

An Examination of the Educational Needs for Environmental Health and Protection

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The practice of environmental health and protection is at a crossroads. Expanded responsibilities throughout this nation's agencies, prescriptive statutory mandates, and shrunken resources for fundamental public health services have combined to change the infrastructure and the workforce. This article presents the results of the Crossroads Colloquium, a forum of leaders in environmental health, convened to address the educational needs of the workforce. Major recommendations from the Crossroads Colloquium include redefining training by moving from discipline-specific to multidisciplinary training, developing collaborations among agencies, academia, and industry for training and education, and providing opportunities ranging from distance education to graduate degree programs

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More than 25 years have passed since the celebration of the first Earth Day. That day, national commitment to protection of the environment and awareness of environmental health issues was affirmed. This made way for the creation of the U. S. Environmental Protection Agency (EPA) and similar state agencies designed to develop, implement, and enforce resultant legislation. Programs that traditionally had fallen under the purview of state and local public health agencies were incorporated into the emerging environmental health and protection agencies, resulting in a web of agencies responsible for environmental health policy, planning, and regulation at both state and federal levels. | According to the 1988 Institute of Medicine report, *The Future of Public Health*, this has resulted in "fragmented responsibility, lack of coordination, and inadequate attention to the public health dimensions of environmental issues. "2 (P. 12)

The changing environmental health and regulatory structure also created a personnel shift from public health agencies to a myriad of other agencies. This has resulted in a diversified workforce in which environmental professionals are trained in law, engineering, business, and the natural sciences, with few agency professionals having public health training.' According to the EPA Science Advisory Board, "[professionals] have not been trained to assess and respond to environmental problems in an integrated and comprehensive way" and that "this narrow focus is not very effective in the face of intermedia problems that have emerged over the past two decades and that are predicted for the future."

The practice of environmental health and protection is at a crossroads. The federal statutes that were designed to protect the environment and public health have not provided for training of practitioners and future leaders in the field. At the same time, diminishing budgets at the state and local levels have forced cutbacks where the training needs are the greatest. Burke, Shalauta, and Tran recognized that the change in environmental health and protection services "presents a growing challenge to the schools of public health and others in the public health community to assure that environmental health professionals have the necessary training to address public health issues in environmental regulation and decision making. "5(p. 22)

Recognizing this critical juncture for the practice of environmental health and protection, the Health Resources and Services Administration (HRSA) sponsored a project to bring together representatives of government, academia, and professional associations to address training of environmental agency officials at both the state and federal levels. This project builds on the foundations of previous initiatives supported by The Pew Charitable Trusts and HRSA to evaluate the environmental health and protection infrastructure in the United States. *The Crossroads Colloquium: An Examination of the Environmental Health and Protection Education Needs* (the Colloquium) resulted from these studies, which recommended that "An Environmental Health Education Summit should be convened, including leaders from government, business, and academia"^(p 21) with the goals of unifying the field of environmental health, identifying support for needed training and education, and developing a national framework for sustainable educational partnerships.

Goals and Objectives

This project convened The Colloquium, which brought together leaders in environmental health from diverse federal and state agencies, academia, and private foundations. The federal agencies represented included the EPA, Food and Drug Administration (FDA), Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention (CDC), Department of Agriculture, Department of Energy, Occupational Safety and Health Administration (OSHA), and the United States Public Health Service (PHS). State-level participation included the State of California Environmental Protection Agency, the Oklahoma Department of Environmental Quality, and the Arizona Department of Environmental Quality. This diversity represents a wide range of agencies charged with environmental health and protection authorities while the participants represent a broad range of educational disciplines, from epidemiology and toxicology to law and public policy.

The charge for the Colloquium participants was to:

- Consider the current educational and training needs of their agency workforce.
- Determine desired competencies for environmental health and protection practitioners.
- Develop a blueprint for approaches that address the multidisciplinary educational needs of the diversified environmental health and protection workforce.

