
# Program Assessment Report (PAR)

**Earth & Environmental Sciences, BA (EES) Baccalaureate Degree**

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**ACADEMIC YEAR COVERED BY THIS REPORT: 2020-2021**

## I. PROGRAM LEARNING OUTCOMES

The Earth & Environmental Sciences baccalaureate degree program develops many skills • Combining a range of sciences (geology, chemistry, physics, biology, mathematics and computer science) in creatively solving practical problems • Collaborating with others to complete projects • Interpreting text, numbers, and graphs • Thinking critically • Presenting information and thoughts in written and oral formats Learning Outcomes of the program include 1) Students will master basic concepts of earth and environmental science and be able to apply those concepts within the natural world. 2) Students will display proficiency in field and laboratory techniques used in the practice of earth and environmental sciences. 3) Students will be able to write detailed scientific reports for appropriate audiences. The program does not have professional accreditation.

## II. PROCEDURES USED FOR ASSESSMENT

### A. Direct Assessment

1) Master basic concepts and apply those concepts in natural world. The department offers an eclectic array of earth and environmental science courses. Our courses are intended to provide students with fundamental knowledge (assessed by objective homework, exams, and essays) that they then apply in independent projects that include either research papers focused on each particular course topic or field research, with associated reporting to instructors and peers. The EES discipline and our baccalaureate degree is characterized by interdisciplinary synthesis of information. Accordingly, these term paper/presentations and field research experiences become increasingly multidisciplinary as students acquire a broader education as they progress through the degree program. Application to the natural world is assessed through multidisciplinary term papers and field/lab research—both of which are important skills (along with communication) of professionals in our field. Data used for assessment are collected from homework, lab/field reports (written and oral),

written exams, and term papers. Most course evaluations are conducted with both an answer key for objective questions and by subjective analysis of conceptual knowledge. A portion of student assessment in field/lab courses is from instructor's evaluation of ability to use learned techniques. 2) Display proficiency in field and laboratory techniques. Students must be proficient in the use of methods and instrumentation used by professionals who work in the earth and environmental sciences. The proper use and fundamental understanding of research-level methods and instrumentation is promoted by the department's requirement that baccalaureate students take at least 26–38% of their total credit hours (depending on whether earth or environmental science concentration) in laboratory- and field-focused courses. Most students also take additional elective courses that have a laboratory or field practicum component. Proficiency is assessed from lab/field reports, notebook evaluation, and instructor evaluation of, for example, use of equipment and reporting methodology (e.g., proper observation methods, quality assurance). Most course evaluations are conducted with both an answer key for objective questions and by semi-subjective analysis, with rubric, of students' notes. 3) Demonstrate ability to write reports.es. In addition to fundamental knowledge and the ability to conduct research, communication is one of the three most important aspects of science. Scientific writing and oral presentation are instructed in a variety of ways, from our students' first year through their last. We offer a First-Year Seminar (mostly freshmen, but some transfer students) where we work on getting students comfortable speaking in front of their peers weekly and the students write a short essay on a weekly reading assignment. Speaking logically and writing logically go hand-in-hand together. All of our 3000- and 4000-level courses have required writing assignments where students receive instructor feedback on content and grammar. The department teaches a 3-credt hour Scientific Communication course (manuscripts, conference presentations, proposals, etc.). We offer a Writing for Research course in which students work with a faculty member to improve their scientific writing, and we require third- and fourth-year students to attend our weekly department seminar and learn by observation. Assessment of this learning outcome is largely subjective and done by faculty members. Content is important, but an emphasis is placed on improvement from draft-to-draft and demonstration by the student that they are learning from practice and instructor and peer comments. There are several Integrated Writing (IW) courses within EES that offer exposure to literature-based research, content topics in EES, and opportunities to revise and rewrite several reports ultimately achieving a final report including references and annotated bibliography.

## B. Scoring of Student Work

1) Master basic concepts and apply those concepts in natural world. Data used for scoring are collected from homework, lab/field reports (written and oral), written exams, and term papers. Most course evaluations are conducted with both an answer key for objective questions and by subjective analysis of conceptual knowledge. A portion of student assessment in field/lab courses is from instructor's evaluation of ability to use learned techniques. 2) Display

