

**ANNUAL LEARNING
OUTCOMES ASSESSMENT
REPORT**

**SEPTEMBER 1, 2021-AUGUST
31, 2022**

Environmental Health Sciences PhD
Program
Emory University

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I. PROGRAM MISSION

The PhD program in Environmental Health Sciences (EHS) provides students with interdisciplinary training to better understand the impact of the environment on human health and disease. Students in the program have a wide range of unique opportunities for research and education through the participating departments across campus and the numerous health agencies affiliated with the program. Further, the program aims to produce a unique cadre of future leaders in the field of environmental health sciences who have expertise in both laboratory- and population-based research. Upon graduation, EHS students will have received comprehensive training in the EHS core areas of Exposure Science, Biological Mechanisms of Susceptibility and Disease, and Environmental Determinants of Population Health.

II. PROGRAM CONTEXT

Since matriculating our first cohort of PhD students in Fall 2011, the EHS program has achieved a diversity of successes, in the context of student training, opportunities, and achievement, as well as programmatic sustainability and growth. These accomplishments have been driven by a highly motivated student community, in partnership with a faculty and staff that are committed to mentoring the next generation of environmental health scientists. Indeed, the entire EHS program was developed in close collaboration with EHS faculty in order to ensure faculty involvement and a cutting-edge training program that prepares students to engage with current and future environmental health concerns.

Each year of the EHS program, we have matriculated ~6 students, with some years as few as 4 students, while other years we have enrolled as many as 8 students. Certainly, in more recent years, as the success of the EHS program has become more widely recognized, the number of highly competitive applicants and enrollees has increased. With the help of the LGS, we hope to continue this trajectory of growth in future years. Typically, students spend ~5 years in the EHS PhD program. This timeline allows students to engage with rigorous coursework and research rotations, in years 1 and 2, followed by their candidacy examination at the end of year 2. Once they have advanced to candidacy, students are prepared to apply their classroom training to their research projects, while working closely with their dissertation advisor and committee.

Through the extensive collaborations developed with other research groups within the Rollins School of Public Health, as well as across the university, and beyond, students have a variety of faculty and research opportunities to choose from to ensure the diversity of training that they need to ensure their success in EHS. Indeed, while we have always worked closely with our colleagues in Epidemiology, Biostatistics, Global Health, and Environmental Sciences, our students have been proactive in seeking out and establishing collaborations with faculty from the School of Medicine, School of Nursing, as well as programs in Neuroscience and Immunology in the GDBBS. Furthermore, through our extensive partnerships with CDC and other government institutions, students have been able to integrate this unique expertise to further extend their research projects and goals. The influence of their collaborations is reflected in career trajectories of students following graduation from the EHS program. Indeed, students graduating from the EHS PhD program are prepared to engage with environmental health sciences issues in a variety of settings. Typically, our students are drawn to work with a variety of government entities, including CDC, EPA, and NIEHS, while others prefer an academic path, matriculating into highly competitive postdoctoral fellowships at institutions like Harvard and USC.

III. STUDENT LEARNING OUTCOMES

As part of our more extensive Learning Outcomes Assessment Report (2019-2021), we were mindful in reviewing and revising specific learning outcomes and their assessment for the future. With these revisions, we were focused on providing a more granular or detailed assessment of student training and progress. Since the submission of that report, progress on several of those revised assessments has been made, while others are still being pursued. Below, we have divided this revised assessment into Direct and Indirect and included these assessments in Table 1 and highlighted their alignment with student learning outcomes in the EHS program.

Direct:

- A. Emphasize focus on training elements of research rotations as outcomes
- B. Establish a Research in Progress seminar series for PhD students in years 1-5 of the program
- C. Collect qualitative data from core course faculty on student proficiency
- D. Reformat written dissertation proposal to allow a more extensive literature review and synthesis
- E. Refocus evaluation of qualifying exam on Learning Outcomes A-C

Indirect:

- A. Expand grant writing resources for students
- B. Integrate the EHS alumni network
- C. Extend public engagement through the Call to Action initiative

