FINAL PROGRESS REPORT

Occupational Safety and Health Training Project Grant in Industrial Hygiene

TRAINING PROJECT GRANT
CDC/NIOSH Grant Number
5 T02 OH 008624-07

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Date of Report: **September 25, 2012**
Start Date: **07/01/2009**
End Date: **06/30/2012**

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ABSTRACT

The Industrial Hygiene (IH) Program at the University of North Alabama (UNA) was created in the mid 1970's in response to the passage of the Occupational Safety and Health Act of 1970. It is one of the first undergraduate programs of IH established in the nation and the only one in the State of Alabama. The program offers the degree of a Bachelor of Science (or Bachelor of Arts) with a major in IH.

The IH curriculum is designed to prepare professionals for the comprehensive practice of IH. It is broad in scope and includes complementary education in the allied sciences of safety and environmental health. It also contains a very important component of chemistry courses, and offers, without the need of any extra coursework, the option of a double major in industrial hygiene and general chemistry.

The objectives set for the UNA IH Program under the NIOSH Training Project Grant (TPG) during the cycle 2009-2012 were twofold: maintain a healthy level of enrollment and offer an academic program of quality that addresses the current and emerging needs of the profession. Enrollment in the program has remained steady over the years with an upward trend in this three-year cycle (2009-2012) over the previous cycle (2004-2009). With the provision of NIOSH scholarships, a number of high-caliber students have been attracted to the IH field. The level of enrollment has necessitated the consistent offering of IH courses and yielded viable graduation outputs (average of 7.3 graduates per year). In this three-year cycle, the average enrollment of the UNA IH Program was 35.3 students per semester with a range of 30 to 38 students. Stable enrollment at the current level is indicative of great success when records that preceded the TPG award are taken into account (14 students per semester in 2000; 38 in 2012). During this cycle, the Program has graduated 21 students. Placement records show that 15 of these students are employed in the field of occupational health and safety (OH&S). Among these UNA graduates, two are members of under-represented minorities.

The UNA IH Program was evaluated for re-accreditation by the Applied Science Accreditation Commission (ASAC) of ABET, Inc. during the year 2008-2009. The evaluation was outcome-based and yielded no deficiencies or weaknesses (two concerns and three observations). The support of the NIOSH TPG was very influential for the success of this evaluation. The most relevant changes elicited by the ABET evaluation were the additions of a capstone project course and a component of physical agents to the curriculum. Content of IH courses continue evolving to reflect new trends of professional practice. Topics such green technology, leadership in energy and environmental design (LEED) and Bayesian statistics have been incorporated into the curriculum.

HIGHLIGHTS / SIGNIFICANT RESULTS

The objectives of the UNA IH Program under the renewal cycle of the NIOSH-TPG funding (2009-2012) were aimed at maintaining healthy levels of enrollment and continuing a process of quality enhancement to assure a program that is attuned with the needs of the profession and the expectations of program's constituencies.

During this three-year cycle of the grant, important advances have been made in these two fronts. The number of industrial hygiene (IH) majors enrolled in the program has been steady at an average of 35.3 students per year and a range from 30 to 38 students. A very important contributor to IH recruitment is the scholarship program created with funding of the NIOSH TPG. The number of scholarship recipients increased steadily until the academic year 2009-2010, when by a NIOSH request, the eligibility was limited to junior and senior students majoring in IH. This new requirement explains the drop observed in the second year of this cycle (2010-2011). Since our objective still was the recruitment of quality candidates regardless of their classification, qualifying and promising candidates below the junior level were initially supported by departmental scholarships until they reached a classification at which they could apply for NIOSH scholarships.

Enrollment Trends for Past Three Academic Years

	Year 1 (Current Cycle) 2009-2010		Year 2 (Current Cycle) 2010-2011		Year 3 (Current Cycle) 2011-2012	
	Enrollment	NIOSH Scholarships	Enrollment	NIOSH Scholarships	Enrollment	NIOSH Scholarships
Full-Time Students	30	20	38	14	38	16
Part-Time Students	0	0	0	0	0	0
Student FTE[1]	30	20	38	14	38	16

[1] FTE = Full-time Equivalent

Since July 2009, the Program has graduated 21 students (see Table 4 of the Appendix). Placement records show that 15 of these students are employed in the field of occupational health and safety (OH&S). Among these UNA graduates, two are members of under-represented minorities (9.5%).

The evaluation of objectives and outcomes completed for the ABET Self-Assessment Report (2008) revealed only a few shortcomings that were promptly corrected and became effective during this cycle. The following is a list of the most relevant changes that were elicited by the results of the assessment/evaluation process:

A capstone project course (IH 496, one credit-hour) was added to the curriculum. This course must be completed by all IH graduates and must be taken at the last semester of

the senior year. A component on physical agents was added to the course IH 310, Industrial Ergonomics and IH 310L, Industrial Ergonomics Laboratory. This course is now called "Industrial Ergonomics and Physical Agents." The lecture component of this course was increased from 2 to 3 credit-hours. The numbering of IH 411, Industrial Safety was changed to IH 311, and the prerequisites CH 312 and CH 312L (Organic Chemistry II) were changed to CH 311 and CH 311L (Organic Chemistry I).

