

Assessment Plan

B.S. Environmental Biology, B.S. Earth Science
School of Environmental and Sustainability Sciences
College of Natural, Applied and Health Sciences
Kean University

The School of Environmental and Sustainability Sciences (SESS) was created in July 2013 and is home to B.S. degree programs in Earth Science (currently three options and one in development), Environmental Biology, and Sustainability as well as B.A. degrees in Earth Science (currently five options). While current assessment plans already in place are being used during the 2013-14 AY (for all programs, including Sustainability and the BA options), the information provided here presents a draft reformulation of the individual plans into a more congruent and contiguous manner so as to facilitate overall assessment in SESS that is consistent and universal.

Mission: The Mission of the faculty in the Environmental Biology and Earth Science Programs within School of Environmental and Sustainability Sciences (SESS) at Kean University is to provide research-based training and experiences necessary for the next generation of environmental scientists to be able to:

- recognize the complex and integrated nature of environmental, ecological, and geological related issues and questions facing the world today and in the future;
- address these issues and questions using the most current knowledge in their discipline, a multi-scale and trans-disciplinary approach, and a keen awareness of the needs/concerns of society with respect to the sciences;
- make informed judgments and decisions about environmental issues to embrace the broader social and economic aspects of managing the environment based on scientific approaches
- be successful in graduate school, other post-baccalaureate professional schools, or jobs in their respective scientific disciplines; and finally
- be the next generation of environmental and earth scientists who have the ability to respond to immediate and future challenges through critical scientific thinking and analysis supported by excellence in scholarship and communication.

Our program provides students with knowledge of, and practical skills in multi-disciplinary topics including: (1) The science underpinning climate change and how we can adapt; (2) The pathways of chemicals and pathogens through our environment; (3) The impact of pollutants on ecosystems; (4) Ecosystem functioning in aquatic and terrestrial habitats; (5) Emergency Management and Forecasting; (6) Restoration and Conservation Biology; and (7) How to formulate and test hypotheses through research. In addition to the integrated approach of laboratory and classroom learning, our students work with current, complex, and multi-faceted environmental issues locally and globally by providing internship or case-study experiences and projects as well as partnering with various industry and government sectors. Students also have opportunities to conduct original research in the field and work on campus with SESS faculty

members and present their findings at national science conferences. With hands-on learning and field- and laboratory-based research, SESS offers our students an opportunity to explore a field that combines sophisticated technologies with research that can help them better understand the highly complex and integrated nature of environmental, ecological, hazardous, and health-related problems, issues and questions facing the globe and its inhabitants.

Assessment Process: With the formation of the School of Environmental and Sustainability Sciences (July 2013), a wide variety of major degree option programs have been consolidated into the same administrative unit. Therefore, the means of assessment is being reformulated now for review and implementation following the 2013-14 AY. In the reformulation, four common program student learning outcomes (SLOs) will be shared between B.S. Environmental Biology majors and B.S. Earth Science majors. The fifth SLO is designed to be specific and unique for each degree program in order to assess the outcomes particular to the major. Data will be collected from the courses that are common for all SESS B.S. Degree majors. These courses provide the backbone of the theoretical knowledge, skills, technical expertise the students need for research design, implementation, data analysis and interpretation; and to communicate science effectively (written and oral) to public and professional audiences. As these courses are the key building blocks for all SESS B.S. Degree students in both Environmental Biology and Earth Science Programs, they are used as the primary target for assessing student's knowledge and abilities in the content and basic skills (technical and analytic) appropriate for undergraduate science majors. These courses will include those common among the major program options as well as one key course from within each option plus a capstone experience course.

We will also assess, separately, the success achieved in our entry level courses common for all BS Environmental Biology majors and entry-level courses common for all BS Earth Science majors (to be identified). For both the courses common to all SESS majors and those common to the Environmental Biology or to the Earth Science programs, we will apply the GE oral and written rubrics to written assignments and oral presentations in these classes to assess student's ability to critically read, think, analyze, and present about the sciences. A separate rubric for critical thinking will be added for longitudinal assessment of majors during the completion of their degree work. We will also assess student performance on the lab components of the entry level sequence courses, common SESS courses (as appropriate) and select upper division courses that focus on research methods.

In order to provide evidence for students demonstrating growth in content knowledge we will a multiple tool approach. We will use previously used, but recent, ACT science assessment tools, and current science subject-specific ETS national assessment tools. All SESS Freshmen will take an old ACT subject exam to gauge the level of preparedness of the students for university-level science. We will also administer a 'pre and post' assessment strategy by giving all SESS Freshmen the appropriate ETS National Subject Exam. This assessment will also be given upon completion of the entry level sequences to gauge the level of improvement in student knowledge after completing the sequence. This assessment will also be given to new Transfer students entering Kean. Any Transfer student or Kean direct entry students who scores below the national

50th percentile on any of the different areas of knowledge will need to complete an individually developed IEP (Individual Education Plan) in the summer in order to take upper division courses.

We will also give the ETS specific subject assessments to all SESS seniors in the Senior Research course to determine the level of retention of the basic concepts in the environmental and earth sciences. Lastly, we will use Graduating Student Surveys to provide evidence for the level of success the students feel they have achieved on such items as the ability to demonstrate basic knowledge as unifying principles; the ability to identify interconnections among disciplines; the ability to design and conduct research; the ability to apply the latest computation and lab methods; the interconnections among scientific disciplines; the biotic and abiotic processes of the environment and how these can change due to natural and anthropogenic disturbances and hazards; the ability to communicate scientific results; and the ability to demonstrate a global perspective of science.

