Academic Degree Programs Assessment

Submitted to the University Assessment Panel

AY 2021-2022

Part I: Assessment Plan

College of Liberal Arts and Sciences

Department of Geology and Environmental Geosciences

Geology

Ph.D.

2021-2022

Submitted to the University Assessment Panel by: Mark R. Frank

Mark R. Frank, Interim Chair

1. Introduction

The Ph.D. program prepares students to design, conduct and manage research projects with large, diverse data sets. They build global networks of collaborators, learn to communicate with the producers and consumers of scientific information, and participate in a professional development internship. Our goal is to create graduates who can excel in high-level scientific positions in various settings. Throughout its 40 year history, our Ph.D. program has largely been populated by students who developed a previously unknown passion for research while completing an M.S. or B.S. degree. Many did their previous degree(s) at a smaller university where they established a close relationship with a mentor who stoked their enthusiasm for science, learning and teaching. Most arrive without regard for the job market or how their work will prepare them for that market – they just want to pursue their passion for science. Our program takes this raw energy and gives it purpose and direction, molding students who most often have ordinary midwestern backgrounds into competent, thoughtful, innovative scientists who are ready to be leaders on the national and international stage. Their research projects take them all over the world and build an understanding of the important role that geoscientists play as stewards of the natural environment. We train Ph.D. students to be model citizens through a culture of close mentorship, transparency and inclusion. During monthly meetings with the Chair, Ph.D. students on the Student Advisory Committee represent their peers and provide input on how to improve the overall experience of all students in the department. We routinely include Ph.D. students on faculty search committees. To combat nationwide, persistent, low diversity in geoscience Ph.D. programs, we recently created a DEI Committee that is primarily comprised of faculty, M.S. and Ph.D. students who completed an NSF-funded, semester-long, Unlearning Racism in Geoscience program. Our required GEOL 501 course trains students in professional ethics and our GEOL 603 course builds in our TAs, an appreciation for the diverse learning styles and cultural backgrounds of NIU undergraduates. These investments yield lasting dividends in the form of improved student experiences in the undergraduate courses that are often taught by our Ph.D. students.

2. Student Learning Outcomes (SLOs)

Graduate students seeking a Ph.D. in the Department of Geology and Environmental Geosciences are expected demonstrate a broad variety of skills and knowledge throughout their progress through the program. For purposes of assessment, and to ensure that students have a clear understanding of what is expected of them throughout the program, the Department of Geology and Environmental Geosciences divides these skills and knowledge into five basic categories described below.

1. Specialized Geoscience Knowledge

   Graduate students are key agents in the advancement of scientific knowledge, generally in a fairly specialized realm. This knowledge can be subdivided into four general areas of earth materials, earth features, earth processes and interpretation of the geological record. For example, graduate research may involve reconstructing the depositional environment of glacial sediments, petrographic analysis of rocks and minerals, or modeling of geological processes. Students are expected to develop and demonstrate unique geoscientific skills and knowledge of their chosen sub-discipline, and to impart this knowledge to others, including non-specialists.

2. Collection, Evaluation, and Manipulation of Data

   Scientific inquiry and interpretation relies on accurate collection and evaluation of observational and experimental data. Interpretations are only as good as the data that support them, and

scientists must strive to maintain excellence in collecting and handling data. Consequently, students must be able to accurately collect and synthesize field and laboratory observations or data. They must be able to assess the data quality, recognize sources of data error and bias, and demonstrate basic proficiency with computer programs used to organize, manipulate, analyze and present data.

3. Scientific Analysis

Scientific analysis is higher-order critical thinking and creative reasoning that requires students to apply their knowledge and skills in novel ways. Students who can effectively perform this critical thinking will be able to devise original research plans, formulate testable scientific hypotheses, develop multiple working hypotheses to interpret scientific data and observations, assess the quality and accuracy of scientific reporting in the modern media, and assess the approach and results of their own research, as well as the research of others.

4. Communication

The successful advance and use of scientific knowledge and understanding requires effective communication, not only amongst scientists, but also amongst scientists, governments, educators, and the public. To ensure that graduates of the program are effective communicators,students will be able to conduct literature research, summarize the work of others, write technical summaries of research, prepare public presentations, and explain technical information to generalaudiences, including primary and secondary school students and teachers.

5. Societal Significance of Geoscience

Geoscientists have long been at the forefront of the battle for environmental preservation and forthe safe, efficient and logical exploitation of Earth's natural resources. To continue this tradition,and to assist in producing an environmentally conscientious public, students will be able to recognize, describe and explain short- and long-term environmental issues and risks faced by humans and induced by human activities. In addition, they will be able to explain the ways that geoscience contributes to society, including natural hazard assessment, water and mineral resource management, energy resource exploration and utilization, waste management, environmental protection, environmental and climate change, and education.

3. Program-by-Baccalaureate Student Learning Outcomes Matrix

NA

4. Curriculum Map

Course	Program Student Learning Outcomes						
	1.Specialized Geologic Knowledge	2. Collection, evaluation, and manipulation of data	3. Scientific Analysis	4. Communication	5. Societal Significance of Geosciences		
GEOL 501	B	B	D	D	D		
GEOL 720	P	P	P	P	P		
GEOL 799	F	F	F	F	F		
Note. Course supports the outcome at the B=beginning, D=developing, or P=proficient level.							