Concerning continuous improvement, the IH Program outcomes were reviewed by the Program Director to eliminate redundancy and improve concurrence with current demands of professional practice. A group of alumni practicing IH for more than three years were contacted and asked to review a proposed, streamlined version of 25 outcomes. The majority agreed with the outcomes as stated with a few providing suggestions that were added to the current version.

Content of IH courses continue evolving to reflect new trends of professional practice. The course IH 322, Industrial Hygiene Problems, added the topics of green technology, leadership in energy and environmental design (LEED) certification, and sustainable development and stewardship. The course IH 444, Air Sampling, added the topic of risk communication based on Bayesian Statistics and a discussion on the impact of the European "derived no-effect limits" (DNELs) to the practice of IH in the USA.

Instrumentation has been acquired to support a new section of the course IH 310L, now called Industrial Ergonomics and Physical Agents Laboratory. New or replacement instruments include a real-time sound frequency analyzer (Quest, SoundPro SE/DL), a data-logging radiometer with UV probes (Solar Light PMA2100), an ion chamber survey meter (Fluke 415B), a Ludlum Model 3 survey meter with an alpha/beta/gamma detector and a portable area heat stress monitor (wet bulb globe temperature monitor, WBGT Quest). All these instruments were bought with department funding and NIOSH TPG contributions. A DustTrack II aerosol monitor (TSI) and MIRAN infrared analyzer (SapphIRE, Thermo) were acquired with funding of a grant awarded to UNA from the U.S. Department of Health and Human Services, Health Resources and Services Administration (HRSA).

OUTCOMES / RELEVANCE / IMPACT

The NIOSH TPG continues to be instrumental not only in maintaining a healthy level of enrollment at UNA, but also by promoting and rewarding academic excellence through a program of students' scholarships. Fifteen students of the UNA IH program graduated in the last three years have found placement with important companies and are actively contributing to the advancement of occupational health and safety. Four UNA IH students who enrolled in the University of Alabama in Birmingham (UAB)'s Master in Public Health in Industrial Hygiene have successfully completed their degree during this three-year cycle. From a cohort of 108 students who graduated between May of 1994 and May of 2007, 18 have become ABIH-certified (CIH, 17%) and 16 have become BSP-certified (CSP, 15%).

UNA is primarily a teaching institution. Research production is obviously limited by the teaching loads assigned to IH full-time faculty. However, research is important and carried out to foster better education and students' participation in this area of learning. Research production during this cycle yielded a peer-reviewed publication, a presentation and publication at an international conference, two grant-supported studies, and two undergraduate students' projects.

TECHNICAL REPORT

I. Background and Grant Objectives

The University of North Alabama (UNA) is located in a geographical area of significant industrial activity with a potential for further expansion and development. Important national and international companies have chosen this region for expanding their operations attracted by reasonably priced energy (hydro, fossil, and nuclear), economic incentives, and comparatively low costs of living. Newcomers are diversifying and changing the local economy that is becoming less dependent on the production of consumable goods and more oriented to the manufacture of complex, highly valued, durable products. New facilities are bringing modern technology to an area that is already a well-established center for engineering research and the home of a number of high-tech companies (Huntsville-Madison area).

Changes in technology will undoubtedly demand a better educated and prepared labor force. We see the Department of Chemistry and Industrial Hygiene at UNA as one of the contributors for the supply of qualified professionals and a resource for specialized training and service. Understandably, to be competitive we must offer high-quality programs that are relevant to current and emerging technological demands.

Quality assurance through continuous academic improvement requires a sustained effort that is focused on a periodical evaluation of results and on a timely correction of shortcomings. The NIOSH support of faculty release time devoted to program management has been invaluable in advancing the IH Program to the current level of achievements. The program was awarded a NIOSH Training Project Grant (TPG) in 2001, initially for a cycle of three years. The NIOSH-TPG was renewed three times, for an expected total of sixteen years. The program became ASAC-ABET accredited in 2003, reaccredited in 2009, both times with a maximum of six years and without interim reporting requirements. The UNA-IH Program, currently one of five baccalaureate programs in IH accredited in the U.S, has earned a reputation for graduating a reliable pool of highly qualified health and safety professionals who are providing valuable services to workers and employers in this geographical region and beyond.

The NIOSH TPG has also provided a valuable contribution to support a program of academic scholarships. This contribution has been decisive in recruiting and retaining students with good scholastic merits who were competitively sought after by other academic

institutions. After graduation and once employed, these bright IH alumni have helped build a program reputation that is quite solid and advantageous for the upcoming generations of our graduates.

