DIRECT FROM AEHAP

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A Fork in the Road for Environmental Health Workforce Development and U.S. Public Health

Editor's Note: In an effort to promote the growth of the environmental health profession and the academic programs that fuel that growth, NEHA has teamed up with the Association of Environmental Health Academic Programs (AEHAP) to publish two columns a year in the *Journal*. AEHAP's mission is to support environmental health education to ensure the optimal health of people and the environment. The organization works hand in hand with the National Environmental Health Science and Protection Accreditation Council (EHAC) to accredit, market, and promote EHAC-accredited environmental health degree programs. AEHAP focuses on increasing the environmental health workforce, supporting students and graduates of EHAC-accredited degree programs, increasing diversity in environmental health degree programs, and educating the next generation.

This column will provide AEHAP with the opportunity to share current trends within undergraduate and graduate environmental health programs, as well as their efforts to further the environmental health field and available resources and information. Furthermore, professors from different EHAC-accredited degree programs will share with the *Journal's* readership the successes of their programs and the work being done within academia to foster the growth of future environmental health leaders.

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Introduction

It is widely understood by public health professionals that the practice of environmental health prevents disease. Accordingly, the profession is an honorable and noble profession that often is not fully appreciated until a public health crisis arises. With new and returning public health threats of environmental, domestic, and global significance gaining notoriety, interest in addressing these threats among our nation's college-entering population is on the rise as public health is one of 11 hot college majors according to *U.S. News & World Report* (Gandel & Haynie, 2013).

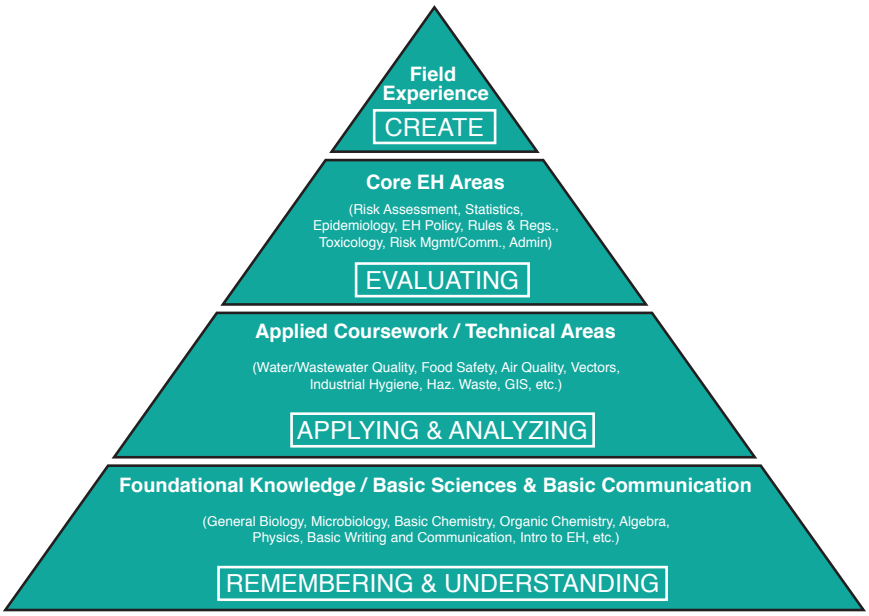
Despite noticeable interest in the scientific aspects of the public health profession by current and entering students, the diversity of content delivered by various academic programs, as well as the lack of nationwide program availability, has drawn attention by health policy researchers (Tarasenko & Lee, 2015). To paraphrase Robert Frost and Rachel Carson, these entering and undecided college students driven towards a career in environmental public health stand now where two roads diverge. One road—a solid road to a career in disease prevention through environmental health—is built upon a foundation comprised of science and technical expertise. The other road—the road more frequently traveled—provides beautiful signage advertising the same career destination, but often leads to dead ends or arduous detours due to a weak foundation not capable of meeting the demands of an increasingly complex domestic and global environment.

The National Environmental Health Association (NEHA) Committee on the Future of Environmental Health (1993a) offers the following definition of environmental health:

> Environmental health and protection refers to protection against environmental factors that may adversely impact human health or the ecological balances essential to long-term human health and environmental quality, whether in the natural or human-made environment.

FIGURE **1**

A Depiction of the Alignment of Select National Environmental Health Science and Protection Council Degree Program Requirements With Bloom's Taxonomy of Educational Objectives



> These factors include but are not limited to air, food and water contaminants, radiation, toxic chemicals, wastes, disease vectors, safety hazards, and habitat alterations. (p. 29)

The field is comprised of environmental health professionals who are trained in technical areas, as well as areas including epidemiology, toxicology, statistics, risk assessment, policy, and management (NEHA Committee on the Future of Environmental Health, 1993b). The field is also heavily reliant on other professionals who support or directly work in this field such as epidemiologists, geologists, climate scientists, social scientists, health educators, biologists, attorneys, and law enforcement officers. To be an active participant in the environmental health discipline and most supporting professions in related disciplines, professionals are generally required to have a firm foundation in science and an understanding of environmental health technical areas.

