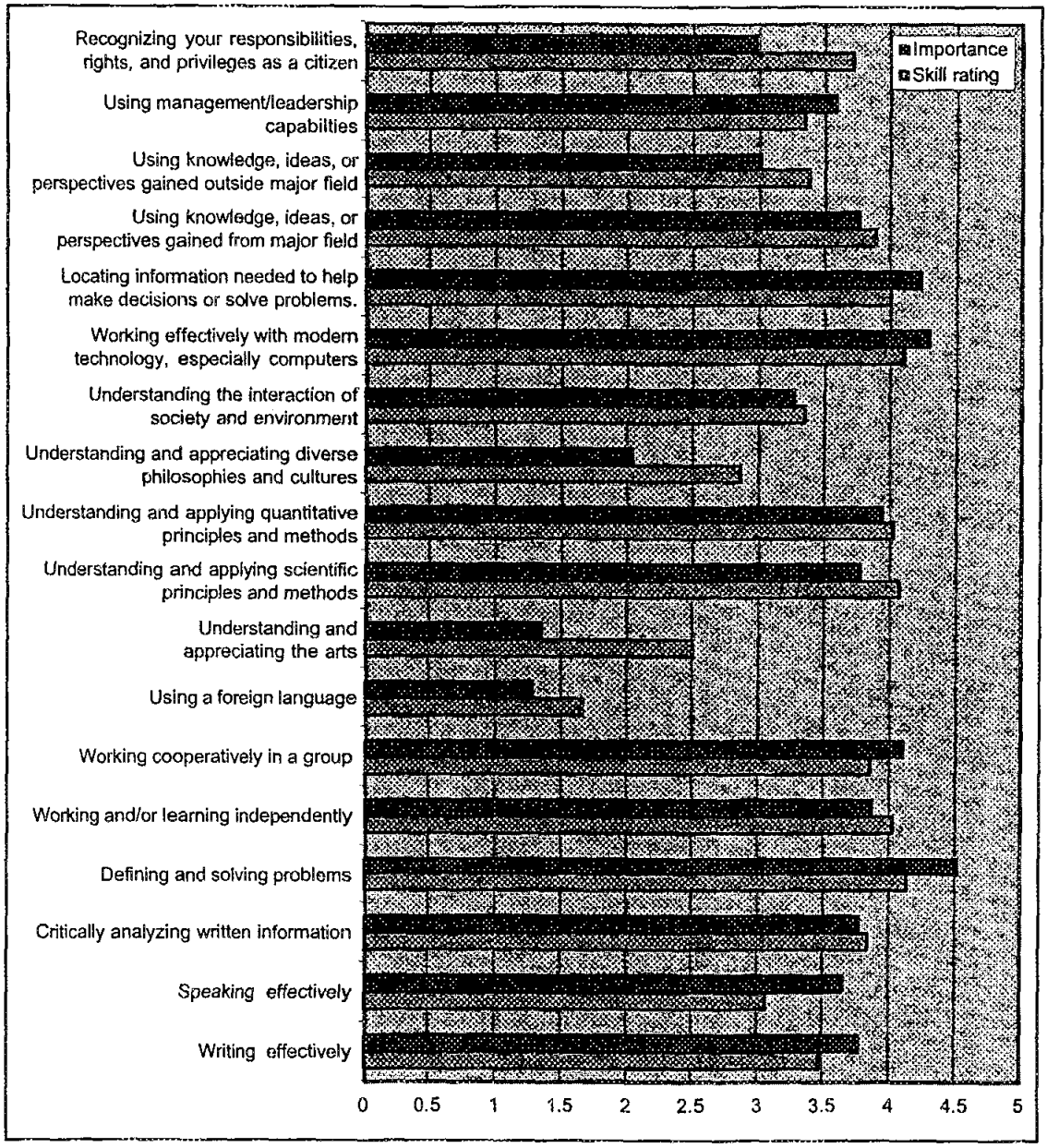


Figure 2.6: 1999 1-year alumni survey results relating outcomes and perceived importance.

Table 2.7: Mathematics Requirements

Mathematics				
PRE	Math	124	Calc/Anal Geometry I	5
PRE	Math	125	Calc/Anal Geometry II	5
PRE	Math	126	Calc/Anal Geometry III	5
REC	Math	307	Differential Equations	3
REC	Math	308	Linear Algebra	3
GEN	Additional 300-level mathematics course			

Table 2.8: Physics Requirements

Physics				
PRE	Phys	121	Mechanics	4
PRE	Phys	122	Elec-Mag & Osc	4
PRE	Phys	123	Waves	4
REC	Phys	131	Exper Phys Lab	1
REC	Phys	132	Exper Phys Lab	1
REC	Phys	133	Exper Phys Lab	1

Tables 2.7-2.16 illustrates the categorization of and general sequencing of courses required or recommended prior to entry to the department, and for ultimate graduation (see also Table A.1 in the appendix for full curricular summary data). Courses denoted "PRE" must be completed prior to admission to the department, courses denoted "GEN" can be taken at any appropriate time, while the designations "JR" and "SR" imply the junior and senior years, respectively.

2.4.2 Design Experience

Our approach to ensuring that students develop suitable design skills and experience has four principal components:

1. Small-scale, distributed design considerations throughout the engineering curriculum.
2. Domain-specific design courses, which provide students with technical design background for specific application areas.
3. A design/professional practice seminar course intended to provide experience and knowledge concerning those aspects of design practice that cut across disciplines.
4. A capstone design course that combines the technical and broader issues of real design work, and which includes aspects from multiple CEE disciplines.