Methods

To provide a framework for the Colloquium, the participants were provided with a set of readings describing changes in environmental health and protection authorities among state agencies and challenges for the public health workforce. Participants also were asked to consider a series of general background questions from the perspectives of their agency/organization to prepare for discussions at the Colloquium. Following are the questions that they considered:

1. In light of the expanding number of agencies at all levels of government involved in environmental health and protection, is there a need for improving public health training of the environmental workforce?
2. What are the typical educational backgrounds and what are the educational needs of professionals in your agency?

3. Is there a need to develop or enhance public health-based competencies in the workforce?
4. What kinds of training and education would you recommend?
5. What are the existing approaches for educating the workforce and how can they be enhanced?
6. Are there new approaches that need to be developed (i.e., degree programs, continuing education, distance learning, educational partnerships)?
7. How can these approaches be implemented? (i.e., Is there a need for new partnerships? What are the sources of support? What are the roles of the agencies, academic institutions, foundations, private sector?)

Defining the Field of Environmental Health and Protection: A Broader View

Environmental health means different things to different people. This fact is obvious when one considers the wide range of responsibilities of public health practitioners in environmental health. jobs run the gamut, from restaurant inspection to nuclear safety, from rodent control to hazardous waste cleanup. To communities and decision makers, environmental health and protection also includes a broad range of political, social, and economic considerations.

During preliminary discussions at the Colloquium, it was recognized that there was a need to concur on a common definition for environmental health and protection. As one participant remarked, "environmental health needs to be more than a `buzzword.' There has to be enough of an understanding [of what it is] so that people know who to turn to" with questions about environmental risk issues.

An "environmental web" of agencies is responsible for administering environmental health and protection programs and their organizational settings and regulatory mandates generally have defined the field. Colloquium participants agreed on a broader definition of environmental health and protection, which cuts across agency authorities.

This broader perspective is captured in the following description provided in "The Report on the Future of Environmental Health":

Protection against environmental factors that may adversely impact human health or the ecological balances to long term human health and environmental quality, whether in the natural or human-made environment. These factors include, but are not limited to air, food and water contaminants; radiation, toxic chemicals, wastes, disease vectors, safety hazards, and habitat alterations.³(p 28)

This definition was viewed as encompassing both the environmental health and regulatory aspects of the field and recognizes the continuum among them, which ultimately provides for protection of human health. The Colloquium participants recognized that social and political processes also are inherent to environmental health and protection.

Refining the Questions

Following preliminary discussions at the Colloquium, participants reviewed the original question list and refined the focus of discussion to five questions. These questions, listed in the box, "The Critical Questions," were regarded as critical to the development of an educational and training strategy for current and future agency environmental health and protection practitioners.

Results and Findings

General findings

Despite the diverse backgrounds of the participants, including different agencies with different mandates, a common thread emerged among the Colloquium participants. There was a consensus that a dramatic need exists for improving the environmental health education and training of the health and environmental agency workforces. From field workers to decision makers, from secondary schools to postdoctoral education, improvements in education and training are critical to the continued success of the nation's environmental health and protection programs.

In addressing the following questions, the Colloquium participants called for a practical approach and emphasized that the focus should be on unifying existing efforts and gaining support of the various stakeholders in a cooperative and collaborative manner.

Question 1: What are the training and educational needs for the environmental health and protection workforce?

Recommendation---Redefine approaches to training: Moving from discipline-specific to multidisciplinary training. Just as the practice of environmental health has been redefined as a multidisciplinary field, the training of practitioners to address emerging issues also must be redefined. It is important to consider the tremendous diversity of personnel involved in the many aspects of environmental health and protection. Colloquium participants noted that many practitioners in environmental health and protection, including decision makers, are trained in a specific discipline such as geology, engineering, biology, chemistry, economics, law, or political science. Although skills in specific fields are critical to successful program implementation, multidisciplinary educational programs are needed for providing practitioners with the ability to view problems with a broad perspective that ultimately sees the protection of public health as the goal. A broad core knowledge complemented by specialized advanced training is analogous to that of medical education, in which a core of knowledge is required for all students in medical school after which the physicians may choose to specialize in a given field of interest. Although multidisciplinary training alone will not assure the improved application of public health approaches in environmental protection, improving the expertise of the workforce is an essential step toward integrating the core functions of public health into environmental decision making.