The IH Program at UNA was created in the mid 1970's in response to the passage of the Occupational Safety and Health Act of 1970. Dr. Raymond Isbell, Chair of the Department of Chemistry, anticipated the emerging need for education in occupational health and created a program that was unique, even under current standards. The IH program was created in 1978; the first course descriptions appeared in the 1979-1980 UNA catalog. The name of the department was changed to the Department of Chemistry and Industrial Hygiene in 1987. The nesting of the IH program in the chemistry department influenced its curriculum, which has a strong emphasis of chemistry. Under the current configuration, the IH curriculum requires enough coursework to award students a double major in industrial hygiene and general chemistry. The dual-track configuration has been commended by ASAC-ABET evaluators, NIOSH reviewers, and employers of our graduates.

The major core components of the curriculum are offered by the Department of Chemistry and Industrial Hygiene. The prescribed supporting courses of the curriculum are offered by the Departments of Biology, Computer Science/Computer Information Systems, Mathematics, and Physics and Earth Sciences (see Table 1 of Appendix).

Dr. Crescente E. Figueroa (program director and faculty), Dr. Brentley Olive (department chair and faculty), Mr. Todd Hogue (adjunct faculty) and Dr. Leshan Elliott (adjunct faculty) are direct contributors to the IH program with teaching responsibilities in environmental, health and safety courses. Both tenured members hold doctoral degrees, are certified in industrial hygiene (CIH), and are members of the American Industrial Hygiene Association (AIHA). One of the part-time instructors is certified in IH (CIH) and safety (CSP) and the other holds a Ph.D. in Industrial Hygiene. In addition to the core IH faculty, five full-time faculty members of the Department of Chemistry and Industrial Hygiene provide the needed additional support to the IH curriculum by teaching the other core requirements of the major. All faculty members of department have doctoral degrees. The areas of specialty of the chemistry faculty are analytical (1), organic (2), instrumentation (1) and physical chemistry (1).

Members of our and other academic departments at the university collaborate jointly to foster the education of IH students. For example, Dr. Brian Huffman (Department of Chemistry and IH) contributed to the course IH 444L, Air Sampling Laboratory, supervising IH students in the analysis of air samples by using gas chromatography and mass spectrometry. Dr. Joyce McIntosh (Department of Health, Physical Education and Recreation) contributes to the course IH 310L, Industrial Ergonomics and Physical Agents Laboratory, by leading a practice in the evaluation of activity metabolism. Dr. Brian Thompson (Department of Physics and Earth Sciences) is a lecturer in the course IH 322, Industrial Hygiene Problems with a presentation on LASER safety. Dr. Ronald Smith (Department of English) was a lecturer in the course IH 322, Industrial Hygiene Problems with a presentation and mock practice on technical writing.

Concerning curriculum matters, the IH director obtains continuing advice from the UNA IH Advisory Board and program constituencies. The UNA IH Advisory Board was created in the year 2000 and is constituted by members who represent industry (EH&S management, 4 members; Occupational Nursing, 1 member), Government (OSHA, 1 member) and consultation services (Environmental, 1 member). The board meets at least once a year with attendance of faculty members to discuss the advancement of the program and the opportunities for collaboration (see a copy of the 2011 minutes in the Appendix). Members also give exit interviews to graduating seniors at the end of every semester. The director also seeks periodical advice from employers and alumni in surveys collected for the evaluation of program objectives and outcomes. Constituencies (employers and former students) have been also contacted for obtaining advice on matters that require special or additional input.

The curriculum contains a central component of industrial hygiene and general chemistry with additional education in allied disciplines of occupational safety and environmental compliance. The curriculum is conformed to serve a set of educational objectives and program outcomes set forth by the IH faculty and members of the Program Advisory Board. The program outcomes also comply with expectations set under general and specific criteria by ASAC of ABET for applied science programs in industrial hygiene.

Program Objectives

The mission and objectives of the IH Program were set forth as broad expectations for career achievements by our students a few years after graduation. The current statement of program objectives is as follows: "The IH Program at the University of North Alabama is dedicated to preparing students who are technically competent to fulfill the professional duties in the practice of IH, who understand the challenges of ethical responsibility of the IH profession, and who are properly educated to undertake graduate studies in occupational health and safety. It is expected that, within three years of graduation, students will be able to:

1. Demonstrate high level of knowledge, skills, and technical competency in recognizing, evaluating, and controlling workplace hazards and stressors
2. Provide guidance and significant support to the advancement of health and safety in the workplace
3. Be creative and resourceful by applying science and recognized scientific principles for the diagnosis and control of occupational health problems
4. Act responsibly and ethically by adhering to code of ethics of the industrial hygiene profession
5. Communicate with constituencies effectively by both written and verbal means
6. Demonstrate a continuous and long-term commitment to learning
7. Contribute to the health and safety profession by participating actively in professional organizations, technical committees, or local groups
8. Complete a graduate degree at a Masters level for those choosing to pursue graduate studies immediately following undergraduate graduation."