Table 1. Revised Assessment Plan

Assessments	Assessment Revisions	Student Learning Outcomes			
		A. Exposure Science	B. Biological Mechanisms	C. Population Health	D. Research
Direct					
1. Conduct Research Rotations	→ Emphasize focus on training elements of research rotations as outcomes	X	X	X	X
2. Conduct Research-in-Progress Presentations	→ Develop Research-in-Progress seminar series that would allow students in years 1-5 to present research once a semester	X	X	X	X
3. Demonstrate Proficiency in Core Coursework	→ Collect qualitative data from core course faculty on student proficiency	X	X	X	
4. Submission of Dissertation Proposal	→ Reformat the written dissertation proposal to allow a more extensive literature review and synthesis	X	X	X	X
5. Completion of Qualifying Exam	→ Refocus evaluation of qualifying exam on Learning Outcomes A-C	X	X	X	X
Indirect					
1. Submit Applications for Research-Related Funding	→Expand grant writing resources for students	X	X	X	X
2. Employment in Academia or Other Public Health Work	→Integrate EHS alumni network	X	X	X	X
3. Participation in Public Engagement and Outreach	→Extend public engagement through the Call to Action initiative	X	X	X	X

IV. ASSESSMENT SUMMARY

Direct Assessments:

1. Conduct Research Rotations:

Overview: To ensure that the training portion of the research rotation aligns more faithfully with the Learning Outcomes A-D, more specific language was provided on the Research Rotation Form to help guide students and faculty in developing clear learning objectives. This language asked them to review the Learning Outcomes and core competencies for the EHS program and develop learning objectives that align with these training elements. This has provided two important assessment tools: First, it provided a more detailed assessment of the training that students are

receiving and how it meets the goals of learning outcomes. Second, it has allowed us to identify deficiencies in student training or performance. This information provides an earlier indication of problems that we can address through direct engagement with the student before they move forward to their dissertation proposal and candidacy exam.

Evaluation: This revision has been extremely successful in ways that we did not originally plan. Most profound has been a more positive change in student perspective on their rotations. Rotations are not seen as intimidating or stressful as before since students and faculty understand that the rotation is a training opportunity and not an agreement to produce papers, abstracts, reviews, which may not be feasible endpoints for a junior student in a 15-week rotation. Students also feel that they are receiving skills that are more applicable to their interests and research goals. Again, feeling less focused on discrete research deliverables, like a paper, allows them to devote more focus and effort to skill building.

Action Plan: Given the success of this modification, we do not anticipate any immediate changes. We will be monitoring the outcomes of this approach on student preparedness for their candidacy exams, as well as dissertation defenses. Specifically, we will be focused on skill-building during the rotation and how that translates to their dissertation research.

2. Conduct Research-in-Progress Presentations:

Overview: The Research-in-Progress (RIPs) seminar was developed to provide all PhD students in each year of the program the opportunity to develop and present their research. While junior students (1st and 2nd years) would be expected to present their rotation work and dissertation proposal development, more senior students (3rd, 4th, 5th years) would be able to use this platform to present their dissertation work and receive feedback.

Evaluation: The RIPs seminar series was established in Spring 2022 and has run successfully through Fall 2022. Although initially developed for PhD student presentations, we decided to expand the seminar so that postdoctoral fellows and some faculty, in addition to PhD students could present. To date, we have had 2 (1st and 2nd Year) PhD students present on their work, 2 postdoctoral fellows, and 3 faculty members. The presentations given by PhD students were extremely strong focusing on work they had performed during their research rotations. All seminars have been well-attended and the engagement with the speakers has been excellent. We have had some feedback from PhD students that they do not feel comfortable presenting in a setting with senior faculty. They feel intimidated and lack confidence in their presentation skills as well as the extent of their research progress, especially for junior students who have not had as much time to work on their projects.

Action Plan: Moving forward, we have discussed two possible approaches to ensure students have the opportunity to present their work within the department. First, to assuage concerns about comfort and confidence, prior to each student presentation, an explicit announcement would be sent to the faculty and audience that reminds them of the content the student will be presenting (research rotation, conference presentation, paper or grant submission, dissertation defense practice), so that the audience has a better context or lens through which they can place the

expectations of the student's work. The rationale for this approach is that the expectations for a junior student who is presenting data from a research rotation, which is skills-based, should be very different from a more senior student who is presenting data for a paper they are planning to submit. I strongly believe that this will allow the RIPS presentations to be most beneficial for all involved. Second, it has been proposed that we develop a student-only RIPS seminar series. In this setting, PhD students would be presenting to their peers, rather than a diverse audience of faculty, staff, and students. Based on student feedback, it is felt that this setting would improve their comfort level and anxiety with presenting.

