2016

Department of Chemistry and Biochemistry Ph.D. Assessment Plan

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College of Liberal Arts and Sciences
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A. The Ph.D. Candidate in Chemistry will:

2. Effectively engage undergraduate students as Teaching Assistants and consistently practice laboratory safety. In particular:

a. All students will demonstrate comprehensive knowledge of the NIU Chemical Hygiene Plan, participate in lab safety training, and consistently practice and promote all safety policies in their assigned teaching and research laboratories.
(Same as M.S. candidate)

b. 90% of students will apply sound pedagogical practices as laboratory or recitation instructors and will be considered effective instructors by at least 70% of their assigned undergraduate students.
(Same as M.S. candidate)

c. All Ph.D. students will be able to implement an effective safety plan for the academic, industrial, or government research laboratory and exhibit behaviors that identify and instill a safety culture.

3. Communicate published research using clear and effective language. In particular:

a. All students will be able to give a seminar in the primary field of study that organizes, accurately presents, and explains the significance of the published works of others. **(Same as M.S. candidate)**

5. Demonstrate advanced proficiency within the field of study and conduct research that culminates in a dissertation. In particular:

a. All Ph.D. students will demonstrate knowledge proficiency at the 60^{th} percentile composite norm level in general chemistry and two undergraduate chemical subject areas, with at least one subject area in the field of study.

b. All Ph.D. students will demonstrate an advanced understanding of the primary field of study.

c. All Ph.D. students will articulate a research problem, discuss its potential and limits with respect to theory, knowledge, or practice within a field of study, and formulate hypotheses, concepts, experimental designs, and/or techniques beyond the current boundaries of knowledge within the field of study.

d. All Ph.D. students will communicate complex ideas in a clear and understandable manner.

e. All Ph.D. students will conduct research that makes a substantive contribution to society and advances the field of study (e.g. grant writing, poster/oral presentations at local/regional/national meetings, manuscript writing/publication).

6. Demonstrate breadth of learning experiences. In particular:

a. All Ph.D. students will engage in collaborative/interdisciplinary research experiences and/or provide evidence of broad professional development through diverse activities (workshops, professional networking (e.g. LinkedIn), professional committees, symposia, seminars, internships, RCR training).

b. All Ph.D. students will effectively mentor undergraduate research students.

7. Demonstrate professional conduct and ethics. In particular:

a. All Ph.D. students will practice, encourage and promote ethical, professional, and responsible research conduct.

Indirect Measures:

a. All Ph.D. students will meet or exceed expectation of the Dean's Designee report administered by the Graduate School.

b. All Ph.D. dissertations will meet or exceed expectation on the external review of dissertations conducted by the Graduate School.

c. All Ph.D. students will obtain professional employment within 6 months of receiving the degree.

B. Explanation of Methods.

The following table summarizes methods used in the Ph.D. Assessment Plan to gather quantitative data on the Student Learning Outcomes (SLOs) that uniquely apply to the Ph.D., and not to the M.S., candidate. The timeline for the Ph.D. Assessment Plan spans 10 semesters and begins with "Semester 1" to accommodate the program's practice of admitting students in both fall and spring semesters. Students are responsible for regularly entering their SLO data into Individual Development Plans (IDPs) and for scheduling meetings with faculty advisory committees, beginning semester 2. An important role of the advisory committees is use the SLO data to improve student performance. The advisory committees later become the student's candidacy examination committees. SLOs are referenced in the following Summary table using the coding format in section A (SLO 2c, 5a, etc.).

Summary of Assessments.