Program Educational Outcomes

The current statement of program educational outcomes is as follows: "The curriculum is designed to provide knowledge and technical skills in the areas of health and safety while promoting a behavior that is guided by strong principles of ethical responsibility. It is expected that, upon graduation, students of this program will be able to:

1. Identify health-affecting agents, factors, and stressors and how they relate to typical industrial processes, unit operations, and tasks
2. Explain mechanisms of human physiological response, toxicity, and health damage associated with the exposure to industrial agents, factors, or stressors
3. Describe mechanisms of generation and air dispersion of chemical agents in quantitative and qualitative terms
4. Assess dose-response and risk characterization of occupational agents based on toxicological data, mechanisms of exposure and routes of entry
5. Apply principles of epidemiology and statistics
6. Use sources of information for identifying and predicting health, safety, and environmental hazards and stressors
7. Know the scope, application, use, and interpretation of standards that regulate the exposures to chemical and physical agents in the workplace
8. Be proficient in all phases of exposure assessment including the selection of strategies for obtaining representative data; the application of analytical chemistry and microbiology for the collection, handling and analysis of samples; the interpretation of data and the communication of results
9. Apply principles of physics and mathematics to describe mechanical systems, energy sources, and the methods used for evaluating occupational exposures to physical agents
10. Identify, prioritize and make recommendations of applicable options for the control of occupational hazards
11. Apply principles of design and use standard practices for performance evaluations of ventilation systems used for exposure control
12. Select and recommend proper personal protective equipment
13. Describe fundamental aspects of safety and understand the importance of creating effective safety programs
14. Describe fundamental principles of environmental health
15. Understand that occupational and environmental health issues can impact the environment, trade, and economic growth
16. Apply principles of management to health and safety
17. Identify the scope of application, use, and limitations of selected standards and guidelines applicable to health, safety, and environmental practice
18. Understand the importance of information updating and knowledge of contemporary issues

19. Communicate effectively with various constituencies
20. Design programs and training materials for educating constituencies in occupational health and safety
21. Demonstrate familiarity with the code of ethics of the IH profession and the importance of ethical conduct and professional responsibility
22. Work effectively with others and in a multi-disciplinary team
23. Value the need of staying current and the advantage of life-long learning
24. Design and conduct experiments and interpret results from the analysis of experimental data

25 Use current technology and modern scientific tools."

II. RESULTS AND DISCUSSION

a. Enrollment Results

The program maintained a good level of enrollment during the 2009-2012 cycle. The program enrollment, indicated by the number students declaring IH as their major field of studies in the fall semester of each year, yielded averages that were up by 11% with respect to the previous cycle (31.4 students in the 2004-2009 cycle; 35.3 students in the 2009-2012 cycle). Enrollment data of this cycle is given in Table 2 of the Appendix. The enrollment may be increased even further with the current level of resources available at UNA. However, graduation outputs must be scrutinized closely to avoid exceeding the current demands of the job market.

The UNA NIOSH TPG funds a number of academic scholarships that provide support to offset partially the cost of tuition fees. These academic scholarships have been decisive in recruiting and retaining students, particularly those with good scholastic merits who are competitively sought after by other academic institutions that offer them enrollment in more recognizable academic programs than IH. The NIOSH UNA IH Scholarship is awarded to IH students who complete an application (including two letters of recommendation) and who are able to maintain an overall institutional GPA of 2.7, and a GPA of 3.0 in all occupational health and safety requirements over the course of their studies. Recipients must also be enrolled in at least one IH or chemistry course every semester. Scholarship recipients are closely monitored and discontinued from the award if they either fail to meet the scholarship requirements, or have poor performance in critical major core components.

The number of applicants and recipients of the NIOSH UNA IH Scholarship fluctuated during this period due to the restrictions introduced to the awarding process and explained earlier (see Table 3 of the Appendix). During this three-year cycle, the average number of scholarship recipients was at 47% of the total number of students enrolled in the program. A great majority of awardees were able to maintain the scholarships until graduation, with only two discontinued from these awards; one for not meeting requirements of academic proficiency and the other one for changing the major (see Table 3 of the Appendix). An important proportion (almost 50%) of IH students successfully obtaining and

maintaining scholarships (a relatively high GPA for a very demanding major) gives an indication that the IH academic program is effective in recruiting and graduating scholarly advantaged candidates. The enrollment in graduate studies of UNA IH students during the 2009-2012 cycle was low; only one student continued into graduate studies. A possible reason for this result could be that graduating seniors are obtaining good job offers and these are difficult to pass by at a time when employment options for graduating seniors, in general, are scarce.

b. Graduation Rates and Placement Results

Since July 2009, the Program has graduated 21 students (see Table 4). Placement records show that 71% of these students are employed in the field of occupational health and safety (OH&S). Among these UNA graduates, two are members of under-represented minorities (9.5%).

