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EDITED BY

David Dyjack,
National Environmental Health Association,
United States

REVIEWED BY

Jeremy R. Sullivan,
University of Texas at San Antonio,
United States

*CORRESPONDENCE

Christina E. Ndoh
✉ tina.ndoh@pitt.edu

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Virtually prepared: designing remote environmental health practicum experiences

Christina E. Ndoh^{1*}, Nesta Bortey-Sam¹, Maggie Moore² and Alexander Ufelle²

¹Department of Environmental and Occupational Health, University of Pittsburgh School of Public Health, Pittsburgh, PA, United States, ²Department of Public Health, Slippery Rock University, Slippery Rock, PA, United States

The push for virtual education modes continues to grow and develop following unprecedented acceleration during the COVID-19 pandemic. Environmental and occupational health education echoes that demand, where programs are seeing the focus expand from lab-based bench work to include greater practice emphasis in areas such as environmental health equity, environmental justice, environmental policy, and environmental health literacy. Part of the educational foundation for Environmental and Occupational Health MPH programs includes a practicum designed to provide students with “real-world” experience beyond classroom applications. Given the expected increased demand for virtual educational models from students and virtual employees from the professional sector, higher education programs that require practicum experiences must seek innovative approaches that meet both student and employer needs. The University of Pittsburgh’s Department of Environmental and Occupational Health is a practicum host site for local universities. Recently, faculty have sought to co-create virtual environmental health practicums in response to requests for these types of opportunities. This article expands upon work on “virtual” or “remote” practicum placements and builds upon best practices to contribute to continuing research in this area. The article also shares insight into creating additional virtual opportunities in the environmental health field. This work presents a case study of the development of a virtual student practicum, documents the processes and procedures followed to develop work grounded in best practices, and shares lessons learned and recommendations for developing future virtual practicums for public health students. The student and practicum host provide reflections on the practicum design and experience.

KEYWORDS

environmental health professionals, virtual/remote work, workforce development, public health practice, environmental education, public health practicum

1 Introduction

Environmental health professionals (EHP) serve vital societal roles through research and implementation of policies and practices to mitigate human health risks from environmental hazards. However, like many sectors within the U.S. economy, environmental health has faced recent labor shortages that threaten the continuity of environmental health services and public safety. The shortage of environmental health professionals is second only to nursing within health sciences, with state, local, and tribal governments all impacted (Ryan and Hall, 2022).

In response to this shortage, schools of public health, public health associations (such as the American Public Health Association (APHA) and the National Environmental Health Science and Protection Accreditation Council (NEHA)), and governmental organizations have all proposed efforts aimed at recruitment and retention of a prepared workforce. Congress introduced the Environmental Health Workforce Act (H.R., 2021, 2,661) to recruit and maintain sufficient staffing for environmental health positions, and despite the bill's stall, is indicative of the importance of this crisis (Farquhar, 2021). As academic institutions look to pipeline programs such as summer internships and fellowships, early exposure pathways, and increased funding for student support, we must also take a critical look at the delivery methods employed for meeting the needs of current and prospective students and ask, "Are our modes outmoded?" As scholars begin to advocate for increased virtual EHP training and opportunities (Goodman, 2015; Hendrix and Schneider, 2020; Perea-Ryan, 2022) and as the demand for virtual work increases among employees and managers (Booth, 2020; Hackney et al., 2022), the academic institutions preparing students need to critically examine how to best meet those needs. Recognizing this shortage in EHP and the increasing employee and employer demands for virtual work options was one of the impetus for the creation of this virtual practicum experience. This perspective reviews a virtual environmental health practicum offered as part of the degree requirements for an Environmental and Occupational Health (EOH) student at Slippery Rock University (SRU).

In recent years, SRU EOH students have completed practicums at multiple organizations, including academic institutions (e.g., Environmental and Occupational Health Department of the University of Pittsburgh School of Public Health), non-governmental organizations (e.g., Environmental Health Projects and Women for a Healthy Environment), governmental agencies (e.g., Allegheny County Health Department, water treatment plants, and Veteran Affairs), and with local industries (e.g., construction, manufacturing, and pharmaceutical). As a standard process, affiliation agreements are signed between the practicum sites and the university, stressing conditions for students working with external agencies (SRU MPH Program, 2023). For students who are seeking a virtual practicum placement they are encouraged to secure practicum sites based on guidance provided by the faculty mentor/advisor to ensure that such sites will fulfill the practicum requirements using a virtual format.