Entry-Level Requirements

Aligning with the need for science-based environmental health practitioners, entry-level requirements for many state and local health agencies generally require a minimum of a Bachelor of Science (BS) degree including at least 30 semester hours (45 quarter hours) of science. In at least 33 states, a credential, such as a registered sanitarian or registered environmental health specialist, is required (Harvey, 2014), with many of these states requiring at least 30 hours of science as part of a BS degree to be eligible to take the credential examination.

For persons wishing to enlist as an environmental health or environmental science officer in one of the nation's uniformed services (e.g., U.S. Public Health Service [USPHS], U.S. Army, U.S. Navy, etc.), applicants will find they need a BS degree in environmental health from a program accredited by the National Environmental Health Science and Protection Accreditation Council (EHAC) or a master of public health degree in environmental health with at least 30 semester hours of science or a master's degree in environmental health from an EHAC-accredited graduate program (Commissioned Corp of the USPHS, 2016; U.S. Army, n.d.; U.S. Navy, n.d.).

Developing Environmental Health Problem Solvers

Navigating the complex and ever-changing world of local, national, and global environmental health is difficult for many current practitioners, and is more so a challenge for entering professionals. Modern complex problems require innovative solutions, but also require astute professionals who can recognize and assess emerging and returning threats to public health. As a whole, U.S. higher education has come under fire for inadequately enhancing critical thinking skills in their graduates despite 99% of faculty saying that developing a student's ability to critically think is one of the major goals of an undergraduate education (Arum & Roska, 2011).

In EHAC-accredited BS programs in environmental health, students are expected to critically think about and recognize environmental health problems throughout their program. Accordingly, EHAC programs have a structured curriculum in line with Bloom's Taxonomy of Educational Objectives to enhance critical thinking abilities. In Bloom's Taxonomy, higher-order thinking skills are indicative of critical thinking. Bloom's Taxonomy orders learning objectives from simple categories to more complex categories, with an understanding that successful higher-order cognition (e.g., evaluation and creation of new knowledge) requires cumulative mastery of lower-order categories (i.e., remembering, understanding, application, and analyzing) (Krathwohl, 2002).

The 31 programs accredited by EHAC (n.d.) have curricula that ensure each program is providing students with a firm foundation of background knowledge in the basic sciences and environmental health technical areas (Figure 1). Education researchers indicate that for critical thinking skills to be developed, a foundation built upon background knowledge is needed (Kennedy, Fisher, & Ennis, 1991; Lai, 2011; Willingham, 2008), and some researchers indicate it is more so possible with domain-specific knowledge (i.e., technical expertise) (Bailin, 2002; Bailin, Case, Coombs, & Daniels, 1999; Facione, 1990).

For practicing local environmental health, domestically or abroad, the environmental health practitioner is expected to have a comprehensive understanding of environmental health and protection (Ameri-

can Public Health Association [APHA] & National Center for Environmental Health [NCEH], Centers for Disease Control and Prevention [CDC], 2001). The higher order competencies are most achievable after one has been immersed in the application of the practice, which is done through the applied and technical areas of the EHAC curriculum. By teaching environmental health core competencies related to risk assessment and epidemiology (APHA & NCEH, CDC, 2001), students gain valuable knowledge and experience applying their technical knowledge for evaluating and characterizing exposure-response relationships and characterizing risks. These skills inform and lead to risk communication, intervention, and management strategies, and are all, accordingly, higher-order skill sets. These problem solving competencies are more fully developed in graduates when they are built upon the strong technical and scientific foundations found in EHAC programs.

Field Experiences and Problem-Based Learning

Field experiences in environmental health often involve the creation and/or evaluation of existing environmental health programs at the field experience host agency or company. All 31 EHAC-accredited programs require every student to participate in a field experience in the profession. The classroom, lab, and field courses offered by the respective universities are fully complemented by real-world practical experiences in industry, local health departments, and government agencies.

Case Study: Jayson Clinger, The University of Findlay

Now in his sixth internship in just over four years, Jayson spent his summer at the BP-Husky Refinery in Toledo, Ohio (see photo above). Reflecting on his first internship at Honda of Marysville (Ohio), Jayson stated, "I gained a lot of problem solving skills from my first internship." He went on to say, "Students can recognize a lot of problems in different settings and come out knowing many regulations and major hazards from doing internships." In his classes at The University of Findlay, he felt that "the courses in technical areas, notably industrial hygiene, occupational health, regulations, chemistry, and physics were helpful for getting a general background. A decent number of the classes provided me with hands-on training with pumps and other equipment." In speaking about the importance of internships, Jayson said, "The internships, they are where I learned the most. And all my classmates pretty much get hired from their internships, too." The internships are also a lucrative experience as he explained, "I never heard of anyone else in other programs getting these kinds of good paying internships."