Method and Type	Description	Target	Timeline	Person(s) Responsible
Professional development and lab safety course, CHEM 690. Direct, Summative	SLO 2c: Measures ability to perform hazards assessments, implement proper laboratory controls, and model behaviors consistent with a lab safety culture.	All Ph.D. students will successfully complete all workshops and assignments in CHEM 690 and meet or exceed expectations on a RA lab safety scoring rubric.	CHEM 690: Semester 1, 2, 3, and 4. Research Laboratory: Each semester/term doing research.	Director of Graduate Studies and Safety Personnel from the Office of Research, Compliance, Integrity, and Safety.
Standardized ACS (American Chemical Society) Exams Direct, Summative	SLO 5a: Measures content proficiency at the undergraduate level in chemistry.	All Ph.D. students will achieve a minimum 60^{th} percentile composite norm score in general chemistry and two subject areas of chemistry.	Administered to all entering M.S. students during orientation week. Re-taken, if < 50^{th} percentile, during orientation week in the next semester.	Divisional Faculty and the Director of Graduate Studies.

Qualifying examination and written dissertation. Direct, Summative	SLO 5b: Qualifying Examination measures advanced content knowledge and ability to interpret and analyze data, design experiments, and differentiate hypotheses. Written dissertation provides an additional measure of content mastery in primary field of research.	All Ph.D. students will meet or exceed expectation on all indicators on a qualifying examination scoring rubric and on a specific indicator in a written dissertation scoring rubric.	Qualifying exam is in semester 4 or the beginning of semester 5. Written dissertation is evaluated in the defending semester of term.	Qualifying examination Committee. Dissertation Defense Committee.
Candidacy examination, oral defense of dissertation research, and written dissertation. Direct, Summative	SLO 5c: Each method measures ability to articulate a research problem, establish its significance, design experiments, interpret outcomes, and differentiate hypotheses.	All Ph.D. students will meet or exceed expectation on specific indicators in candidacy examination, oral defense of dissertation research, and written dissertation scoring rubrics. .	Candidacy exam is in semester 6 or beginning of semester 7. Oral defense and written dissertation methods are applied in the defending semester or term.	Candidacy Examination Committee. Dissertation Defense Committee.
Candidacy examination, oral defense of dissertation research, and written dissertation. Direct, Summative	SLO 5d: Measures ability to communicate complex concepts and methods.	All Ph.D. students will meet or exceed expectation on specific indicators in candidacy examination, oral defense of dissertation research, and written dissertation scoring rubrics. .	Candidacy exam is in semester 6 or beginning of semester 7. Oral defense and written dissertation methods are applied in the defending semester or term.	Candidacy Examination Committee. Dissertation Defense Committee.
Professional writing and presentation activities; honors and awards Direct, Summative	SLO 5e: Provides evidence of contributions that advanced the field of study, such as manuscript/grant proposal writing, oral/poster presentations, and honors/awards.	All Ph.D. students will show evidence of at least 4 out of 6 items listed in a Ph.D. Individual Development Plan (IDP) template.	Ongoing.	Ph.D. Student.

Collaborative research and professional engagement activities Direct, Summative	SLO 6a: Measures involvement in collaborative/interdisciplinary research and in engagement activities such as webinars/workshops, professional networking, internships, responsible conduct of research training, etc.	All Ph.D. students will show evidence of collaborative training and at least 4 out of 6 professional engagement items listed in a Ph.D. Individual Development Plan (IDP) template.	Ongoing	Ph.D. Student
Mentoring of undergraduate research students Direct, Summative	SLO 6b and 7a: Measures mentoring behaviors in the research laboratory, including training, modeling and promoting professional/ethical behaviors, and proper procedures to ensure safe laboratory practices.	All Ph.D. students will meet or exceed expectation in a mentoring survey given to research undergraduates assigned to a graduate student.	Ongoing, at end of undergraduate research experience.	Ph.D. Student.
Dean's designee reports and external dissertation reviews Indirect, Summative	Provides external measures of the quality of the oral dissertation defense and written dissertation.	All Ph.D. oral defenses and written dissertations will meet or exceed expectation based on external evaluations provided by the Graduate School.	Defending semester or term for the oral defense. External dissertation review schedule is set by the Graduate School	Dean of the Graduate School.

C. Alignment Matrix of Student Learning Outcomes and Assessment Methods.