1.1 Environmental and occupational health program requirements

Departments of EOH, like all academic programs, must understand and comply with the requirements and practices of relevant accrediting bodies. With many EOH departments and programs being part of a school of public health, The Council on Education for Public Health (CEPH) provides requirements that govern the entire school and, in turn, the EOH programs. Additionally, EHAC provides accreditation tailored explicitly to the education and training of students in environmental health science and protection. Currently, there are 243 CEPH-accredited schools and programs, inclusive of 67 schools of public health, 158 public health programs, and 28 standalone baccalaureate programs (CEPH, 2023). Currently,

35 programs have EHAC accreditation, 26 at the undergraduate level, and nine at the graduate level, with six institutions having accreditation of both an undergraduate and graduate environmental health program for 29 distinct institutions with EHAC accreditation (EHAC, 2020a,b; CEPH, 2023). Of those 29 institutions accredited by EHAC, 15 also have CEPH accreditation at the school, program, or standalone baccalaureate level.

1.1.1 CEPH accreditation practicum requirements

Practicum requirements for CEPH are covered under criterion D5, "Applied Practical Experiences" of the 2021 amended accreditation criteria (CEPH, 2021). Per the criterion, students must have two non-academic final products that fulfill the needs of both the practicum site and the institution while attaining five public health competencies. In line with the requirements, the final products must address five competencies, with a minimum of three addressing foundational competencies in public health, and the remaining can be concentration specific. There are 22 foundational competencies from which students must pick at least three with evidence of the application in the final products. These foundational competencies are categorized into Evidence-based Approaches to Public Health, Public Health and Health Care Systems, Planning and Management to Promote Health, Policy in Public Health, Leadership, Communication, Interprofessional and Intersectoral Practice, and Systems Thinking (CEPH, 2021). As stipulated in criterion D4 of CEPH's "Criteria and Procedure" document, at least five competencies are required to reflect knowledge and skill of the concentration (CEPH, 2021), in this case, EOH.

Slippery Rock University's EOH competencies assess and evaluate risk assessment, management and communication, toxicology fundamentals, industrial hygiene, and environmental health management at the federal, state, and local levels (SRU MPH Program, 2023). The required practicum is 200 contact hours, a three-credit course, and students can begin the practicum after accumulating 21 credits of core classes.

However, CEPH, does not mandate minimum contact hours for the practicum experience (CEPH, 2021), nor specify a delivery mode for the practicum. Many virtual practicum students predominantly work with secondary data and use the information to achieve the two required work products, embracing the competencies outlined in the CEPH accreditation document.

1.1.2 EHAC accreditation requirements

EHAC accredits undergraduate and graduate programs in environmental public health. Undergraduate program requirements are largely course-based, while Graduate Programs are predominately competency-based (EHAC, 2020a,b). Both programs rely on solid foundations in the STEM subjects/natural sciences, i.e., biology, chemistry, physics, toxicology, epidemiology, risk assessment, risk communication, risk management, and statistics. The competency-based graduate degree program guidelines and the curriculum require the attainment of the following competencies: analytical skills; statistical analysis; research methods; communication skills (written and oral); administrative skills; natural sciences; environmental and public health science knowledge and skills; and risk assessment, communication, and management. The competencies guide course content, knowledge, and practical skills. EHAC undergraduate curricula must include the following environmental health technical

areas (air quality and health; food protection; occupational health and safety; solid and hazardous material and waste management; water and wastewater; and zoonotic and vector-borne diseases and their control) with in-depth study required in four of these and other environmental health topics provided in the criteria. Graduate criteria recommend exposure to these and other environmental health topics and in-depth study of at least one of the provided environmental health topics. As environmental health topics evolve, EHAC suggests that accredited bodies offer courses in global climate change and human health for undergraduates and graduate students, topics in global warming, ozone depletion, and population health (Samano et al., 2020). A recent study found that no CEPH-accredited MPH programs required a course in climate change or offered a “climate change” track, although climate change was taught in other disciplines (Becker, 2019).

The rigor in STEM-based subjects and environmental health practice-based internships should prepare graduates from EHAC-accredited institutions for the numerous environmental health problems facing the globe. Undergraduate internship requirements include a 180-h practical internship that requires students to demonstrate problem-solving skills, the ability to work as part of a team, effective communication, and knowledge of organization dynamics. Graduate criteria require a culminating experience that can consist of a thesis, portfolio, written exam, or paper of professional quality that is appropriate to graduate-level education.

A summary of key characteristics of CEPH and EHAC practicum requirements is shown in Table 1.

