

Student Learning Outcomes
Bachelor of Science, Safety
Department of Health Sciences
College of Applied Science and Technology

Upon successful completion of the program, the graduate of the Bachelor of Science program in Safety will have acquired a foundation in the physical, biological and behavioral sciences, and be able to demonstrate the ability to:

1. Anticipate potential hazards to people, property and the environment.
2. Recognize existing hazards to people, property and the environment.
3. Evaluate potential and existing hazards to people, property and environment with respect to risk and regulatory requirements.
4. Control potential and existing hazards to people, property and the environment to achieve acceptable levels of risk or meet regulatory requirements.
5. Develop loss prevention and control programs, including engineering and behavioral strategies.
6. Evaluate the effectiveness of loss prevention and control programs, including engineering and behavioral strategies.
7. Manage and communicate safety, health and environmental information to stakeholders.
8. Function as a member of the safety professional community, with a commitment to continuing professional growth.
9. Acknowledge the standards of professional conduct that are published by professional safety organizations and/or certification bodies.

Safety Program Assessment Plan

The Department of Health Sciences has implemented a multiple measures assessment procedure that includes evaluation of faculty (by students and professional peers), facilities, curriculum, and advising (See Table I). The methods include class evaluations; surveys of new graduates, 1st- and 5th-year alumni; professional practice evaluations; and the IBHE Student Outcomes Initiative. The Safety Program utilizes a multiple-measures approach to program quality management on a course, program, departmental, and university level. The evaluation strategies target four major “customers” of the Safety program: students, graduates, employers, and institutional accreditation agencies. In addition, the University surveys students regarding attainment of program learning outcomes and career success. The survey data has, for example, led to an increase in the ergonomics content of HSC 370 and was also a factor in the decision to change HSC 462 (Ergonomics) to HSC 362 (Ergonomics). In 2002, the program began implementing IBHE Student Outcomes Project. Ongoing assessment led to a major program revision during 2006.

Table I: Summary of Safety Program Evaluation Activities

Evaluation Programs	Responsible Authority	Evaluators	Evaluation Techniques	Frequency
HSC Dept. Assessment Program	Department Chairperson	Students Graduates Employers	Survey Questionnaires	Annually
Safety Program Advisory Committee (planned)	Safety Program Director	Alumni, Employers and Subject Matter Experts	Open Discussion	Annually
Program Faculty Meetings	Program Faculty	Faculty	Open Discussion	Weekly to bi-weekly
Professional Practice	Professional Practice Coordinator	Professional Practice Supervisors	Performance evaluations	Every Semester
Faculty Evaluations	Department Chairperson	Faculty Peers, Department Chair, Students	Performance evaluations	Every Semester
Scope of Practice	Program Director	Faculty	Review Accreditation Standards and other Studies of Professional Safety Practice	Annually

Data From Assessment Program

Table II: Senior Satisfaction Survey Results for 2000-2002, 2004, and 2007-2008

Educational Preparation	Year 2000-02	Year 2004	Year 2007-08
	(n=10)	(n=10)	(n=11)
• Satisfied with instruction on writing effectively.	90%	100%	95%
• Satisfied with instruction on speaking effectively.	100%	100%	100%
• Satisfied with instruction on listening effectively.	100%	100%	100%
• Satisfied with instruction on using computer technology.	80%	60%	70%
• Satisfied with instruction on professional behavior.	100%	90%	95%
• Satisfied with instruction on problem solving.	100%	90%	95%
• Satisfied with instruction on teamwork.	100%	90%	95%
• Satisfied with instruction on continuous professional development.	100%	100%	100%
Program Performance			
• Overall experience in Safety Program	100%	100%	100%
• Satisfied with course content	100%	100%	100%
• Satisfied with class size	90%	100%	95%
• Satisfied with computer equipment and facilities	100%	80%	90%
• Satisfied with classrooms	100%	90%	95%
• Satisfied with student club experience	100%	100%	100%
• Satisfied with faculty encouragement to attend professional meetings	90%	100%	95%
• Satisfied with professional practice experience	90%	90%	90%
• Satisfied with faculty interaction.	100%	100%	100%
• Satisfied with student interaction.	100%	100%	100%
• Satisfied with academic advisement.	100%	70%	85%
• Satisfied with laboratory experiences.	80%	90%	85%
• Satisfied with laboratory equipment and facilities.	70%	80%	75%
• Satisfied with field experiences	90%	100%	95%