5. Assessment Methods

EXPLANATION OF ASSESSMENT METHODS TABLE

Assessment Method	**Explanation**					
	Description	Student-Level Achievement [a]	Program-Level Target [b]	When Data Will be Collected	Person Responsible	SLOs Covered
Annual Progress Report	Each Ph.D. student must convene a thesis committee meeting wherein they summarize the research and coursework progress they have made in the preceding year. Student can be judged to 3) does not meet expectation, 2) meets expectations, or 1) exceeds expectations.	A student will receive a score of Meets (2) or better on this assessment.	100% of all students will meet or exceed the student-level target (2) for progress in the program.	Annually, near the end of each spring semester.	Student submits report to their dissertation committee. The Dissertation Director submits to the Graduate Program Director, the committee's evaluation of student progress.	1, 2, 3
Teaching Evaluations	Annual evaluation data submitted by students in courses taught by the Ph.D. student. Student can be judged to 3) does not meet expectation, 2) meets expectations, or 1) exceeds expectations.	A student will receive a score of Meets (2) or better on this assessment.	100% of students will demonstrate established or higher proficiency	Evaluations submitted at the end of each semester, data aggregated when returned to department at the start of each subsequent semester.	Graduate Program Director	1, 4, 5
Colloquium	Each Ph.D. student will prepare and deliver a professional, public presentation of their research. Student can be judged to 4) introductory, 3) basic, or 2) established or 1) advanced.	A student will receive a score of basic (3) or better proficiency on this assessment.	100% of students will show basic or higher proficiency	Delivered no later than the semester in which the dissertation defense occurs.	Graduate Program Director	1, 2, 3, 4

Assessment Method	Explanation					
	Description	Student-Level Achievement [a]	Program-Level Target [b]	When Data Will be Collected	Person Responsible	SLOs Covered
Dissertation Defense	Each Ph.D. student will publicly present their research methodology, results, and interpretations. The student will then defend their work during questioning by the thesis committee. Student can be judged to 4) introductory, 3) basic, or 2) established or 1) advanced.	A student will receive a score of established (2) or higher proficiency on this assessment.	100% of students will demonstrate established or higher proficiency	Conducted in the final semester before graduation.	Dissertation Director and dissertation committee	1, 2, 3, 4, 5
Candidacy Exam	Each Ph.D. student must pass an exam to move to candidacy. This is a written examination prepared by an examining committee approved by the Graduate Program Director. A student can be judged to be 4) introductory, 3) basic, or 2) established or 1) advanced proficiencies.	A student will receive a score of established (2) or higher proficiency on this assessment.	100% of students will show established or higher proficiency	Taken after student completes the 30 credit hours of coursework beyond the M.S. degree	Examination committee submits results to Graduate Program Director	1, 2, 3, 4

Assessment Method	Explanation					
	Description	Student-Level Achievement [a]	Program-Level Target [b]	When Data Will be Collected	Person Responsible	SLOs Covered
External Review of Scholarship	Publication of peer-reviewed articles; presentations at professional conferences; scholarships won; receipt of competitive research funding; honors and awards received. Student can be judged to 2) does not meet expectation, or 1) meets expectations.	A student will receive a score of meets (1) on this assessment.	100% of students will have presented at a national or international conference, won competitive external research funding, and been listed as first author on a peer-reviewed publication (by time of graduation)	These activities occur in a nonperiodic manner. Their timing depends on when students submit papers, attend conferences, or apply for external scholarships and research funding. We attempt to summarize this information at the end of each spring semester.	Ph.D. students and faculty members are requested to inform the Graduate Program Director when these things happen. This should normally be reported in the Annual Progress Report.	1, 2, 3, 4, 5
Employer Survey	Survey sent to student employers. Employers can respond that our students are prepared for their careers: 1) disagree, 2) slightly agree, 3) agree or 4) strongly agree	Employers will respond with a score of slightly agrees (2) or better on this assessment.	75% of employer responses will be in the agree slightly, agree, and strongly agree	Conducted at the conclusion of any internship, or 6 months after job placement	Assessment Coordinator	1, 2, 3, 4

Note. [a] Student-level target is the score or performance an individual student must demonstrate to say the student met the student learning outcome.
[b] Program-level target is the percent of all students that must demonstrate they meet the student learning outcome.

ASSESSMENT METHODS-BY-OUTCOMES MATRIX

Assessment Method	**Program Student Learning Outcome**						
	1.Specialized Geologic Knowledge	2. Collection, evaluation, and manipulation of data	3. Scientific Analysis	4. Communication	5. Societal Significance of Geosciences		
Annual Progress Report	F, I	F, I					
Teaching Evaluations	F, I			F, I	F, I		
Colloquium	F, D	F, D	F, D	F, D			
Dissertation Defense	S, D	S, D	S, D	S, D	S, D		
Candidacy Exam	S, D	S, D	S, D	S, D			
External Review of Scholarship	F, I	F, I	F, I	F, I	F, I		
Employer Survey	S, I	S, I	S, I	S, I			
Note. F=formative assessment, S=summative assessment, D=direct assessment, and I=indirect assessment. See the paragraph above for an explanation of each type of assessment.							