2 Practicum perspectives

The practicum hosts and student provide their perspectives on creating a successful environmental health practicum. The primary objectives of these perspectives are to present opinions from the student and preceptor on the methods employed and strengths and

weaknesses associated with the virtual practicums and to provide case study text that can apply to audiences beyond academia.

2.1 Preceptor perspective

Primary goals as a preceptor for this virtual practicum included:

1. Ensure that the student learned discrete skills that would be useful as an EHP
2. Successful inclusion of the identified public and environmental health competencies
3. Professional and timely completion of the enumerated work products

The last goal is a defining element between an internship and a practicum. CEPH expects that practicums provide applied practice experiences that can prepare students for the workforce (CEPH, 2023), so one challenge was to find specific tasks that were beneficial to practice work at the University of Pittsburgh while also providing enumerated workforce readiness skills that meet CEPH competencies. We also needed to ensure that our students had demonstrable products at the end of the practicum.

Upon request from the SRU Public Health Department Chair, we developed several practicum opportunities that one or more students could complete. Each practicum included tasks that could reasonably be accomplished in 200 h, accounting for the time needed to obtain pertinent background information on the area of focus. A total of six environmental health practicum options were developed, with some components designed to work together within a single practicum. The student was presented with all six options and ultimately settled on developing an air quality and environmental health user guide, online training, and knowledge check. A formal MOU was signed to codify the practicum goals and establish an online practicum experience. The student could set their virtual hours

TABLE 1 CEPH and EHAC practicum requirements.

Key components	CEPH	EHAC
Program targets	Applied experience required at the baccalaureate level, but no specific practicum required Required for MPH and DrPH in accredited SPH and PHP programs	Required for Undergraduate programs. (No practicum required for graduate level programs)
Contact hours	No minimum number of hours; Institutions may set a minimum hours	180h minimum
Documentation	Portfolio demonstrating at least two non-academic work products required (e.g., project plans, grant proposals, training manuals, lesson plans, surveys, videos, presentations)	Documentation of time tracking of work (e.g., equipment, data collection, and data interpretation)
Acceptable placements	Governmental, non-governmental, non-profit, industrial, and for-profit settings or appropriate university-affiliated settings. To be appropriate for applied practice experience activities, university-affiliated settings must be primarily focused on community engagement, typically with external partners	Appointments outside of university settings encouraged; academic appointments should be with EH control facilities that support the university
Competencies	Five competencies must be demonstrated, with a minimum of three being foundational competencies.	No requirements to incorporate key competencies, but students must demonstrate problem solving skills, the ability to work as part of a team, effective communication, and knowledge of organization dynamics.

outside of our predetermined meeting times and provide logs showing hours worked that correlated with work product development. This scheduling was to promote greater flexibility in meeting the time requirements of the virtual practicum.

The preceptors and the practicum student held regular meetings via Zoom and established a Microsoft Teams site to facilitate the ease of transfer of materials. We also remained in steady contact via email to answer questions and determine the next steps in some instances. In the early weeks of the practicum, the student was provided with background readings to acquaint her with some of the critical work for the practicum and with a list of people to contact for informational interviews. A key focus for the work was the creation of educational materials to help the public understand some of the tools available for them to understand air quality conditions in their local area. In addition, there was a focus on understanding health impacts associated with common environmental pollutants and mitigation strategies individuals could take to reduce their potential severity of health impacts.

Overall, the practicum provided a smooth experience that yielded multiple environmental health educational products. We found the need to be flexible as the focus of some of the products expanded to include local/regional air quality data tools in addition to nationally available sources. There were some limitations with needing more regular access to the student, and the need for shared server spaces provided some challenges, making shifts in direction slower than they may have been if the student had been in person. However, the overall project timeline and work product quality were maintained. A potential remedy for this for future virtual practicums would be the implementation of more routine check-ins using a method that works well for the host and student, such as an email touch base in the mornings or short mid-week check-ins.

2.2 Student perspective

I have been active in public health for almost 2 years, developing a deep interest in environmental health and community health education. This interest led me to enroll in an MPH program to develop more knowledge and skills to present this information. Through this education, I plan to become a public health professional who identifies health issues within a community and educates the members to provide the best healthy living outcome. When beginning my second year in the MPH program at SRU, a 200-h practicum was required to gain experience in one's intended concentration. While this was an excellent opportunity to gain more experience, I had limited time to complete an in-person practicum as a full-time student. With my advisor's guidance, I contacted the University of Pittsburgh's Department of Environmental and Occupational Health, and the faculty there could accommodate a fully remote practicum highlighting environmental health education for communities. An initial meeting occurred between the preceptor and me to discuss the topic of this practicum and the types of educational materials for community benefit. A tentative schedule was drafted within the first 2 weeks to ensure all parties were aware of the upcoming goals for each project and that I completed deliverables on time. Throughout the practicum, weekly meeting notes would include points discussed and high-priority tasks to ensure timely completion by the next check-in. This process ensured a common understanding of the upcoming steps between the preceptor and student and maintained the momentum and timeline of the practicum.