SESS Program Student Learning Outcomes (SLOs): Students who graduate with a BS Degree from SESS will be able to:

SLO #1: Demonstrate technical knowledge and skills as well as an understanding of the basic mechanisms and processes associated with biological, atmospheric, geologic, hydrologic, and geographic systems as unifying principles of contemporary environmental and earth science relevant to their own discipline and to those related disciplines in an operationally oriented research environment. This includes basic principles, theories, methods, and protocols for scientific discovery and problem-solving (KU 1, 2) (GE K1, K2, K3, S1, S2, S3)

Direct Measure: Use GE rubric to derive data from written and oral research assignments in courses common to all SESS majors, to those common to Environmental Biology majors, and to those common to Earth Science Majors, to assess student's ability to critically read, think, analyze, and present about the sciences.

Direct Measure: Assess evidence for students demonstrating content knowledge using previously used, but recent, ACT science assessment tools, and science subject-specific ETS national assessment tools to Freshmen, students completing the entry level Environmental Biology and Earth Science sequences, and to new Transfer students.

Indirect Measure: Implement the Graduating Student Survey

SLO #2: Articulate and demonstrate critical thinking/analysis with regard to application of methods and findings. This includes designing and conducting efficient and targeted scientific studies of contemporary problems in the environmental biological and earth sciences. Synthesize and integrate multiple dynamic and system processes and their interactions as well as impacts on, and interactions with, human and societal systems. (KU 1, 2, 3, 4) (GE K1, K2, K3, K4; S1, S2, S3, S4, S5, V1, V5)

Direct Measure: Use GE rubric to derive data from written and oral research assignments in courses common to all SESS majors, to those common to Environmental Biology majors, and to those common to Earth Science Majors, to assess student's ability to critically read, think, analyze, and present about the sciences.

Indirect Measure: Implement the Graduating Student Survey

SLO #3: Appraise, validate, and synthesize relationships in a quantitative manner that expresses system behaviors and characteristics necessary for visualization, knowledge discovery, and prediction. This includes global and historical views and methods of environmental analysis. Analyze data using current, appropriate and efficient laboratory, field, appropriate software, and statistical methods in order to identify and visualize the discoveries and knowledge resulting from research projects that provide an understanding of causes, solutions, prediction of outcomes, etc. associated with these contemporary problems. (KU 2, 3) (GE K4, S1, S2, S3, S4, S5)

Direct Measure: Use GE rubric to derive data from written and oral research assignments in courses common to all SESS majors, to those common to Environmental Biology majors, and to those common to Earth Science Majors, to assess student's ability to critically read, think, analyze, and present about the sciences.

Direct Measure: Use data from scores on the lab portions of courses

Indirect Measure: Implement the Graduating Student Survey

SLO #4: Communicate scientific research findings and other information efficiently and convincingly to professional and community audiences using oral and written methods. (KU 1, KU4) (GE K1, K3, K4, S1, S2, S3, S4, S5, V1).

Direct Measure: Use GE rubric to derive data from written and oral research assignments in courses common to all SELS majors, to those common to Environmental Biology majors, and to those common to Earth Science Majors, to assess student's ability to critically read, think, analyze, and present about the sciences.

Indirect Measure: Implement the Graduating Student Survey

SLO#5 (Different SLO for Environmental Biology and Earth Science majors):

B.S. Environmental Biology: Identify the interconnections among scientific disciplines and the multiple dynamic biotic and abiotic system processes associated with the various components of the environment. Identify how these can change under varying environmental conditions (both natural and anthropogenic); and apply these relationships to scientific investigation. Demonstrate a global perspective of the environmental and life sciences and how they are connected to a global society. (KU 1, 2, 3, 4) (GE K1, K2, K3; S1, S2, S3, S4, S5, V1, V2, V4).

B.S. Earth Science: Discern, design, research, analyze, interpret, apply, evaluate, verify, and implement research to identify and address fundamental and other questions, problems, or issues in Earth Science. This includes formulation of research questions, hypotheses and testing; critical observations, analysis, and visualization; access of pertinent data archives and their manipulation; and complex systems analysis and modeling. (KU 1, 2, 3, 4) (GE K1, K2, K3, K4, S1, S2, S3, S4, S5).

Direct Measure: Use GE rubric to derive data from written and oral research assignments in courses common to all SESS majors, to those common to Environmental Biology majors, and to those common to Earth Science Majors, to assess student's ability to critically read, think, analyze, and present about the sciences.

Indirect Measure: Implement the Graduating Student Survey

*** KU Student Outcomes: *Kean University graduates should be able to:***

1. Think critically, creatively and globally;
2. Adapt to changing social, economic, and technological environments;
3. Serve as active and contributing members of their communities; and
4. Advance their knowledge in the traditional disciplines (GE) and enhance their skills in professional areas (Prof. programs)

****General Education Student Learning Outcomes**

Student Learning Outcomes – Knowledge: Students will demonstrate proficiency in knowledge and content by:

- (K1) applying the scientific method to understand natural concepts and processes;
- (K2) evaluating major theories and concepts in social sciences;
- (K3) relating historical references to literature; and
- (K4) evaluating major theories and concepts in the fine arts.

Student Learning Outcomes – Skills: Students will demonstrate the skills necessary to:

- (S1) write to communicate and clarify learning ;
- (S2) communicate effectively through speech;
- (S3) solve problems using quantitative reasoning;
- (S4) think critically about concepts in multiple disciplines; and
- (S5) show information literacy.

Student Learning Outcomes – Values: Students will exhibit a set of values that demonstrates:

- (V1) personal responsibility;
- (V2) ethical and social responsibility;
- (V3) social and civic engagement;
- (V4) respect for diverse cultures and perspectives; and
- (V5) life-long learning.