Jayson Clinger at his internship at the BP-Husky Refinery in Toledo, Ohio. Photo by The University of Findlay.

For fall 2016, Jayson is enrolled in a fully-funded graduate program at the University of Iowa's College of Public Health in the National Institute of Occupational Safety and Health-supported Heartland Center for Occupational Health and Safety.

Case Study: Candice Graves, Eastern Kentucky University

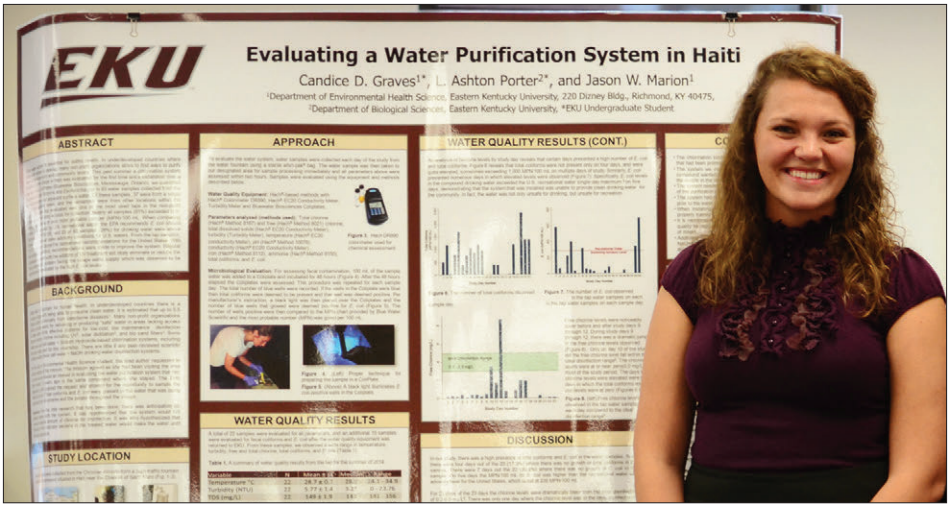
Candice (Candi) Graves graduated from Eastern Kentucky University (EKU) in 2015 after completing an internship in Wisconsin through the USPHS Junior Commissioned Officer Student Training and Extern Program. Candi was one of over 20 environmental health interns attached to the Indian Health Service (IHS) and earned approximately $2,000 per month as an ensign. The experience, along with her prior field experience as a mission worker in Haiti, has inspired her to seek a career with the USPHS or IHS.

As a student at EKU, she investigated a water treatment system designed and installed by a U.S. nongovernmental organization (NGO) at a mission hospital in Haiti (see photo on page 43). The auto-chlorination system supposedly functioned in the U.S. but was never assessed in Haiti after installation. Upon inquiring about the lack of water quality assessment, Candi sought answers, obtained water quality assessment materials, and then observed concerning results. Drinking water samples had mean levels of *E. coli* of 110 CFUs/100 mL, and one sample contained 694 CFUs/100 mL. Candi tactfully sounded the alarm. Backed with chlorine data that showed median free chlorine levels of 0.04 mg/L and undetected levels in many samples, Candi reached out and got a UV system installed by an engineering-focused NGO from Clemson, South Carolina. The UV system was assessed and resulted in no *E. coli* in the finished water.

Reflecting on this experience, Candi stated, "I learned the methods for all those tests in my water class. From the experiences our faculty shared with us, I was able to deal with the not-so-ideal situation that was going on with the water purification system. They taught me how to deal with situations in a professional manner and I really think that made a difference when it came down to solving the problem."

Conclusions

Students desiring to enter the environmental health profession should be mindful of the importance of which fork in the road to take in terms of seeking a science-based



Candice Graves presents her research conducted on a water treatment system in a Haitian mission hospital. Photo by Jamie Hisel, Eastern Kentucky University.

degree or one offering little science. There are many paths to a career in environmental health, and the diversity of the professionals working in environmental health enhances the profession and public health. A student seeking a direct and expedient route, one that allows for an opportunity to jump right into the profession with a BS degree, however, should consider a degree from an EHAC-accredited school. EHAC-degreed students also excel in graduate and professional degree programs due to the strong foundation in both basic science and core public health disciplines.

Lastly, university faculty, deans, and chairs wishing to actively engage in global health, One Health, or the ever important local environmental health practice are encouraged to seek accreditation through EHAC. Program leaders and faculty for new or envisioned environmental health programs are encouraged to contact AEHAP for assistance (www.aehap.org). AEHAP has volunteer mentors that can assist you in aligning your program's curriculum with EHAC criteria.

Our communities, locally and globally, need and expect more of us. Together, as universities and practitioners, we can train future generations of environmental health professionals to be even better than we are today.

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