My primary practicum goals were to create content aimed at educating community members on air quality and how poor air quality affects their health. These educational materials describe common air pollutants, the source of those pollutants, how they impact health, and strategies to minimize health impacts. There were also multiple charts provided that linked air quality measurements with colors and terminology commonly found on weather reports and air quality websites. We established projects based on what materials we believed would be most accessible for community uptake. Presenting this information in multiple forms would give the best chance for community members to be reached and educated. The four specific deliverables completed during my practicum were:

1. an air quality user guide for synchronous and asynchronous environments,
2. a summary pamphlet pointing users to additional air quality resources,
3. a PowerPoint file for synchronous training sessions, and,
4. a 10-question pre/post-test to assess changes in air quality and environmental health knowledge with the education materials.

The user guide shows individuals how to interpret air quality tools, protect health, and learn about air quality information specific to their area, in this case, Pittsburgh. Deliverables from this practicum are shown in [Figure 1](#).

This remote practicum greatly benefited my education in multiple ways. A trusting and open relationship was fostered from the beginning, always allowing an open line of clear communication to minimize confusion and maximize productivity. Meetings were conducted weekly and scheduled carefully to ensure all parties were present. For each project, I was given full autonomy to research and develop products as I saw fit while still having the "safety net" to reach out to my preceptors anytime with questions or concerns. My preceptors supported me greatly, so I encountered no limitations during this practicum experience. Common challenges that impact a remote experience may include limited internet access or communication constraints.

For students wishing to complete a virtual practicum, I encourage them to independently research selected topic(s) and select projects aligned with their interests. Strive to be a self-sustaining, motivated individual who stays on top of deadlines and asks questions when needed because, ultimately, you are responsible for your own time. Lastly, capitalize on the time saved from commuting and mundane office tasks and instead funnel that time into being creative and offering ideas to enhance the quality of projects. While I was completing the virtual practicum, I received an opportunity to advance my career in the public health field. I applied the professional skills I acquired along with environmental research and educational material creation to become a Health Educator for a local county health department. I am grateful for the knowledge I received from my preceptors, allowing me to create relationships within the community to provide health education materials to promote a healthy, fulfilling life.

3 Discussion

The SRU MPH program is delivered via an online platform, making it easier for students to adjust to and pursue virtual practicum.