3. Demonstrate Proficiency in Core Coursework:

Overview: A more qualitative assessment by faculty of student performance in core coursework would provide a more detailed narrative of each PhD student's performance that is not reliant on grades. This assessment would allow us an opportunity to evaluate any bottlenecks in student training within these core courses. For example, are there skills that students routinely struggle with and do these struggles manifest in future issues with their understanding of key concepts that are evaluated during the qualifying exam and dissertation defense? If these issues are observed, we would be able to intervene and provide additional support for the student in this specific knowledge area. As this assessment would be performed in each of the core courses that reflect the core competencies of the program, an additional detail of student progress on Learning Outcomes A-C would be available. This information would also provide an opportunity to conduct a more detailed evaluation of the curriculum and make sure we are offering the most up to date and relevant training that our students need for success within their PhD, as well as their careers.

Evaluation: Currently, a formal assessment focused on more detailed and qualitative measures of student success has not been developed. To date, when students have struggled with certain courses, I have been in direct contact with the student and the course director, and we have worked together to identify their issues and help find ways to mitigate them. In these situations, student performance has improved. However, these incidences are recorded and can be considered if there are additional struggles with other courses, the candidacy exam, or other aspects of research.

Action Plan: The development of a formal assessment will be projected for Fall 2023. This will allow us to capture the incoming class of PhD students and collect information as they begin with their initial coursework. I envision this assessment to be composed of no more than 5 questions that asks the instructor to provide qualitative evaluations of the student's performance based on the specific learning objectives outlined in the course syllabus. As these are the learning objectives the course instructor will be most aware of, they should provide the richest amount of information. Instructors will be contacted at the beginning of the semester regarding the assessment and will be reminded about the assessment as the semester draws to a close. We will ask that the assessment be returned to the DGS at the same time that grades are submitted to the university.

4. Submission of Dissertation Proposal:

Overview: As a program that views its diversity of expertise and interests as a critical strength, we have struggled to develop a pre-candidacy assessment tool that provides an equitable, comprehensive, and consistent evaluation of student performance, especially in the context of the dissertation proposal. While the learning outcomes are clear, the best way to ensure they are being integrated and addressed within a student's dissertation proposal has been elusive. To address these issues, we will reformat the written dissertation proposal guidelines and requirements to provide a more comprehensive assessment of students understanding of how their project aligns with the core competencies of the program. While this will allow us to better evaluate Learning Outcome D, it will also allow us to expand the utility of this assessment to evaluate Learning Outcomes A-C. This revision will specifically accomplish these goals by providing the following guidance to students as they develop their written dissertation proposal:

Comprehensive Literature Review and Synthesis: In this section of the research proposal, students have the opportunity to demonstrate a comprehensive understanding of the full body of research relevant to their proposed research, to synthesize that work into the scientific premise of their proposed project, and to show how their research will make a valuable contribution to existing knowledge. It should not only summarize past work but show how it evolved to give rise both to the aims of the proposed research and the methods to be employed. The review should include the core aspects of environmental health research: exposure assessment, biological action, and environmental determinants of population health. Unlike the narrowly focused introduction or discussion sections of a manuscript, or the analysis of eligible papers in a systematic review, this section allows students to demonstrate in-depth knowledge of a broad range of relevant research that they believe has led to the proposed questions and approaches. Students may wish to include an updated version of this section of the proposal as a separate chapter in their dissertation to provide a comprehensive foundation and rationale for the research presented.

The written proposal will be evaluated by an individualized qualifying exam committee of four examiners. Three examiners may be dissertation committee members, and at least one member must be an external examiner selected by the DGS; three of the four examiners must be EHS Program faculty. The written proposal will be evaluated based on the student's:

- Ability to address synthetic questions relevant to their dissertation research;
- Ability to integrate information across the EHS core areas of Exposure Science, Biological Mechanisms, and Population Health; and
- Depth of understanding in the core discipline of their primary focus.

Evaluation: A formal revision to the written proposal has not been agreed upon and formally defined within the EHS Student Handbook. However, as the instructor for EHS 790R, I have taken this opportunity to devote an entire class period to discussing the candidacy exam and highlighting the need for students to fully understand the importance of their work within the context of their area of study, as well as the broader field of environmental health. Furthermore, as DGS, I help to coordinate all aspect of the written and oral candidacy exam and am able to provide students and faculty with more explicit information regarding the goals and content of the candidacy exam and how best to ensure their questions are synthetic and challenging students to integrate the core areas of EHS. Overall, I still believe that modifications to the EHS candidacy exam and process need to be made. However, the approaches that have been taken, in the interim, have allowed us to better

evaluate student progress on their research.

Action Plan: The stumbling block with this modification has been agreeing on language and expectations. We will work closely with the EHS Executive Committee to formalize these modifications.