The employment of graduates in recent years has been very successful. The success is reflected by the importance of the hiring companies and the satisfaction expressed by these companies with the performance of our graduates. It is not uncommon for UNA IH graduates to acquire managerial responsibilities in occupational health and safety after only a few years of employment. ALCOA has offered permanent employment to two of our students following searches that include all the undergraduate ABET-accredited programs in IH. After a short period of training, one of these students has been assigned to a manufacturing facility in East Tennessee to manage the IH program. NCH Corporation (Irving, TX) offered a working opportunity to one of our graduates who, for personal reasons, declined the offer. Impressed by this graduate, NCH managers contacted the UNA Program to obtain referrals on a second applicant. The second proposed candidate accepted this offer and, in less than two years, has been promoted to a corporate industrial hygienist position. The Veteran Affairs Hospital System selected a recent graduate as a trainee in OH&S. A recent communication from the program coordinator indicated satisfaction with the performance of this graduate and a desire to see more applications from UNA IH students in future searches. While attending professional conferences and seminars, the UNA IH Program Director has been approached more than once by employers who want to express their satisfaction with the performance of UNA IH graduates employed at their companies (Alliant Corporation, Landmark Environmental Inc., and Wyle Laboratories). Employers' satisfaction is also indicated by recurrent recruitment. A number of companies have offered employment to more than one graduate of the UNA IH program. Bridgestone Firestone has employed three, BP Amoco has employed four, 3M has employed five, NASA has employed three, TVA has employed four, Wise Alloys has employed four, and Wyle Laboratories has employed two.

c. Minority Recruitment

The recruitment of minority students has been less successful, indicating that a more effective recruitment plan must be put in place to attract a more balanced representation among different racial groups. In the 2009-2012 period, the program graduated a total of two minority students who are currently employed in the field of occupational health and safety.

The plan devised for the recruitment of minorities consists of collecting ethnicity data among a group of high school students who are enrolled in high school chemistry and who participate in the annual chemistry competition organized by the Department of Chemistry and Industrial Hygiene. The competition considers five counties in Alabama, four counties in Tennessee and one county in Mississippi and includes high school students enrolled in chemistry courses (first- and second-year). Participating students who declare to be members of a group of under-represented minority will be formally invited to the UNA campus for a half-day activity that will include demonstrations of IH practice and presentations of career opportunities in occupational health and safety.

d. Internships and Undergraduate Research

For more than fifteen years, a number of paid internships and cooperative educational programs in OH&S have been available to the UNA IH students. These opportunities hit a record number in 2011, when more than thirteen different companies solicited applications of UNA IH interns for summer employment. In 2011, a total of 18 students participated in part-time or full-time practicums. Interestingly, while the UNA IH Program struggled finding enough internship applicants, other sister institutions struggled finding enough internship openings for the placement of their students. Internship experience is not mandatory in the IH curriculum; however, internship participation is strongly encouraged. Internships and cooperative education opportunities are advertised on a website managed by the Office of Career Planning and Development (LionJobs). Applications (resume and supplemental materials) can be posted electronically. Interested companies can access this site (via password) to review submissions. Currently, the Office of Career Planning and Development is creating online fillable forms to be used by supervisors in the evaluation of interns' performance. The IH Program Director is reviewing the contents of these evaluation forms to ensure that critical assessment components are not missing.

UNA is primarily a teaching institution. Research productivity is obviously limited by the teaching loads assigned to IH full-time faculty. However, research is important and carried out to foster better education and students' participation in this area of learning. Research production in the last two years includes a presentation in an international conference, a peer-reviewed publication, two grant-supported studies (MESC, Entech), and two undergraduate students' projects.

The study "Evaluation of Slot Loss Factors" was accepted for presentation at the 10th International Conference on Industrial Ventilation (Paris, France, September 2012) and the paper was published in the proceedings of this conference.

The peer-reviewed publication "Hood Entry Coefficients of Compound Exhaust Hoods" (Figueroa, C.; Journal of Occupational & Environmental Hygiene, 8: 740-745, 2011) was a result of two experimental studies carried out by students enrolled in undergraduate research. Results of each of these experimental studies were submitted by the participating students to a competition organized by the Middle Tennessee Section of the American Industrial Hygiene Association (MTS-AIHA, 2008 and 2009) where they received a 'best paper' award. The MTS-AIHA Paper Award Competition considers

OH&S programs in the South Kentucky, Middle Tennessee and North Alabama areas. The UNA IH Program is the only undergraduate program of this group.

The proposal "Determination of the Chemical Evolution of Oil-Dispersant Systems via Sea-Air Exchange" (Olive, B.) obtained funding ($27, 500.00) from BP Exploration & Production, Inc. and is managed through the Marine Environmental Sciences Consortium (MESC), Dauphin Island Sea Lab.

The proposal "Validation of Helium Diffusion Samplers" (Olive, B.) obtained funding through two internal research grants from the UNA College of Arts and Science. This study also received support from the manufacturing company (Entech) through equipment loans.

The study "Consistency in Predicting Risk of Different Noise Evaluation Metrics" (Figueroa, C.) involved the participation of two students who collected sampling data and assessed the likelihood of noise exposures. A research poster with preliminary results of this study was presented at the annual UNA Research Day (2011).