Recommendation---Provide experiential learning: A practical approach. Ten years ago, it was recognized in the Institute of Medicine (IOM) report that "the provision of public health services is uneven and needs strengthening across the nation, partly due to a lack of well-qualified professionals 112(p.129) and "some schools (of public health) have become somewhat isolated from public health practice. "2(p.128) These findings underscore the isolation of public health education from public health practice. This is particularly acute in the field of environmental health and protection, where the emphasis on research in schools of public health has reduced the opportunity for students to develop practical, hands-on skills.

Colloquium participants concurred with the IOM report and acknowledged that few improvements had been made in the years since the report was released. Currently, most personnel are trained on the job. Traditional discipline-based education does not address the realities of current environmental health practice. Cross-discipline experiential training opportunities, such as those present in programs accredited by the National Environmental Health Science and Protection Accreditation Council (EHAC), must be developed more fully to prepare more personnel for contemporary environmental health practice. Involvement of the practice community in teaching, the development and support of internships, case study training, and community-based educational opportunities will build necessary competencies and will benefit agencies and schools alike. At the same time, students will gain an appreciation for the interplay of science, politics, economics, law, and public values that define efforts in environmental health and protection.

Recommendation---Emphasize public health approaches. The federal regulations that dictate requirements for environmental health and protection have emphasized legal and technological controls. Current programs in environmental protection regulate end-of-pipe releases of contaminants to the environment and emphasize clean-up strategies. Permitting and compliance have become the indicators of environmental quality and serve as surrogate indicators of environmental health. Despite tremendous public concern about health effects from environmental pollutants, these approaches do not support development of surveillance systems to evaluate impacts on community health. As a result, a distressingly small minority of environmental personnel is trained in the basic sciences of public health.

The training of environmental professionals should include a basic understanding of the core functions of public health: assessment, policy development, and assurance. A public health approach including epidemiology, health surveillance, and exposure surveillance can serve a valuable role in expanding the knowledge base on exposures and human health outcomes. Evaluation of actual human exposures and understanding the population health effects can guide prevention efforts and policy making. The need for this training is particularly acute for those charged with evaluating environmental risks and implementing risk management strategies aimed at protecting public health.

Recommendation---Recognize the importance of stakeholder communication. The Presidential/Congressional Commission on Risk Assessment and Risk Management recently has developed a model for addressing risks to the environment, public health, and worker

health with stakeholders at the core of the decision-making process.' Environmental health and protection involves the interaction of political, social, and environmental factors and practitioners must recognize the importance of stakeholder involvement. The success of any environmental management approach depends on the support of stakeholders, from community members to regulated industries. The education of environmental professionals must include an appreciation of the essential role of the community in environmental decision making as well as the development of communication skills to reach diverse stakeholders.

Recommendation---Secure resources for educational and training programs. Limited funding is the greatest impediment to successful implementation of educational and training programs for professionals in environmental health and protection. Historically, graduate students in environmental health and protection were trained largely under grants from the Public Health Service or other federally sponsored programs. Many Colloquium participants acknowledged that they had trained under fellowships that allowed them to earn degrees on a full-time basis without the need for seeking additional outside funding to pay for their education and living expenses. In recent years, the costs of graduate education have escalated while training support has decreased dramatically. Students either are forced to carry excessive debt to cover the costs of their education and living or to work in order to support themselves through their training. This has great disadvantages because many students are unable to bear the debt burden and are pursuing other fields in which funding is available more readily. Many current students are forced to work, often at unrelated jobs. In many graduate programs, this has resulted in an increasing percentage of students prolonging or interrupting their studies. This is a burden for both students and faculties in the schools and limits the number of trained individuals entering the environmental health and protection workforce.