5. Completion of Qualifying Exam:

Overview: The revisions made to the written proposal submission will serve to strengthen the original Learning Outcomes associated with the Qualifying Exam:

The written component of the qualifying exam allows for an assessment of the student's knowledge of core EHS areas (Learning Outcomes A-C). The oral defense component of the qualifying exam therefore allows for an assessment of the student's ability to design and propose novel research examining key challenges in the field (Learning Outcome D).

These specific revisions will ensure a more explicit demonstration and means of evaluation of a student's comprehensive understanding of the full body of research relevant to their proposed research, their ability to synthesize that work into the scientific premise of their proposed project, and to show how their research will make a valuable contribution to existing knowledge.

Evaluation: Please see Direct Assessment #4.

Action Plan: As stated in Direct Assessment #4, we will continue to work with the EHS Executive Committee to formalize these changes.

Indirect Assessments:

1. Expand Grant Writing Resources:

Overview: Although students are encouraged to submit for funding from external and internal announcements, we will work to provide them with the skills to be best prepared to develop and apply to these opportunities through more extensive training in grant writing, which will enhance our ability to assess submission for research related funding and Learning Outcomes A-D. There are some options for grant writing courses available within the Rollins School of Public Health (BSHES 712, EPI 730). However, these courses may not completely align with student schedules, which would necessitate the EHS program develop a course that meets the needs of our students. This course would provide students small group engagement with faculty experienced in grant writing and submission, as well as other grant writing resources available through the school and university. While understanding the process of how a grant is submitted, reviewed, and funded is important, a more critical focus of the course would be on the development of a cohesive and thoughtful written document. This course would be offered to students in years 2-5, as these students would be developing their dissertation proposals and submitting for pre-doctoral funding.

Evaluation: Although an explicit grant writing course has not been developed, we have helped students identify other resources that can offer them the skills needed for successful grant development and submission. Within the RSPH, Dr. Janet Gross is a grant writing consultant who

has worked closely with our faculty in developing and offering feedback on their grant proposals. We have discussed with RSPH leadership the possibility for Dr. Gross to provide grant writing workshops geared towards PhD students. Additionally, students are currently enrolled in the IBS 522r Hypothesis Design and Scientific Writing course that is provided by Dr. Anita Corbett. This is a course that is explicitly focused on grant writing for PhD students. In previous years, we have had MD/PhD students from the EHS program take this course with overwhelming success.

Action Plan: With students participating in the IBS 522r course in Spring 2023, we will have a very good data regarding our next steps for providing grant writing support for EHS students. If the IBS 522r course continues to be beneficial to students, then we may not need to develop a stand along grant writing course within EHS. Rather, we could provide the IBS 522r course as a suggested elective for students and offer additional grant writing support through seminars with Dr. Janet Gross. If the IBS 522r course is not seen as beneficial, then we would need to have a further discussion about developing more extensive grant writing support within the EHS program.

2. Integrate EHS Alumni Network:

Overview: The most valuable career resource is the alumni network. In the last 10 years, the EHS program has developed an extensive network of alumni that have transitioned into a variety of career fields. These alumni are directly involved in the public health career arena and can offer invaluable advice to our students regarding job openings, hot areas of interest in public health, the changing landscape of public health work, and insight into trainings or information that might be helpful as students transition to the workforce. Moreover, these insights can be used as a tool to help guide the progress and evolution of the EHS curriculum, as we ensure that we are offering our students the most relevant trainings for their future career success. We plan to develop the EHS alumni network as a go-to resource for our current EHS students who are thinking about possible career options and available opportunities. We will continue to track the EHS alumni through annual surveys and share these updates, along with contact information, with current EHS students and encourage them to reach out to the EHS alumni as they explore career questions. This revision will help to improve the employment success for our current EHS students, which aligns with Learning Objectives A-D.

Evaluation: In the last year, we have had the opportunity to engage out alumni in a variety of ways. A greater effort was made to collect relevant and up to date contact information for all alumni, ensuring that we can easily communicate with them. Small efforts have been made to keep our faculty engaged with the program. As DGS, I make sure to include our alumni listserv on all correspondence that highlights student and faculty accomplishments, whether they are academic or personal. I also plan to include them in our final EHS PhD enrollment decisions for the Fall 2023 cohort. Alumni have also been included in the PhD Application Bootcamp that I have developed, as well as part of the EHS 790R Professional Development course that all EHS PhD students are required to take. In these capacities, alumni are able to share their experiencing, impart their wisdom of navigating a PhD program, and offer unique advice about the current state of environmental health science within the workforce. Alumni have also been a critical component of our networking events. Although these events have been inconsistent in recent years due to

COVID, we are planning an in-person even in the spring that will bring together our current students with many of our alumni.