The study "An Independent Validation of the Thermo Scientific Miran SapphIRE" (Olive, B.) was completed in 2010 and helped understand the response and operation of a portable infrared analyzer recently acquired by the Department of Chemistry and IH.

e. Program Quality Improvement

A long-term objective of the IH program was seeking academic accreditation. Accreditation is valued because it provides an opportunity for in-depth, peer-reviewed evaluations of the academic program and demands a sustained commitment to quality improvement. The IH Program at UNA became accredited on August 15, 2003. The UNA IH program became the sixth baccalaureate program in IH to receive accreditation from the ASAC of ABET in the U.S. The initial accreditation review (curriculum-based) was very successful, considering that a very positive assessment was given to the curriculum (no deficiencies, weaknesses, or concerns were found) and a six-year extension for re-accreditation was granted, a rare occurrence for a first-time application.

The UNA IH Program was evaluated for re-accreditation during the 2008-2009 academic year. This time, the evaluation was based on outcome assessment. The final statement submitted to UNA by ASAC of ABET on August 11, 2009, indicated that no deficiencies or weaknesses had been found. This report listed two concerns and three observations. Consequently, the accreditation was again granted for another six years with no interim reporting requirements.

We truly believe that the success on the accreditation and re-accreditation efforts of the IH Program has been strongly influenced by the NIOSH TPG. This grant has partially funded the release of time that the program director has used for managing records, assessing and evaluating program objectives and educational outcomes and seeking input from

program constituencies. The NIOSH TPG has also been a valuable addition to the records presented to ABET evaluators who looked at this accomplishment very favorably.

The evaluation of objectives and outcomes revealed only a few shortcomings which were considered for remedial action. The following is a list of the most relevant changes that were prompted by the results of the assessment/evaluation process:

A capstone project course (IH 496, one credit-hour) was added to the curriculum. This course must be completed by all IH graduates and must be taken at the last semester of the senior year.

A component on physical agents was added to the course IH 310, Industrial Ergonomics and IH 310L, Industrial Ergonomics Laboratory. This course is now called "Industrial Ergonomics and Physical Agents." The lecture component of this course was increased from 2 to 3 credit-hours.

The numbering of IH 411, Industrial Safety was changed to IH 311, and the prerequisites CH 312 and CH 312L (Organic Chemistry II) were changed to CH 311 and CH 311L (Organic Chemistry I).

A streamlined process has been devised for the evaluation of educational outcomes. This process will yield annual results by using direct methods of assessment (graded student work representative of each outcome). Annual averages are monitored to assure compliance.

f. Summary of Faculty Service

Service is expected for appointments, tenure and promotion at the University of North Alabama. An outcome of the IH Program at UNA is that students understand the need for, and the value of, professional service. Therefore, in addition to contractual responsibilities, the faculty of the IH Program has a duty fulfilling an exemplary role that emphasizes personal commitment to values we want to instill in our students. The following is a summarized list of service provided by the IH Program faculty in the last three years.

Dr. Crescente E. Figueroa

Professional Organizations

Full member of the ANSI Z9 Ventilation for Health and Safety Committee

Member of the ANSI Z9.4 Sub-Committee, Ventilation in Abrasive Blasting Operations

Member of the ANSI Z9.7 Sub-Committee, Recirculation of Air from Industrial Processes

Member of the ANSI Z9.8 Sub-Committee, Management, Operation, Testing, and Maintenance of HVAC Systems (non-industrial occupancies)

Member of the ANSI Z9.10 Sub-Committee, Design and Operation of Dilution Ventilation Systems in Industrial Occupancies

Member of the AIHA Engineering Committee

Member of the AIHA Academic Special Interest Group

University Service

Member of the Emergency Preparedness and Safety Committee (2004 – 2007, served as chairperson 2006-2007)

Member of the Multicultural Affairs Committee (2004-2007, served as secretary 2006 - 2007)

Member of the Phi Kappa Phi Scholar Students Forum Committee (2004 - present, 2005 – 2008 served as chairperson)

Member of the Faculty and Students Affairs Committee (2007-2010, served as chairperson 2009-2010)

Member of the Human Subjects Committee (2007 – present)

Member of the University Promotion and Tenure Committee (2010 - present)

Member of the Undergraduate Readmission Committee (2010 – present)

Dr. Brentley S. Olive

University Service

Chair, Department of Chemistry and Industrial Hygiene: 2009 - present

Chair, Faculty Search Committee: 2006-2007, 2007-2008

Chair – Department of Chemistry and Industrial Hygiene Scholarship Committee: 2002- 2009

Safety and Emergency Preparedness Committee – Fall 2007 – Present (Chair 2008-2009 Academic Year)

Chair, Wilson Dam Section Educational Committee: 2000 – 2011 (Coordinator for Annual ACS High School Exam Competition)

Faculty Advisor for the UNA Christian Student Center: Fall 2001-Present

Faculty Advisor for the Student Affiliates of the American Chemical Society: Fall 2000-Fall 2002

Parking and Traffic Committee: Fall 1999 – Fall 2002, 2004 - 2007

Human Subjects Committee – 2003-2004

Community Service

Radon Advisory Board – Lauderdale County Cooperative Extension Radon Awareness Program

FUTURE PLANS AND NEW OPPORTUNITIES

A self-evaluation study will be completed by July of 2014 as part of the ASAC-ABET re-accreditation plan. Employers and graduates will be surveyed during the year

2011-2012 and data will be used for the evaluation of program objectives and educational outcomes (indirect methods).

