CHEMISTRY: CHEMISTRY EDUCATION (PH.D.)

https://ceps.unh.edu/chemistry/chemistry-phd

**Description**

The Ph.D. Option in Chemistry Education is designed for students who plan a career at the interface of Science and Education (e.g. discipline-based education research, educational program assessment, STEM curricular design, chemistry teaching, etc.). The rigorous program involves coursework in Chemistry, Psychology and Education and original research in Chemistry Education, leading to the submission of a dissertation. Students with a research-based MS (or equivalent) will be admitted directly to the program. Students with a BS (or equivalent) will first obtain an MS degree, carrying out original laboratory-based research with a faculty mentor, and submitting a thesis. The program has a focus on developing strong writing and oral communication skills. Financial support is typically available through a teaching assistantship.

**Requirements**

**Ph.D. Option in Chemistry Education**

- Demonstration of a broad understanding of undergraduate chemistry by passing a series of basic examinations or satisfactory performance in approved courses.
- Demonstration of chemistry laboratory research proficiency by completing a thesis-based M.S. (or equivalent) either at UNH or another university.
- Satisfactory performance in a series of courses in science education, cognition, and qualitative/quantitative research methods.
- Attendance at Department seminars.
- Attendance at Graduate Research Update sessions and presentation once annually from year 2 onward.
- Satisfactory presentation of a Research Progress Report in the second year of residence,
- One oral presentation at a regional or technical conference, and one oral or poster presentation at the UNH Graduate Research Symposium.
- Preparation and oral defense of an original research prospectus in the third year of residence. Successful completion of the research proposal defense enables the student to advance to candidacy.
- Preparation, public presentation, and oral defense of a written dissertation.
- GPA of 3.0 or higher required to graduate.
- Please contact the department for additional information on this option.

**Faculty Research Advisor and Dissertation Committee**

Students select a research advisor during the first semester in the program after interviewing at least three faculty members. During each semester thereafter, students conduct independent research under the supervision of the Faculty Research Advisor. In the second year of residence and before the Research Progress Report, a dissertation committee is selected. This committee evaluates the student’s Research Progress Report and the Research Proposal Defense. Once the Research Proposal Defense has been passed and the student advances to candidacy, a fifth committee member is selected and added to the Dissertation Committee to evaluate the Dissertation Defense.

**Coursework Requirements**

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 800</td>
<td>Introduction to Chemistry Teaching and Research Practices</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 801</td>
<td>Modern Tools for Researchers in the Chemical Sciences</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 802</td>
<td>Critical Thinking for Chemists</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 803</td>
<td>Creative Thinking for Chemists</td>
<td>1</td>
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**Chemistry Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>CHEM 995</td>
<td>Colloquium (CHEM 995F Colloquium: Chemistry Education)</td>
<td>1-4</td>
</tr>
<tr>
<td>CHEM 997</td>
<td>Seminar</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 999</td>
<td>Doctoral Research</td>
<td>0</td>
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3 Chemistry CORE courses in a sub-discipline recommended by research advisor or MS degree

**Quantitative Statistics**

Choose 2 courses (see examples below)

- PSYC 705: Tests and Measurement
- PSYC 805: Research Methodology and Statistics I
- PSYC 806: Research Methodology and Statistics II
- PSYC 907: Research Methods and Statistics III
- EDUC 978: Applied Regression Analysis in Educational Research
- EDUC 979: Applied Multilevel Modeling
- EDUC 981: Quantitative Inquiry: Methods and Techniques of Educational Research
- MATH 835: Statistical Methods for Research
- MATH 836: Advanced Statistical Modeling
- MATH 839: Applied Regression Analysis

**Qualitative Methods**

Choose 1 course (example below)

- EDUC 904: Qualitative Inquiry in Research
- EDUC 982: Qualitative Fieldwork & Data Analysis
- SOC 904: Sociological Methods IV: Qualitative and Historical Research Methods

**Cognition**

Choose 1 course (example below)

- PSYC 789: Cognitive Development
- PSYC 710: Visual Perception
- PSYC 712: Psychology of Language
- PSYC 716: Cognitive Neuroscience
- PSYC 731: Brain and Behavior
- PSYC 914: Advanced Seminar in Cognition
- PSYC 917: Advanced Seminar in Sensory and Perceptual Processes

**Student Learning Outcomes**

All graduates will be able to:

- Comprehend, plan and conduct advanced research under the guidance of a research advisor while developing their intellectual independence that demonstrates scholarship.
- Develop the ability to design and conduct experiments safely, as well as to analyze and interpret data.
- Develop and demonstrate oral and written communication skills to enable effective communication in all aspects of their professional career. This would include presentations, developing papers for published works and grant writing.
- Develop and apply theories, methodologies, and knowledge to address questions and resolve problems in the field of chemistry and in associated interdisciplinary projects.
- Develop the capacity of function and work effectively alone and in a team environment.
- Develop professional and ethic responsibility and follow this throughout their careers in the field or in academia.
- Investigate research ideas related to the content, context, and human experience of chemistry learning.
• Understand and implement research methodologies from education, psychology, and sociology.