Action Plan: We will continue to keep our alumni involved with the EHS program through their participation in the PhD Application Bootcamp, EHS 790R course, and the GDEH Networking events. Based on feedback from EHS students, they would like to have more direct interactions with alumni whenever they had questions or needed advice or mentoring for a variety of different situations. For example, for students who are preparing to graduate, they felt it would be beneficial to talk to alumni about how they developed their job search, who they contacted, why they chose the career path that they did, etc. Additionally, some students have expressed interest in participating in internships, which would provide them with more hands-on experience in different environmental health settings (government, industry, etc). Contact with alumni would be imperative to developing these engagements. The needs expressed by our students have been the major motivator for the EHS program to make sure we have the most up to date contact information for our alumni, so when a student expresses some interest or has some questions, we are able to easily pair them with specific alumni.

3. Extend Public Engagement through the Call to Action Initiative:

Overview: As a response to the societal and political unrest that resulted from the murders of Brianna Taylor and George Floyd, as well as the COVID pandemic and presidential election, PhD students developed the Call to Action initiative, which provided a platform for faculty, staff, and students to have meaningful engagement with issues that affect the people and the communities that we work with. One of the major facets of this initiative has been to identify and organize public outreach opportunities that faculty, staff, and students can participate in. Through these engagements, students would be able to develop their community interactions, science communication of their discipline-specific interest areas, and development of community-based research opportunities. As the majority of EHS faculty and students are a part of the Call to Action initiative, we will be able to directly monitor outreach opportunities, student engagement, and outcomes, especially as they relate to Learning Outcomes A-D.

Evaluation: What has been most impressive is the way that the Call to Action initiative has been a spark for additional activities that are focused on diversity, equity, and inclusion, and social justice within the department. Since our previous report, we have established a departmental DEI committee that is composed of faculty, staff, and students from the department. This committee meets once a month and has been instrumental in developing department specific DEI goals and initiatives, as well as representing the GDEH in RSPH and university-wide DEI discussions. These initiatives have highlighted a variety of community-engaged opportunities that our EHS students can participate in. Although difficult to currently quantify, anecdotally, I have seen a change in student perspective as they think about their research work and how it fits into a larger context of social justice and DEI. These discussions and considerations have become much more common and have resulted in specific student-driven workshops on DEI topics, including neurodiversity and disability, as well as curriculum change focused on better integration of DEI topics into each course that is offered.

Action Plan: The involvement of our students in DEI and social justice issues has evolved beyond the Call to Action initiative. While the departmental DEI committee continues with its mission within the department, new opportunities and resources are emerging from these activities. These opportunities are for students to get more involved in DEI at various levels of the school and university, as well as the community. Our best approach is to make sure that, as a program, we are keeping students aware of these opportunities and resources, so that they do not fall to the side. One way we have been able to do this is through the Our Voices seminar series, which invites environmental health scientists and community members from underserved backgrounds to present their work. Through this initiative, we hope to highlight the environmental health work that is going on, not just at Emory, or in Atlanta, but across the country. Additionally, we are able to pair students with a variety of community-engagement opportunities through the Community Engagement Program that is part of our NIH-funded HERCULES grant, which is focused on understanding how the environmental influences health. Finally, students have found several DEI and social justice opportunities through our faculty. Many of our faculty are working in these spaces and are able to provide opportunities and resources for students to get involved.

V. FACULTY INVOLVEMENT

Faculty are involved in each step of the EHS PhD program. Faculty feedback is extremely valuable to future directions of the EHS program. To facilitate this feedback, data and concerns are brought to the EHS Executive Committee, which is composed of senior faculty representatives from each of the core competency areas highlighted in our program. Major decisions or programmatic modifications are discussed and decided upon within this committee. However, as can be seen from the objectives, assessments, and action plans, faculty are an imperative part of each of these topics. We rely heavily of faculty engagement and feedback to ensure these objectives are met and are met in an efficient way. Without our faculty, their expertise, and their commitment to training future environmental health scientists, this program does not exist and it certainly would not be as successful as it is.

VI. ASSESSMENT PLAN FOR NEXT CYCLE

An action plan has been developed and presented for each assessment. While some assessments are already in place and yielding important data, others are still being developed, and we will continue to work on these assessments for the next cycle.



Department Chair

12/31/2022

Date