Responses to open-ended questions for graduating seniors:

- Every time I would go into the computer lab, I would have at least one problem (printer not working, computer crashes, etc.). Not much was done to utilize the

computers & only a few projects were given as strictly a group project. If I had the opportunity to work individually, I would.

- The Felmley computer labs were constantly being reserved at times when I needed to use them Printers were always broken.
- I thoroughly enjoyed the program and the faculty. I hope that the courses continue to develop and the program continues to grow/improve.
- I had an overall excellent experience with my time at ISU and in the Safety Department. You could tell that the teachers cared.
- I rated the faculty encouragement and interaction with faculty as satisfactory.
- I would like to have seen some of the required science courses more safety-related, instead of so broad. Also, I would have liked more Elective courses in areas that are perhaps more specialized.

100% of seniors agreed that majoring in Safety was a good decision.

Alumni Satisfaction

The Health Sciences Department Assessment Program sends a survey to first-year and fifth-year graduates of the program. The results of this 5th-year alumni survey for 1999-2000 and 2002 indicate graduate satisfaction with the program.

Table III: First-Year Alumni Satisfaction Survey Results for 1999-2000, 2003, and 2006-2007

Educational Preparation	Year 1999-2000	Year 2003	2006-2007
	(n=21)	(n=4)	(n=6)
• Satisfied with instruction on writing effectively.	95%	75%	83%
• Satisfied with instruction on speaking effectively.	95%	75%	83%
• Satisfied with instruction on listening effectively.	95%	100%	100%
• Satisfied with instruction on using computer technology.	81%	100%	100%
• Satisfied with instruction on professional behavior.	100%	100%	100%
• Satisfied with instruction on problem solving.	100%	100%	100%
• Satisfied with instruction on teamwork.	100%	100%	100%
• Satisfied with instruction on continuous professional development.	100%	100%	100%

Table III, cont'd: First-Year Alumni Satisfaction Survey Results for 1999-2000, 2003, and 2006-2007

Program Performance			
• Satisfied with course content	91%	100%	100%
• Satisfied with class size	100%	100%	100%
• Satisfied with computer equipment and facilities	81%	100%	100%
• Satisfied with classrooms	95%	100%	100%
• Satisfied with student club experience	91%	100%	100%
• Satisfied with professional practice experience	76%	100%	100%
• Satisfied with faculty interaction.	100%	100%	100%
• Satisfied with student interaction.	100%	100%	100%
• Satisfied with academic advisement.	62%	75%	83%
• Satisfied with laboratory experiences.	95%	100%	100%
• Satisfied with laboratory equipment and facilities.	86%	100%	100%
• Satisfied with field experiences	85%	75%	83%

Comments:

- Should have more technical writing classes.
- Field experiences should be used more.
- More PHA, FTA
- More everyday safety tips and advice regarding buildings, MSDS, construction
- More coverage of training and delivering classes
- More management/networking with workgroups of various backgrounds

Safety

Program Changes Based on Assessment

During the 2006-2007 academic year, the Safety Program faculty made a series of modifications to the Safety curriculum on the basis of survey data, feedback from alumni, employers, and a review of practice. The net result is that the curriculum provides a stronger preparation for practice and the curriculum is accreditable by the Applied Science Accreditation Commission of the Accreditation Board for Engineering and Technology (ASAC/ABET), the most rigorous accreditation standard for safety degree programs in the United States, and the accreditation held by all of our peer programs. In this section, the changes that were implemented are described. Following the section describing changes in the curriculum that were implemented 2006-2007, there are examples of other modification that have been made in individual courses to address other recommended changes.