Among working professionals, similar training disincentives also exist. Limited funding is available in health and environmental agencies to cover the costs of educational and training programs. Workshop participants concurred that given the tremendous competing needs, assuring that money is available for training is not a priority. There are also issues concerning the practicality of training. Many agencies, particularly at the state and local level, are not staffed adequately. They can ill afford to "lose" valued employees to educational programs. Accessibility to the educational system is limited largely by money, time, and practicality. Agencies are focused largely on their immediate needs and have not made long-term investments in their workforce. Development of financial incentives for both personnel and agencies is key to meeting the educational needs of the workforce.

Question 2: What are the competencies needed for improving environmental education?

The multidisciplinary nature of the field of environmental health and protection has brought together students and practitioners with a wide variety of educational and practice backgrounds. To establish cohesive and complementary approaches for solving this nation's environmental health problems, there is a need to establish a broad-based curriculum that includes core competencies. Areas of more specialized training where

students may choose an area of emphasis or expertise when core competencies have been achieved should remain a part of the curriculum. The Public Health Faculty/Agency Forum first described the need for developing a workforce skilled in various disciplines and defined competencies for practitioners of environmental health and protection "to raise the level of future practice."8(p.89) The competencies defined then have been refined in this project and provide the fundamental skills that are desired for leaders and practitioners in environmental health and protection agencies. The Colloquium participants recognized that one person cannot be skilled in all of the subject areas and instead intended that professionals in the field have some knowledge, understanding, and appreciation for each of the listed subject areas.

The competencies are divided into four broad categories: Technical Sciences, Public Health Sciences, Political and Social Sciences, and Risk Sciences. Within each of these categories are listed more specific skills that are desirable for a practitioner of environmental health and protection. Under technical sciences are listed basic sciences, environmental sciences, and environmental engineering/sustainable technology. These skills and curricula provide a strong scientific foundation necessary to understand the basis of environmental health sciences. In addition, courses in environmental fate and transport, sampling, and exposure evaluation are important for understanding movement of chemicals through the environment and potential pathways for human contact. Public health sciences lists epidemiology of acute and chronic diseases associated with environmental and occupational stressors, biostatistics, and communicable disease/ chronic disease. The public health sciences provides a basis for understanding and evaluating disease in human populations. Political and social sciences include political skills, managerial and organizational skills, economic considerations/ decision theory, environmental law, ethics, and cultural skills. Political and social sciences provides a foundation for understanding the policy process, which is essential to the formulation and implementation of environmental health and protection programs. Cultural skills provide understanding of the human context in which the policies will be implemented. Risk sciences includes risk assessment skills, risk management skills, and risk and other communication skills. Risk sciences provide a framework for managing and organizing data and serves as an increasingly important tool in the environmental health and protection policy process. These skills represent a comprehensive list of the desirable competencies for a practitioner of environmental health and protection. Table 2 also lists core curricula that would help to prepare a student in developing the desired skills.

Colloquium participants recognized that such extensive education and skill development may be achieved through various means including formal course-work for degree programs, certificate programs, on-the-job training, distance learning, and professional continuing education.

Question 3: Who should be trained?

Early introduction to health and environmental sciences is essential to improve the level of public knowledge, develop interest, and attract talented students to the field.

Ideally, introduction to the basic competencies of environmental health and protection begins in the elementary and secondary schools. The scope of this meeting, however, focused on college, graduate, and continuing education for the existing and future environmental health and protection workforce in the state and local agencies other than health departments. There was a clear consensus that training for all levels of educational and work status is necessary to provide a well-trained workforce for the nation's environmental health and protection programs.

The target audience for education ranges from entry-level personnel such as technical field staff to science and policy leaders. The educational approach should build on the defined competencies. It includes all levels of postsecondary education, from the bachelor degree level to postdoctoral training, with recognition of the importance of internship exchanges and continuing education throughout.