The IH faculty has participated providing recommendations for the design of the IH teaching facility that will be part of the new UNA Science and Technology Building, whose construction is expected to start during the 2012 – 2013 academic year. The new IH teaching facility will include a lecture area and three laboratories for the teaching of air sampling, physical agents / ergonomics and ventilation.

A series of visits with administrators of the China Institute of Industrial Economics and Management, an institute affiliated with Tsinghua University, lead to a proposal for the creation of a Master of Business Administration degree with a concentration in Occupational Health and Safety (2010). This program would be offered by UNA and attended by practicing Chinese business managers. The OH&S component of this program is intended to highlight the benefits of this discipline in business management and provide knowledge on how to establish effective OH&S programs. The OH&S component of the MBA consists of four courses that would be delivered in a hybrid format of distance learning and traditional classroom lecture. This project is still on hold but has given the benchmark for other potential agreements with other international institutions of higher learning.

UNA is studying the feasibility of adding a degree in engineering technology to the current list of academic options. It is quite possible that this new program will require a supporting component of OH&S. The IH Program could become a service program offering the supporting course(s) in OH&S.

APPENDICES

Appendix 1. Summary of Program Curriculum

A list of the courses that are part of the IH curriculum is given in Table 1. The last column of this table was used to indicate if each course was either a general studies component (GS), a major core requirement (CR), or a prescribed supporting (PS) course. For a few courses of the general studies and prescribed supporting courses, more than one option is acceptable. These courses are:

History: Survey of World Civilization to 1500 (HI 101) and Survey of World Civilization Since 1500 (HI 102) or United States History to 1877 (HI 201) and United States History Since 1877 (HI 202).

Computer Science: Introduction to Computers (CS 110); Intermediate Computer Topics (CS 120); or Computer Science (CS 155).

Mathematics: Pre-Calculus Algebra (MA 112), Calculus for Business and Life Sciences I (MA 121), and Calculus for Business and Life Sciences II (MA 122); or Calculus I (MA 125) and Calculus II (MA 126).

Students must choose one of the following Area II (Humanities and Fine Arts) electives (3 credit-hours each):

AR 170, Art Appreciation
AR 180, Introduction to Art History
AR 281, Art History Survey I
AR 282, Art History Survey II
FR 101, Introductory French
FR 102, Introductory French
FR 111, Language Laboratory
FR 112, Language Laboratory
FR 201, Intermediate French
FR 202, Intermediate French
GR 101, Introductory German
GR 102, Introductory German
GR 111, Language Laboratory
GR 112, Language Laboratory
GR 202, Intermediate German
MU 222, Music Appreciation I
MU 244, Survey of Music Literature
PHL 201, Introduction to Philosophy
RE 221, Old Testament
RE 231, New Testament
SP 101, Introductory Spanish
SP 102, Introductory Spanish
SP 111, Language Laboratory
SP 112, Language Laboratory
SP 201, Intermediate Spanish
SP 202, Intermediate Spanish
GR 201, Intermediate German
TH 210, Introduction to Theatre

Students must choose two of the following Area IV (History, Social and Behavioral Sciences) electives (3 credit-hours each):

EC 251, Principles of Macroeconomics
EC 252, Principles of Microeconomics
ED 299, Human Growth and Development
GE 102, World Regional Geography

GE 260, Human Geography
PS 241, U.S. Government and Politics
PY 201, General Psychology
SO 221, Introductory Sociology

Graduation requirements include the successful completion of the IH curriculum courses with the following number of total credit hours:

General Studies Component:	41 Credit-Hours
Major Core Requirements:	53-61 Credit-Hours
Prescribed Supporting Courses:	40-41 Credit-Hours
Total:	134-143 Credit-Hours

In addition, students must have a satisfactory completion of the Collegiate Assessment of Academic Proficiency (CAAP), a Major Field Test (MFAT), and an IH exit examination.

Table 1. Curriculum

Year; Semester	Course	Category (Credit Hours)			
		Math & Basic Sciences	Professional Program Topics	General Education	Class
Fall, Freshmen	CH 111, Gen Chem I	3			CR
	CH 111L, Gen Chem Lab. I	1			CR
	EN 111, English Composition			3	GS
	HI 101 or 201, History			3	GS
	MA 112, Pre-Calc Algebra	3			PS
	Area IV Elective I			3	GS
Spring, Freshmen	CH 112, Gen Chem II	3			CR
	CH 112L, Gen Chem Lab II	1			CR
	CS 110, 120 or 155, Computer Science	3			PS
	EN 112, English Composition			3	GS
	HI 102 or 202, History			3	GS
	COM 201, Fund Speech			3	GS
Fall, Sophomore	BI 111, Gen Biology	4			PS
	CH 311, Organic Chem I	4			CR
	CH 311L, Org Chem Lab I	1			CR
	EN 231, Lit Western World			3	GS
	MA 121, Calculus for Bus & Life Science I	3			PS
	IH 301, OHS		3		CR
Spring, Sophomore	BI 241, Phys & Anatomy I	4			PS
	CH 312, Organic Chem II	4			CR
	CH 312, Org. Chem II Lab II	1			CR
	MA 122, Calculus for Bus & Life Science II	3			PS

