



Doctoral Program in Science Education

Student & Faculty Handbook



**MU Science Education Center
University of Missouri
www.musec.missouri.edu**

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Introduction

The purpose of the Doctoral Program in Science Education is to prepare individuals for research careers in higher education and for leadership positions in various educational settings. The program aims to improve student knowledge about the field of science education, and ability to conduct research in the field. Programs of study are individually planned with a faculty committee, and are based upon a candidate's background, experiences, and professional goals.

Goals for Science Education Doctoral Students

1. Demonstrate proficiency with the breadth of the field of science education (including familiarity with the knowledge base, major research programs, seminal papers, and influential members of the field).
2. Develop knowledge of other fields within education (educational policy, technology, etc.) and be able to apply that knowledge base in both teaching and research contexts.
3. Develop knowledge of science disciplines (physics, chemistry, etc.) and be able to apply that knowledge base in both teaching and research contexts.
4. Demonstrate understanding and ability to apply a variety of methodological frameworks/paradigms to conceptualize and design research, collect and analyze data, and interpret/present findings.
5. Understand relevant theoretical frameworks appropriate to science education research and be able to apply them within specific research projects.
6. Be able to critically review and synthesize research and identify implications for teaching, research, and/or policy.
7. Demonstrate skills (formal and informal) for communicating with various audience (research peers, practitioners, etc.) in different formats (oral/written).
8. Develop knowledge related to teaching science teachers (inservice/preservice teachers, professional development, and/or outreach).
9. Understand the ethical issues involved in being a student, science teacher educator, and science education research and achieve high ethical standards in these areas.
10. Become an active member of the scholarly community both within and beyond the university setting.

Science Education PhD Program
Process at a Glance

(for new students and outside area faculty)

1. Upon entering program, student is assigned a Program Advisor.
2. By the end of the first year, student selects Doctoral Advisor and Advisory committee. Student completes Plan of Study and holds meeting (1 hour) with Advisory Committee for approval of Plan.
3. When students have completed or are in the final semester of their research coursework, they are eligible for Comprehensive Exams. Students will meet with their committee (1 hour) to design a set of exams/projects that will help them to synthesize their knowledge and apply it to their potential dissertation problem. After this meeting, the committee develops 4 comp questions and shares with the student
4. When the written exams are complete, students schedule an oral defense of their comprehensive exams (2 hours). At this meeting, the Advisory Committee asks questions directed at the written products.
5. After a student passes the Comprehensive Exams, he/she is ready to generate the dissertation research proposal, with the assistance of their Doctoral Advisor and Advisory Committee. When the proposal is ready, the student will call a meeting of the committee (2 hours) to discuss and improve the proposal. When the proposal is approved by the committee, the student applies for IRB approval. Once IRB has approved the proposal, data collection begins.
6. The defense of the dissertation research (2 hours) takes place after the dissertation has been written and after the Doctoral Advisor approves.

Notes on Transfer Credit, Residency, Enrollment, and Fee Waivers

Transfer credit: Graduate work completed at other institutions with recognized graduate schools may be accepted toward degree requirements. A maximum of 12 semester hours required for a student's degree may be transferred from another university, pending the approval of the advisor, committee, LTC Director of Graduate Studies and the Graduate School.

Residency requirement: 2 semesters of 9 hours each or 3 semesters of 6 hours each within an 18-month period. During the semesters in which in-residence is established at MU, you may not be employed at MU for more than half-time teaching without the approval of your Advisor and the Graduate School.

Full-time enrollment: Without special permission of the vice provost/dean, the maximum credit hours in Graduate School is 16 hours each semester or 9 for the summer session. Enrollment in 9 hours in the fall and winter and 4 hours in the summer is considered full-time enrollment for graduate students.

Graduate Fee Waivers: If you hold at least a .25FTE graduate assistantship, you are granted a tuition fee waiver. However, the MU Graduate School has a maximum year/semester eligibility for these fee waivers as indicated in the table below. This eligibility is not in effect for tuition fee waivers paid by grants.

| Type of Student | Maximum Years of Eligibility | Maximum Semesters of Eligibility (Not Including Summers) |
|--|------------------------------|--|
| Admitted as master's student | 3 years | 6 semesters |
| Has relevant master's degree, admitted as doctoral student | 5 years | 10 semesters |
| No relevant master's degree, admitted as doctoral student | 7 years | 14 semesters |
| No relevant master's degree, admitted to doctoral program with master's en route | 8 years | 16 semesters |

For more information on Graduate School policy, please see:

<http://gradschool.missouri.edu/financial/assistantships-fellowships/tuition-waivers/eligibility.php>

The Doctoral Advisory Committees

Upon admission to the Science Education Doctoral Program, you will be assigned a Program Advisor. With this advisor, you will plan your coursework for the initial semesters and construct a Plan of Study (see next page). The Program Advisor will supervise your program until the comprehensive exams

During your first year in the program you will take “*Orientation to the Science Education PhD Program*,” where you will meet the science education faculty and find out about their research interests. Based on your research goals, professional interests, and data from these interviews, you will select your Dissertation Advisor and your Dissertation Advisory Committee.