Educational content will vary with level of responsibility. It is envisioned that entry-level environmental health practitioners should be trained at the undergraduate level and have competencies in the basic environmental health and protection sciences and introductory health policy and management. Career professionals in environmental health and protection should be trained at the graduate level to develop a greater depth of knowledge in the sciences and policy. Current science and policy leaders need flexible opportunities for training and education while future leaders should have increased support and opportunities for doctoral and postdoctoral coursework in advanced, interdisciplinary science and policy.

Question 4: What approaches to training and education are needed?

A variety of approaches to implement the competency-based education and training (see Question 2) were discussed by the Colloquium participants. The following recommendations summarize these discussions.

Recommendation---Provide a continuum of approaches for education of practitioners. As noted previously, most practitioners in environmental health lack formal training in public health, while those who have a public health background may need training in other areas including management, economics, law, and policy. Continuing education, including distance education, can provide accessible opportunities for enhancing competencies. Many approaches were recognized for continuing the educational process of practitioners. The approaches range from symposia to multidisciplinary graduate degree programs, depending on the needs of the agency and the individual practitioner. This range of approaches offers flexibility of content and broad options to match varying levels of available resource and time commitment. The approaches for training should provide opportunities for career development and apprenticeship. Distance learning and short-term programs should serve as gateways to more advanced coursework, providing flexible entry to degree programs such as the master's in public health, doctorate in public health, or similar degrees.

Recommendation---Provide leadership training. Public health and environmental leaders must face unprecedented political, scientific, and management challenges. Participants of the Colloquium agreed that few classroom experiences can prepare a stu-

dent to face the real world challenges of contemporary environmental health. Perhaps the most proven method to learn leadership is from leaders. Participants recommended the development of a leadership forum to actively involve students and to assure a continued pipeline of future leaders.

The forum was envisioned as an annual or semiannual meeting of leaders in environmental health and protection from a variety of agencies. The purpose would be to engage in discussions of pertinent issues and challenges facing their agencies and to develop approaches for addressing the challenges. Students in environmental health and protection would be invited to participate in the sessions and learn from observing the decision-making processes of the nation's environmental leaders.

Question 5: How does public health get there? What sort of structure and what resources are needed to achieve these training and educational goals?

Recommendation---Build partnerships for education and training. To address the challenge of training the environmental health and protection workforce, a real need exists to develop interdisciplinary programs based on partnerships. Professionals from industry, government, and academia should be involved in teaching and advising students to increase opportunities for experiential training. Practitioners provide "real world" perspectives to learning that are invaluable to professional development. There are numerous opportunities for partnerships, including adjunct faculty appointments, internships, personnel exchanges, and on-the-job training.

Recommendation---Establish partnerships for funding. Much like the approaches for education and training, opportunities exist for collaboration among the agencies for providing educational and training opportunities to the workforce. Various environmental agencies and industries also have needs for trained practitioners in the field of environmental health and protection. Establishing partnerships and pooling resources can provide revenue sources.

Additional sources of funding for education and training should be pursued by leveraging the support of non-profit foundations that support environmental health and protection programs.

Recommendation---Develop cross-program and cross-agency interdisciplinary opportunities. The separation of the environment by the agencies into the basic media often has resulted in a separation of the workforce into departments with narrow regulatory mandates and limited flexibility. A real need exists for all environmental agencies to move beyond programmatic and agency lines to develop more broad-based approaches for addressing environmental health and protection issues.

Often, practitioners develop policies for protecting a certain environmental resource but lack the skills to evaluate the effectiveness of the policy. For example, individuals in a state environmental agency assigned to the drinking water resources division rarely pursue education in the core functions of public health and the basic public health approaches of surveillance, epidemiology, and prevention. However, these skills would provide a significant benefit for evaluation of the efficacy of policies developed for protecting drinking water

resources, such as utilizing epidemiological techniques, the practitioner would be able to evaluate trends in disease from waterborne sources.

Recommendation---Engage the national environmental health and protection organizations. There is a critical need to develop a constituency for improving the educational opportunities for environmental protection and public health practitioners. National associations have been extremely successful in supporting strong environmental policies; however, they have not been engaged in shaping the environmental education agenda. Through the recruitment of new student participants and the active involvement of the workforce in their national meetings, national associations have the opportunity to participate in the educational process.