Year; Semester	Course	Category (Credit Hours)			
		Math & Basic Sciences	Professional Program Topics	General Education	Class
	EN 232, Lit Western World			3	GS
	Area II Elective			3	GS
Summer	IH 322, IH Problems		3		CR
Fall, Junior	BI 242, Phys & Anatomy II	3			PS
	CH 321, Quantitative Analysis	3			CR
	CH 321L, Quant Analysis Lab	2			CR
	IH 311, Industrial Safety		3		CR
	PH 251, Technical Physics I	3			PS
Spring, Junior	IH 333, Toxicology		3		CR
	IH 310, Ind. Ergonomics & Phys. Agents		3		CR
	IH 310L, Ind. Ergonomics & PA Lab		1		CR
	MA 147, Statistics	3			PS
	PH 252, Technical Physics II	4			PS
	Area IV elective II			3	GS
Fall, Senior	BI 307, Microbiology	4			PS
	CH 341, Physical Chemistry	4			CR
	CH 341L, Phys Chemistry Lab	1			CR
	IH 422, Control of Airborne Hazards		3	3	CR
	IH 422L, Control of AH Lab		1		CR
	IH 490, Special Topics OHS		3		CR
Spring, Senior	CH 322, Instrumental Analysis	3			CR
	CH 322L, Intr. Analysis Lab	2			CR
	CH 465, Environmental Regulations		3		CR
	IH 444, Sampling Methods in IH		3		CR
	IH 444L, Sampling Methods Lab		1		CR
	IH 496, Capstone Project		1		CR

All industrial hygiene core requirements are offered at least once every year. The two topics included in IH 490, Special Topics in Occupational Health and Safety, are rotated and offered every other year. The course-topic, Management of Health and Safety Programs, is offered in the fall semester of even years and the course-topic, Hazardous Waste Operations and Emergency Response, is offered in the fall semester of odd years.

Appendix 2. Tables

Table 2. Enrollment Trends for Past Five Academic Years, IH Program, University of North Alabama

	Year 2009-2010	Year 2010-2011	Year 2011-2012
Full-time Students	30	38	38
Part-time Students	0	0	0
Total	30	38	38

Enrollment numbers are the number of students declaring IH as their major in the fall semester of their academic year**.**

Table 3. Number of NIOSH IH Scholarships, IH Program, University of North Alabama.

Year	Fall /Spring Semester	Students Discontinued (*)
2009-2010	20	0
2010-2011	14	1
2011-2012	16	0

(*) Students were discontinued from the scholarship because either not meeting the requirements or changing their major field of studies.

Table 4. Number of Graduating Seniors, IH Program, University of North Alabama.

Year	Number of Graduating Seniors	Number of Graduating Seniors who Continued Graduate Studies
2009-2010	10	0
2010-2011	3	2
2011-2012	8	0

Table 5. Program Graduates

Program Graduates	Year of Graduation	NIOSH IH Scholarship	Initial or Current Employment/ Job Title/ Other Placement
Uhlman, Robert Van	2009	NO	Senior EH&S, Kinder Morgan
Abston, Jill	2009	YES	Industrial Hygienist, ALCOA

Program Graduates	Year of Graduation	NIOSH IH Scholarship	Initial or Current Employment/ Job Title/ Other Placement
Farris, Gary Ross	2009	YES	UAB, Medical School
Frederick, Jonathan	2009	NO	EHS Engineer, 3M
Proctor, Willie	2009	YES	UAH, Chemical Engineering
Casteel, Lacy Beth	2010	YES	Industrial Hygienist, Qualitest Pharmaceuticals
Davis, Christopher S.	2010	YES	H&S Consultant, Alliant Corporation
Hunter, Michael Brannon	2010	YES	Operator, TVA Browns Ferry
Johnson, Terry D.	2010	YES	Safety Manager, Clayton Supply Division
Salcedo Lomeli, Patricia B.	2010	YES	IH Trainee, VA Hospital System
Green, Josh Tyler	2010	YES	Chemistry R&D, Forsythe and Long Engineering
Morrison, Thomas James	2011	NO	Industrial Hygienist, Little John Engineering
Keller, Daniel Scott	2011	YES	H&S Management, Daikin America
Bailey, Robert Louie Jr.	2011	YES	Boeing
Haynes, Christopher Davis	2011	YES	EH&S Engineer, The Hon Corporation
Jerrolds, Bradley Edward	2011	NO	Unemployed
Patterson, Kyle Anthony	2011	YES	Industrial Hygienist, BP Amoco
Hunt, Samantha Brooke	2012	YES	Unemployed
Kelley, Matthew Lee	2012	YES	Health and Safety, ENSAFE
Rowell, Theus O.	2012	YES	Industrial Hygienist, ALCOA
Smith, Jacob Andrew	2012	YES	Industrial Hygienist, 3M