

Academic Program
Plan for Assessment of Student Learning Outcomes
The University of New Mexico

A. College, Department and Date

1. College: Arts and Sciences
2. Department: Earth and Planetary Sciences
3. Date: April 14, 2014

B. Academic Program of Study*

Ph.D. in Earth and Planetary Sciences

C. Contact Person(s) for the Assessment Plan

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D. Broad Program Goals & Measurable Student Learning Outcomes

1. Broad Program Learning Goals for this Degree/Certificate Program

Upon graduating from the graduate program in Earth and Planetary Sciences, Ph.D. students will be able to:

- A. Broadly understand and explain the significance of major research questions in one or more areas of earth and planetary sciences.
- B. Formulate testable scientific hypotheses.
- C. Carry out independent research in one or more subfields of earth and planetary sciences, using appropriate field, experimental, analytical, and/or computational methods.
- D. Describe, synthesize, and interpret the results of a scientific investigation orally and in writing.

2. List of Student Learning Outcomes (SLOs) for this Degree/Certificate Program

A.

* Academic Program of Study is defined as an approved course of study leading to a certificate or degree reflected on a UNM transcript. A graduate-level program of study typically includes a capstone experience (e.g. thesis, dissertation, professional paper or project, comprehensive exam, etc.).

1. Students will summarize current research questions and approaches in one or more subfields in earth, atmospheric, and/or planetary science.

B.

1. PhD students will write at two research proposals that present a testable hypothesis, outline the types of data needed to test the hypothesis, and describe how the collected data will be used to test the hypothesis. They will demonstrate greater independence than most MS students in preparing the proposal documents.

C.

1. Students will read and critically evaluate primary scientific literature in one or more subfields in earth, atmospheric, and/or planetary science.
2. Students will devise and implement a field, experimental, analytical, and/or computational plan aimed at collecting and analyzing the data necessary to address a specific scientific question.

D.

1. Students will present and defend the results of their research (orally or in poster format) in order to demonstrate mastery of the material and an ability to communicate the results and significance of their work to other scientists.
2. Students will write a dissertation, or collection of manuscripts in which the motivation for the research is outlined, methods are described, data and interpretations are clearly separated, prior work is appropriately referenced, and the significance of the work is articulated.
3. Students will communicate the results of research carried out independently or as part of a team via publication of peer-reviewed articles, maps, meeting abstracts, and/or technical reports. Publication is an obligation inherent in the acceptance of funding for scientific research, and the submission and revision processes force critical reevaluation of data and improvement of writing skills. Publication is also an essential mechanism for communicating and engaging with the larger professional community.

E. Assessment of Student Learning Three-Year Plan

All programs are expected to measure some outcomes annually and to measure all priority program outcomes at least once over two consecutive three-year review cycles. Describe below the plan for the next three years of assessment of program-level student learning outcomes.

1. Student Learning Outcomes

Relationship to UNM Student Learning Goals (insert the program SLOs and check all that apply):

University of New Mexico Student Learning Goals				
Program SLOs	Knowledge	Skills	Responsibility	Program SLO is conceptually different from university goals.
A.1. Students will summarize current research questions and approaches in one or more subfields in earth, atmospheric, or planetary science.	XX	XX		
B.1. Students will write a research proposal that presents a testable hypothesis, outlines the types of data needed to test the hypothesis, and describes how the collected data will be used to test the hypothesis.	XX	XX	XX	
C.2. Students will devise and implement a plan aimed at collecting the data necessary to address a specific scientific question.	XX	XX	XX	
D.3. Students will communicate the results of research carried out independently or as part of a team via publication of peer-reviewed articles and/or technical reports.	XX	XX	XX	

2. How will learning outcomes be assessed?

A. What:

Student Learning Outcome A.1.

- i. (a) All EPS PhD graduate students prepare two research proposals as part of the comprehensive examination process. Each proposal includes a description of prior work on a specific topic, a description of the research question(s) being asked, and discussion of the significance of the work.
- (b) All EPS PHD graduate students are required to take at least one credit of EPS 501, our weekly colloquium series in which outside speakers present talks on their current research. Students enrolled in EPS 501 must prepare written summaries of talks that describe the research questions being addressed, why they are important, how speakers approached the questions, and the significance and merit of the conclusions drawn.
- ii. (a) The measure is direct: the EPS Department requires a formal evaluation of each student’s written and oral exam performance from every member of the examination

committee. Each student completing a comprehensive exam will be collectively rated by the committee (four or more faculty members including one external member) using the attached comprehensive exam matrix.

- (b) The measure is direct: the faculty member in charge of EPS 501 evaluates the written summaries of research talks each semester.
- iii. (a) We expect that $\geq 85\%$ of the students taking their examinations each year will pass the oral portion of the exam.
- (b) We expect that $\geq 85\%$ of the written summaries of colloquium talks will accurately identify the scientific question asked, the approach taken, and the significance of the results.

Student Learning Outcome B.1.