In addition, interactions among the various associations of environmental health and protection should be enhanced to improve the exposure of students and practitioners to a broader realm of the field. Organizations such as the International Society of Exposure Assessment, the Society for Risk Analysis, and the International Society of Environmental Epidemiology have sponsored joint conferences that broaden the coverage of topics, provide greater depth in presentations, and enhance the learning experiences for practitioners and students. These joint projects should serve as examples to other organizations of methods to interact and improve the educational opportunities of their constituents.

Recommendation---Strengthen the academic infrastructure. A wide variety of undergraduate and graduate programs throughout the United States offers academic preparation in environmental health and protection. Many of the programs are offered through schools of engineering, medicine, law, geology, and natural sciences. Most do not participate in any formal environmental health accreditation process such as offered by EHAC. While many of the programs are strong in the technical sciences, they lack a broad-based training for their students in the public health, political, and risk sciences. More programs in environmental health must recognize the need to provide multidisciplinary training that addresses the competencies and offers students the opportunities for experiential learning.

Recommendation---Strategize for long-term funding and support. Public health professionals should recognize that training is a shared responsibility. Diminishing budgets and wavering public sentiment on issues of environmental health and protection influence the commitments made by agencies to environmental programs. Often, decisions regarding funding for programs are made with only short-term goals in mind with only short-term financial commitments to the projects. Agencies must begin to strategize for longer-term funding and support so that wavering sentiment does not threaten environmental health and protection funding or policies that encourage training and education.

Recommendation---National laws must assure that an appropriately trained workforce exists for their implementation. A well-trained workforce requires a strong fiscal commitment to training and education. Thus far, the major national environmental regulations have failed to provide assurance that an appropriately trained workforce exists to implement the regulations. Assuring the success of environmental policies requires a commitment to examining the necessary skills for implementing a policy and providing

training and education where needed. No major statute or regulation should go forward without addressing the fundamental question: Does the environmental health and protection industry have the appropriately trained workforce to implement this policy?

Recommendation---Develop and optimize access and use of the Internet. In this age of technology in which information is readily available at the fingertips of anyone with access to the Internet, the environmental health and protection workforce must not be left behind. Not only do agencies, academia, and industry need to provide information on their Internet home pages but they also must assure that the workforce has adequate access and skill to utilize and navigate the Internet.

Though experiential learning can never be gained from the computer screen, the Information Age provides tremendous opportunity for expanding knowledge and also provides opportunities for practitioners to engage in on-line discussions of challenges they face.

Is the environmental health and protection workforce appropriately trained to do its job? The answer to this question, for now, appears to be "perhaps." Environmental health and protection practitioners and political leaders have guided the nation to unprecedented environmental improvements during the past two decades. However, in light of the growing complexity of managing environmental risks, the Colloquium participants concluded that there is a dramatic need for continually improving the environmental health education and training of agency workforces at the federal, state, and local levels. Despite the need, the participants noted the virtual disappearance of educational and training support. While the major national environmental health statutes require an increasingly complex array of competencies in the workforce, they provide virtually no support for education and training. This has left environmental protection and public health agencies with a critical shortage of employees who are adequately trained to meet increasingly complex programmatic regulatory requirements. More importantly, the erosion of the training infrastructure raises serious questions about the capacity of the workforce to respond to emerging public health threats and to develop effective prevention strategies.

This article has presented a strategy for meeting the educational and training needs of the environmental health and protection workforce. Competencies and curricula are presented along with suggested educational approaches. Developing the appropriate training for this complex and multidisciplinary workforce is a vexing task. However, the greatest challenge is securing the funding necessary to implement and sustain the educational initiatives. Assessment of workforce educational and training needs, along with support for providing training, must become a fundamental component of environmental policies. Ultimately, the success of environmental policies depends on the ability of the workforce to implement them.

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