Chemistry Sequence

Safety majors are now required to complete CHE 140/141 (an 8-hour sequence of general chemistry), rather than CHE 110/112 (a single 5-hour survey course). Organic chemistry (CHE 220) has been moved to a list of recommended electives. This change facilitates a minor in Environmental Health. Over several years, we've compared the performance of students in HSC 380 (*Fire Protection and Prevention*), a required Safety course, who have completed the CHE 110/112 series (*Fundamentals of Chemistry w/ lab*) vs. students who have completed CHE 140/141 (*General Chemistry*). The students with CHE140/141 perform consistently better in HSC 380. CHE 220 is not a prerequisite to any required Safety courses. Organic chemistry is not needed by Safety majors, except in certain industries, based on feedback from employers and alumni. Safety majors wishing to pursue a career in an industry that requires background in organic chemistry will be guided to that course by Program faculty and the Departmental Academic Advisor.

Human Anatomy and Physiology

Safety majors are now required to take KNR 182 (Human Anatomy and Physiology). A basic understanding of human anatomy and physiology will better prepare the student to understand the effects of toxic materials, impact of personal protective equipment, and heat stress on human performance. Note: KNR 182 has no prerequisites. This background will prepare the students for success in occupational health (HSC 248), industrial hygiene (HSC 359), and ergonomics (HSC 362). KNR 181 is listed as a recommended elective, and will be useful to students who wish to specialize in occupational ergonomics.

Required Safety Courses

The faculty have increased the number of safety courses which Safety majors are required to take, based on feedback from alumni and employers. Students are now required to complete the following additional courses: Ergonomics (HSC 362), Accident Investigation and Recordkeeping (HSC 372), Disaster Preparedness (HSC 378), and System Safety (HSC 385). Details appear below:

- *HSC 362 (Ergonomics)*: ergonomics is an important part of practice and ergonomics-related costs have considerable financial impact on employers.

- *HSC 372 (Accident/Incident Investigation and Recordkeeping)*: accident/ incident investigation and recordkeeping are routine responsibilities of the safety professional.
- *HSC 378 (Disaster Preparedness)*: comprehensive disaster management programs are receiving increased emphasis in the public/private sectors.
- *HSC 385 (System Safety)*: risk-based decision making and analysis of complex manufacturing systems to enhance safety, productivity and profitability are common duties of the safety professional.

Elective Safety Courses

Students now select two of the following three courses, on the basis of discussion with the academic advisor and program faculty: HSC 272, HSC 383, HSC 384. Twelve hours (HSC 362, 372, 378 and 385) from the previous list of electives are now required courses. The three remaining HSC courses (272 (*Construction Safety*), 383 (*Agricultural Safety and Health*) and 384 (*Hazardous Materials Regulation*)) represent professional specialization areas. Change in required electives from 12 hours (select 4 from a list of 8 courses) to 6 hours (select 2 from a list of 3 courses). A review of benchmark peer programs and feedback from alumni/employers supports this change.

- *HSC 272 (Construction Safety)*: the construction industry is attractive to many of our students who want a challenging and well-compensated career. Even if students do not choose to make a career in construction safety, they will likely have involvement with construction projects at their place of employment.
- *HSC383 (Agricultural Safety and Health)*: with its location in an area where agriculture is a major player, ISU was the first university in the US to develop a college-level course in agricultural safety and health. This course is considered an asset by agricultural products companies, such as ADM and insurance companies that specialize in coverage for the agricultural sector.
- *HSC 384 (Hazardous Materials Regulation)*: responsible care efforts and substantial liability for mishandled hazardous materials create career opportunities for students who can guide companies through the regulatory maze.

Professional Practice: Increase required hours from 6 to 9.

- This change is a result of comparisons with benchmark/peer programs and analysis of feedback from alumni/employers. Alumni and employers report that the professional practice experience is an extremely important component of the program. This change also addresses a previous inequity. Students were required to complete 9 weeks of full-time professional practice, for which they received 6 credit hours under 398.04. Under the revised program, we will follow the University guideline (1 week of professional practice employment earns one credit hour).