Table 2.9: Chemistry Requirements

Chemistry				
PRE	Chem	142	Gen Chemistry/Lab	5
REC	Chem	152	Gen Chemistry/Lab	5

Table 2.10: Engineering Fundamentals Requirements

Engineering Fundamentals				
PRE	CSE	142	Gen Chemistry	5
PRE	AA	210	Statics	4
PRE	CEE	220	Mech of Materials	4
PRE	ME	230	Dynamics	4
GEN	**One** of the following courses:			
	ENGR	123	Intro Engr Graphics	4
	MSE	170	Fund Materials Science	4
	EE	215	Fund Elec Engr	4
	IND E	250	Fund Engr Econ	4
	CHEM E	260	Thermodynamics	4
	ENGR	280	Intro Systems Engr	4

Table 2.11: Written and Oral Communication

Written and Oral Communication				
PRE	Engl	131	Engl Comp (or equiv)	5
GEN	TC	231	Intro Tech Writing	3
GEN	**One** of the following courses:			
	TC	333	Advanced Tech Writing	4
	ENGL	182	The Research paper	5
	ENGL	281	Intermediate Expos Writing	5

Table 2.12: Distribution Requirements

Areas of Knowledge				
GEN	Econ	200	Microeconomics	5
GEN	Individuals and Societies (I&S)			5
GEN	Visual, Literary, & Perf. Arts (VPLA)			10
GEN	Choice of I&S or VPLA			4
GEN	One in-depth sequence included in courses above			

Table 2.13: Civil Engineering Required Core Courses

CEE Core Courses				
JR	CEE	316	Surveying Engr	4
JR	CEE	342	Fluid Mechanics	4
JR	CEE	390	CE Systems	3
JR	CEE	391	Computer Applications	4
JR	CEE	320	Transportation Engr	3
JR	CEE	345	Hydraulic Engr	4
JR	CEE	363	Construction Matls	4
JR	CEE	379	Elem Structures I	4
JR	CEE	306	Construction Engr I	3
JR	CEE	350	Environmental Engr I	4
JR	CEE	366	Basic Soil Mechanics	4
JR	CEE	380	Elem Structures II	4

Table 2.14: Civil Engineering Design Sequence

CEE Design Sequence				
SR	CEE	440	Design Seminar	2
SR	Choice of CEE 441, 442, 443, 444, or 445			4

Table 2.15: Civil Engineering Technical Electives

CEE Senior Electives	
SR	Choice of CEE 400-level courses (15 credits)

2.4.3 Further Opportunities

In addition to formal coursework, there are numerous other programs and activities available to students that can enhance their preparation for practice. These include the ASCE Concrete Canoe Competition (the U.W. has finished in the top 5 nationally over the past 3 years), the AISC Steel Bridge Competition, and various internships administered through the Engineering Co-op Office. See the appendix for more information about the Co-op program, in particular.

2.5 Faculty

The department is particularly proud of its faculty, both in terms of its research abilities and its commitment to outstanding instruction.

2.6 Facilities

2.7 Institutional Support and Financial Resources

2.8 Civil Engineering Program Criteria

2.8.1 Proficiency in Mathematics and Science

The curricular data and outcomes data presented in sections ?? demonstrate that our students are attaining the required proficiencies in mathematics through differential equations, probability and statistics, calculus-based physics, and general chemistry.

2.8.2 Proficiency in four recognized major civil engineering areas

The junior-year curriculum in particular ensures that our students become proficient in the basics of transportation, construction, structural, hydraulic, environmental, and surveying engineering. Our student's FE Exam results again indicate their readiness for practice in this regard. The junior year also contains laboratory components in each of the following classes: surveying, materials, fluids and hydraulics, soils engineer-

Table 2.16: Upper Division Engineering and Science Electives

Upper Division Electives	
SR	Choice of additional CEE 400-level courses or courses from outside department from approved list (12 credits)

ing, environmental engineering, and computer applications. Students by necessity take courses in a variety of areas during the senior year, as well, and there is general encouragement for students to remain broad in their choice of courses a the undergraduate level.

2.8.3 Design Integrated throughout the Curriculum

2.8.4 Professional Issues

All students are required to complete a 2-course capstone design sequence. The first course in the sequence focuses on professional, ethical, and societal issues tht cut across specific technical boundaries, including procurement of work, bidding processes, project and personnel management, teamwork, an dso on. A significant portion of this course involves presentations by and discussions with practicing professionals, which ensures that students are exposed to the current state of practice in these regards.

2.8.5 Faculty

The majority of the faculty instructing design courses are both licensed engineers and have significant professional experience. All faculty instructing design courses are active in design research at various levels, serve on or lead national technical committees, and have consulting experience. We also on occasion have outside instructors teach certain design courses, and these individuals are typically higly experienced practicing engineers. All our design courses can be and are taught on a rotating basis with the involvment of multiple faculty and off-campus instructors.

2.9 Appendices

ABET tables go here, plus the following additions (in a separate notebook?):

- Writing assessment instrument samples
- course catalog
- strategic plan iterations
- Departmental info sheet
- Student evaluation forms (Yellow and other)