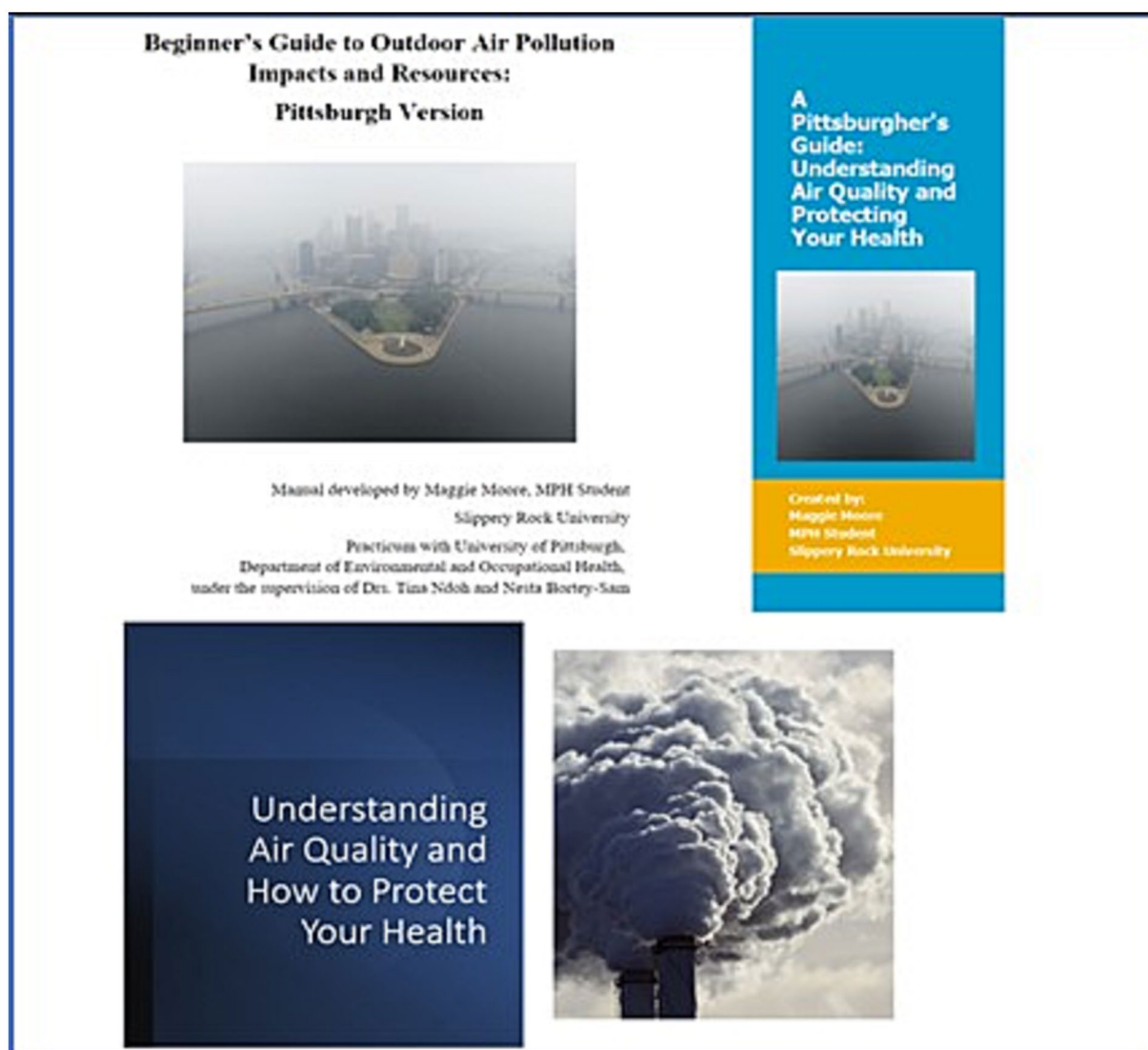


FIGURE 1
Virtual practicum air quality educational materials.

Many SRU MPH students are working professionals, so the flexibility of a virtual practicum is more manageable than traditional in-person options. SRU has a process that helps students achieve practicum matriculation goals in a virtual format. SRU begins by sharing the practicum handbook with the students and securing a practicum site and a preceptor comfortable with virtual supervision. Once there is agreement on the practicum, students are responsible for completing a learning agreement that outlines the project title, learning objectives, methods to achieve these objectives, and the required timeline (SRU MPH Program, 2023). Fundamental to the practicum is the minimum of two required final products that demonstrate the selected competencies. The final products submitted by our students include flyers, executive summaries, questionnaires, educational materials, safety materials, and manuals, which align with some of the examples from the D5 criterion of CEPH's "Criteria and Procedure" document (CEPH, 2021). In addition, students keep an activity log of weekly activities during the practicum. They must complete a scope of work document, which extends the learning agreement and outlines details

of the activities during the practicum. Students are required to present their practicum through voice-over PowerPoint and to submit a final written report. The preceptor is an integral part of this process and is involved in all the steps. Preceptor evaluation, coupled with the overall student portfolio, determines the overall grade for the practicum.

Key components of success for this virtual environmental health practicum included a clear establishment of expectations from all parties, including the MPH program, the preceptors, and the student. At the same time, there needed to be enough flexibility incorporated into the plan to allow for the deliverables to evolve as the student delved further into research on the environmental education components.

4 Conclusion

The practicum requirement in the MPH program allows students to develop skills in preparation for the workforce in the EOH field. The virtual practicum format offers flexibility and meets the current

workforce's expectation for a virtual alternative. Furthermore, preceptors can meet virtual practicum requirements by incorporating standards from accrediting bodies such as CEPH and EHAC. Environmental and Occupational MPH programs may consider assessing student learning outcomes and preceptor satisfaction with virtual placements. Preliminary SRU data indicate preceptor satisfaction with students' performance in online practicum. Best-practices for successful virtual practicums include online data storage that is accessible by both parties, consistent virtual meetings, and agreeing upon deliverables that can be completed with limited to no in-person interactions. This case study provides a roadmap for other programs seeking to meet employer and student demands for virtual experiential learning.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

CN: Conceptualization, Supervision, Writing – original draft, Writing – review & editing. NB-S: Supervision, Writing – original

draft, Writing – review & editing. MM: Writing – original draft, Writing – review & editing. AU: Writing – original draft, Writing – review & editing.

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