Other Recommended Electives: (BSC 160; CHE 220; ENG 145.13 or 249; FIL 250; HSC145, 156, 247; KNR 181, 282, 342)

- The new list of required HSC courses and electives discussed previously will allow the graduate to be successful in many industries. However, because Safety graduates can pursue a variety of career specializations in many different

industries, a list of potentially useful (recommended) electives will help them to position themselves for entry into certain career specializations, as well as faster career growth. The student will select from among these electives after consulting the HSC Departmental Academic Advisor.

- *BSC 160 (Microbiology and Society)* and *CHE 220 (Elementary Organic Chemistry)* are listed as prerequisites for some courses in environmental health, and would also be appropriate for students who wish to pursue a career in the pharmaceutical, chemical or food processing industries.
- Communication is an important part of professional safety practice. Depending upon the writing skills of the particular student, *ENG 145.13 (Language and Composition II Business & Government)* or *249 (Technical and Professional Writing)* is an appropriate course.
- Since about 30% of the Safety majors take positions in the insurance industry, *FIL 250 (Introduction to Insurance and Risk)* is a useful adjunct for those students.
- Completion of *HSC 145, 156 and 247* will allow the Safety major to graduate with a minor in Environmental Health.
- The *KNR 181, 282 and 342* sequence is appropriate for students who wish to specialize in industrial ergonomics.

Terrorism as a Loss Exposure

Terrorism (using biological, chemical, radiological or explosive agents) is an increasing concern for the Safety Professional. With the events of September 11, 2001, disaster preparation and planning has been added to the task list for the safety professional. We have increased coverage of terrorism in HSC 378 Disaster Preparation, HSC 381 Occupational Safety and Health Act (specifically Emergency Action Plans), and HSC/AGR 383 Agricultural Safety and Health (particularly bioterrorism).

Management and Training Skills

Data from the revalidation study conducted by the BCSP in 1998-2000 reveal that the safety profession has increased its emphasis on management and training skills. Safety graduates are often promoted to supervisory roles within a few years of graduation. Class projects in HSC 248, 271, 370, 382 and 383 include development of training materials. Coverage of program auditing has increased in HSC 370.

Computer and Communications Skills

Data from the HSC Departmental surveys revealed that computer technology, computer-based skills, and communications skills were areas that needed improvement. The Safety Program faculty members are making increasing use of a variety of current instructional methodologies and technologies. Faculty members may employ lecture/discussion, demonstrations, case studies, discussion and study groups, role-playing, and program learning modules as teaching techniques. All faculty members use PowerPoint presentations to augment lectures. Two of the faculty members store class notes and other handouts on the department's server, so students can have access to the files as needed. One faculty member makes extensive use of Blackboard™ in his course delivery. Another faculty member offers Construction Safety (HSC 272) as an on-line course during the summer term.

With the 2001 arrival of a new faculty member with expertise in system safety, the Department Head authorized purchase of state-of-the-art software for fault tree analysis and preliminary hazard analysis and risk assessment for installation in the student computer laboratories. Computer-based hazard analysis is required as a component of projects in HSC 271, HSC 272, HSC 370, HSC 374, HSC 380, HSC 384, and HSC 385.

Every course requires computer-based written assignments and/or computer-based presentations. One faculty member uses a virtual reality fire investigation as a class project. All required 300-level courses include a project that is based on an assessment of an actual worksite, product, process or system.

Professional Practice

The assessment instrument for the professional practice program has been updated. With the budget-related loss of a full-time Professional Practice Coordinator, the responsibility for implementation of this instrument has reverted to the Safety Faculty. Under the new curriculum, the required hours for Professional Practice have increased from six (6) to nine (9).

Academic Advisement

Student and alumni satisfaction surveys indicated that academic advisement was one area that could be improved. The current academic advisor has been very good about working with the faculty to identify at-risk students for special counseling before their grades fall below 2.0 GPA. The current academic advisor also works more closely with program faculty to develop a plan of study tailored to the student's professional goals and interests.