- i. All PhD students prepare two research proposals (each advised by different faculty members) in their third semester in residence.
- ii. The measure is direct. Each proposal is evaluated by the student's examination committee.
- iii. Each member of a student's exam committee must provide written answers of "yes" or "no" to the following questions within one week of submission of the PhD proposals: Is a scientific hypothesis or question clearly identified? Is the significance of the problem clearly stated? Are the methods clearly identified and appropriate? Are potential outcomes identified? Is the proposal ready to be defended? A "no" answer to the last question from any member of the exam committee triggers an automatic committee meeting at which the student will receive further guidance regarding changes that must be made to the written proposal before the oral portion of the comprehensive exam can be taken. The written report of the examination committee is forwarded immediately to the departmental Graduate Committee. The questions that exam committee members must answer are clearly communicated to all graduate students. We thus expect that $\geq 85\%$ of our graduate students submitting proposals each year will pass directly to the oral exam stage without a mandatory extra committee meeting and rewriting of the proposal(s).

Student Learning Outcome C.2.

- i. This goal will be assessed via the written proposals described in B.1. above and during the oral portion of the comprehensive examination. The research plan is an integral part of each proposal, and is also assessed in depth during the oral examination.
- ii. The measure is direct. Each member of the exam committee submits a written assessment of the research proposal and of the student's performance during the oral examination.
- iii. Success is defined as attaining an unconditional pass on the comprehensive examination. We expect that $\geq 85\%$ of graduate students taking their comprehensive examinations each year will pass unconditionally.

Student Learning Outcome D.3.

- i. This goal will be assessed via records of publications, maps, abstract, and technical reports authored or coauthored by current and former graduate students that are directly related to work carried out while the students were in residence at UNM.
- ii. The measure is direct. Faculty advisors keep track of publications and reports based on work completed by current and former students. We will consider all publications and

professional reports that are finalized within 3 years following completion of the graduate degree.

- iii. We define success as publication of at least one article or map, or acceptance of one professional report by >75% of our PhD students within three years of completion of the degree. We expect that higher percentages of published abstracts will result at the PhD level.

B. Who:

Student Learning Outcome A.1.

Evidence will come from all graduate students who take the comprehensive examination each year and from all graduate students enrolled in EPS 501 each year.

Student Learning Outcome B.1.

Evidence will come from all graduate students who take the comprehensive examination each year.

Student Learning Outcome C.2.

Evidence will come from all graduate students who take the comprehensive examination each year.

Student Learning Outcome D.3.

Evidence will come from all current graduate students and all students who have graduated within the last three years.

3. When will learning outcomes be assessed? When and in what forum will the results of the assessment be discussed?

Student Learning Outcome A.1.

This outcome is best assessed once per year, during the spring semester, for each year of the three year time-frame. The results from the previous calendar year will be assessed by the Departmental Graduate Committee and brought to the full faculty during each spring semester.

Student Learning Outcome B.1.

This outcome is best assessed once per year, during the spring semester, for each year of the three year time-frame. The results from the previous calendar year will be assessed by the Departmental Graduate Committee and brought to the full faculty during each spring semester.

Student Learning Outcome C.2.

This outcome is best assessed once per year, during the spring semester, for each year of the three year time-frame. The results from the previous calendar year will be assessed by the Departmental Graduate Committee and brought to the full faculty during each spring semester.

Student Learning Outcome D.3.

This outcome is best assessed once a year, during the spring semester, including data from the current year and the three previous years. The results will be assessed by the Departmental Graduate Committee and brought to the full faculty during each spring semester.

4. What is the unit's process to analyze/interpret assessment data and use results to improve student learning?

Student Learning Outcome A. 1.

Written feedback will be collected from each examination committee and from the instructor of record for EPS 501 and will be forwarded to the Graduate Committee for discussion and analysis. Recommendations from this committee will be made to the full faculty. If we fall short of our >85% success goal, we will consider making participation in EPS 501 for more than one semester mandatory and modifying the requirements of the class in such a way that there is a greater emphasis on identification of broad research questions.

Student Learning Outcome B.1.

Written feedback will be collected from each examination committee during the year and will be forwarded to the Graduate Committee for discussion and analysis. Recommendations from this committee will be made to the full faculty. If we fall short of our >85% success goal, we will consider ways to restructure our student/committee meeting timetable and format, and also the nature of class assignments in courses typically taken by graduate students during their first year in residence.

Student Learning Outcome C.2.

Written feedback will be collected from each examination committee during the year and will be forwarded to the Graduate Committee for discussion and analysis. Recommendations from this committee will be made to the full faculty. If we fall short of our >85% success goal, we will consider ways to restructure our student/committee meeting timetable and format, and also the nature of class assignments in courses typically taken by graduate students during their first year in residence.

Student Learning Outcome D.3.

Departmental annual reports contain permanent archives of all publications authored or coauthored by students in EPS each year. We will examine reports for the current year and three previous years. If fewer student publications are arising in timely fashion from graduate work than we expect, we will discuss possible reasons for the lower numbers and, if deemed critical, will consider implementing a graduate seminar on scientific publication.