proficiency in field and laboratory techniques. Students are scored on their lab/field reports, notebook evaluation, and instructor evaluation of, for example, use of equipment and reporting methodology (e.g., proper observational methods, quality assurance). Most course evaluations are conducted with both an answer key for objective questions and by semi-subjective analysis, with rubric, of students' notes. Field and Laboratory Techniques Courses EES 4340 Mapping Methods Basic skills of mapping and measurement with a Brunton compass as applied to field studies in the earth and environmental sciences. Key skills include pace and compass traverse mapping, triangulation, bearing and reverse bearings, measurement of lines and planes. EES 4350 Field Mapping Geologic phenomena studied and mapped in the field. Mapping techniques are utilized in a series of exercises of increasing complexity. Standard methods are utilized for observing, describing, interpreting and mapping rock units and their structure. EES 4360 Environmental Field Techniques Principles of monitoring environmental water quality, including lake, river, groundwater, and related issues. Field experiences, include monitoring system design, well design for various monitoring purposes, sampling protocol, sample preservation, and monitoring and sampling at field sites. EES 4600 Limnology Study of the morphological, physical, chemical, and biological characteristics of lakes, bogs, and watersheds. Includes one week of lecture on main campus and one week of field study in northern Wisconsin. 3) Demonstrate ability to write reports. Scoring of this learning outcome is from student homework, their written essays, and their ability to critically revise their own text and that of others. Assessment of this learning outcome is largely subjective and done by faculty members. Content is important, but an emphasis is placed on improvement from draft-to-draft and demonstration by the student that they are learning from practice and instructor and peer comments. EES has several Integrated Writing (IW) courses. The IW designation for a course must be approved by the undergraduate curriculum committee. Courses will have at least 5000 words (20 double-spaced pages) of writing, which will be evaluated for content, form, style, correctness, and overall writing proficiency and give students the opportunity for revision and improvement. Assignments may take many forms and include a mix of formal writing (e.g., a number of short papers evaluated in both draft and final form, a long assignment broken into smaller parts, thus allowing for multiple drafts, feedback, and revisions,) and informal writing (e.g., journals, logs, short responses to lectures, essay examinations). All writing will count as part of students' performance in the course. Responsibility for ensuring that these course requirements are met rests with the colleges offering the courses. EES 3200 Water Energy and the Environment offers content appropriate writing were students select five different topics and write papers about each. The topics could come from a list of recommendations in the syllabus, or the student could write about a topic (or topics) of their own choice reasonably related to the contents of the course. EES 3660 Environmental Health Internship, the reports were about the student's internship experience the agency, mission, duties performed, any challenges encountered, recommendations for future interns, etc. EES 4010 Writing for Research EES 4270 Process Geomorphology offers content appropriate writing of scientific reports. The writing assignments led up to a final draft of a large report paragraph proposal, list of (starting) references, annotated bibliography, detailed outline, rough draft, and final draft. EES 4330 Global Biogeochemical Cycles offers content appropriate writing of scientific reports. Similar to EES 4270. EES 4960 Senior Thesis offers writing in

literature-based research.

### C. Indirect Assessment

No indirect assessment was completed in 20-21.

## III. ASSESSMENT RESULTS/INFORMATION:

a) Graduation rate b) Grade point earned in field courses. Calculated as average (0-4, where A = 4, etc.) c) Grade point earned in IW courses. Calculated as average (0-4, where A = 4, etc.) d) Curriculum e) Curriculum f) Curriculum g) Curriculum h)Curriculum i) Research opportunities

a) Graduation rate has increased steadily from 14-21% in 2014 to 24-31% in 2019 b) N = 33; 3.88 average with 1 incomplete. c) N = 84; 3.06 average d) Current curriculum is biased heavily toward 1000-level "service courses" and upper-division 4000-level and graduate courses e) Selection and availability of summer field courses currently underserves our students f) Retention of 1st-year students in the Department averaged an underwhelming 45% during past five years g) Not enough 3000-level EES courses are designated as Integrated Writing (IW), which is a curricular requirement of WSU. Students often must wait until senior year to meet IW requirement in 4000-level courses. h) The Environmental Sciences Program is undergoing a redesign to incorporate an interdisciplinary approach. i) There are insufficient experiential learning (research) opportunities to meet the desire of our student

a) This is a positive trend, but more needs to be done with regard to student retention and success. Integrated measure of all three Learning Outcomes b) Students are proficient in field (Mapping Methods) and field/lab techniques (Limnology and Environmental Field Techniques). They excel because they enjoy these types of courses. Learning Outcome #2 c) Above average (3.0 = B) score among all students shows most are able to write scientific reports. In-class teaching in Spring 2020 was interrupted by COVID-19, whereas other years were entirely in-class. Learning Outcome #3 d) Reinvigorate retired and develop new 2000- and 3000-level courses with a proportional reduction of 4000-level. This is expected to create a clearer education path for our majors, help ensure they are prepared for upper-division courses, and possibly help student retention. This process began in spring 2020. Learning Outcome #1 e) New field courses are needed to complement existing ones. Also noted by students. New courses are being planned for sampling and analysis in Iceland and Bahamas as early as Summer 2021. Learning Outcome #2 f) Develop a First-Year Seminar course to help retain students. Such a course was instructed successfully, based on student feedback, for the first time in Spring 2020. Learning Outcomes #1 and #3 g)

Modify (as needed) existing courses so they meet IW standards. This process was initiated in Fall 2019, with two courses meriting IW status, and several others are being considered by undergrad studies committee. Writing for Research (new course) was developed in Fall 2020. Learning Outcome #3 h) Faculty need to create more opportunities for undergraduate involvement in research. Learning Outcomes #1 and #2

## IV. ACTIONS TO IMPROVE STUDENT LEARNING

The current EES programs are under revision with the intention of the new Interdisciplinary Environmental Sciences Program being released in fall 2022. The program in Environmental Sciences at Wright State University will be a regional and national leader in scholarship, research and teaching excellence and will provide a significant contribution to the interdisciplinary / complex field of the environmental sciences. To provide a multi-disciplinary program bringing together earth science, biology, ecology, physics and chemistry that will enable a diverse student body to make productive contributions in research, education and service while obtaining overall proficiency in environmental sustainability. An Environmental Steering Committee has formed and is meeting bimonthly to discuss revisions in the program including establishing measurable program learning outcomes and associating the PLOs to exisiting courses. A newly founded Environmental Advisory Board is being established and will have the first meeting fall 2022. The purpose of the Advisory Board is to advise and assist the Program in strategic planning and development. This includes advice pertaining to creating effective curriculum, experiential learning opportunities, (e.g., internships), implementation of short and long-term goals, community outreach and service, and the garnering of financial support for education, research and scholarship in the environmental sciences.

## V. SUPPORTING DOCUMENTS

Additional documentation, when provided, is stored in the internal Academic Program Assessment of Student Learning SharePoint site.