According to the Graduate school, “the doctoral program committee shall be composed of a minimum of four members of the MU graduate faculty and will include at least three members from the student’s doctoral degree program and an outside member from a different MU program. At least two of the doctoral committee members must be MU doctoral faculty. Additional committee members with specialized expertise who do not meet the criteria for the MU graduate faculty or doctoral faculty may serve on a doctoral committees as a fifth or sixth member, with special permission of the vice provost/dean of the Graduate School” (Effective for students entering Fall, 2005). In the Science Education Program, doctoral committees are composed of 5 individuals: three science educators, 1 scientist, and 1 member whose research interests/approaches fit the students’ dissertation topic/methods.

By the end of your second semester of enrollment, with your advisor, you will submit **Form D-1, Qualifying Examination Results and Doctoral Committee Approval Form** to the Graduate School (available at: <http://gradschool.missouri.edu/policies/doctoral/requirements/committee.php>).

Changing Your Committee

If the composition of your committee changes for any reason, you must file a **Change of Committee** form (available from the Graduate School at <http://gradschool.missouri.edu/policies/doctoral/requirements/committee.php>).

Plan of Study

The Ph.D. in Science Education requires a minimum of 82 semester hours beyond the Bachelor's degree (coursework from the Master's and Specialists degrees can be counted in part or whole toward this total). All MU, graduate degrees require at least 15 semester hours of course work at the 8000 level, exclusive of research, problems, and independent study experiences.

You must work with your Advisor and Advisory Committee to insure your Plan of Study is in compliance with Science Education, Departmental, College of Education, and University guidelines. The Plan of Study is comprised of two major components:

1) course work in science education, science content, and educational research; and 2) research and teacher education competencies. Minimal requirements are presented in the table on the next page.

By the end of your second semester of study, and after your D-1 form has been approved, you must schedule a meeting with your Advisory Committee to approve your Plan of Study. You must then submit **Form D-2, Plan of Study for the Doctoral Degree**, to the Graduate School (available at: <http://gradschool.missouri.edu/policies/doctoral/requirements/plan-study-requirements.php>). All course work must be completed within a 5-year period from the start of your program.

Science Education Doctoral Program

| Component | Requirements/Expectations | | | | | | | | | | | | | | | |
|---|---|---|-------------------------|---------------------------------|--|---|---|---|--|------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|--|--|--|
| Prerequisites | ESC PS 7100: Foundations of Educational Psychology (or equivalent) ESC PS 7170: Introduction to Statistics (or equivalent) | | | | | | | | | | | | | | | |
| Science Education Courses (22 semester hours) | <p><u>Core Courses (10 hours):</u> C&I 8900: Orientation to the PhD in Science Education C&I 8710: Nature of Science and Science Teaching C&I 8712: Inquiry and the Science Curriculum C&I 8714: Research in Science Education</p> <p><u>Emphasis Area (select one) (12 hours):</u></p> <table border="0"> <tr> <td>Elementary Science</td> <td>Middle/Secondary</td> <td>College Science Teaching</td> </tr> <tr> <td>C&I 8720 Advanced Teaching of Elementary Science</td> <td>C&I 8722 Advanced Teaching of Secondary Science</td> <td>C&I 8724/BioSci 8724 College Science Teaching</td> </tr> <tr> <td>C&I 7610-Teaching Techniques and Curriculum in Elementary School Math .</td> <td>C&I 7410 Teaching, Engaging, and Assessing Middle-Level Students</td> <td>ED LPA 9456 The Professorate</td> </tr> <tr> <td>C&I 8900 Seminar in Science Education</td> <td>C&I 8900 Seminar in Science Education</td> <td>C&I 8900 Seminar in Science Education</td> </tr> <tr> <td>C&I 8941 Internship in Science Education</td> <td>C&I 8941 Internship in Science Education</td> <td>C&I 8941 Internship in Science Education</td> </tr> </table> | Elementary Science | Middle/Secondary | College Science Teaching | C&I 8720 Advanced Teaching of Elementary Science | C&I 8722 Advanced Teaching of Secondary Science | C&I 8724/BioSci 8724 College Science Teaching | C&I 7610-Teaching Techniques and Curriculum in Elementary School Math . | C&I 7410 Teaching, Engaging, and Assessing Middle-Level Students | ED LPA 9456 The Professorate | C&I 8900 Seminar in Science Education | C&I 8900 Seminar in Science Education | C&I 8900 Seminar in Science Education | C&I 8941 Internship in Science Education | C&I 8941 Internship in Science Education | C&I 8941 Internship in Science Education |
| Elementary Science | Middle/Secondary | College Science Teaching | | | | | | | | | | | | | | |
| C&I 8720 Advanced Teaching of Elementary Science | C&I 8722 Advanced Teaching of Secondary Science | C&I 8724/BioSci 8724 College Science Teaching | | | | | | | | | | | | | | |
| C&I 7610-Teaching Techniques and Curriculum in Elementary School Math . | C&I 7410 Teaching, Engaging, and Assessing Middle-Level Students | ED LPA 9456 The Professorate | | | | | | | | | | | | | | |
| C&I 8900 Seminar in Science Education | C&I 8900 Seminar in Science Education | C&I 8900 Seminar in Science Education | | | | | | | | | | | | | | |
| C&I 8941 Internship in Science Education | C&I 8941 Internship in Science Education | C&I 8941 Internship in Science Education | | | | | | | | | | | | | | |
| Science Content Courses (12-18 semester hours) | Typically students take 12-18 hours of science content courses. We encourage a strong science background in one content area, or in integrated science disciplines. | | | | | | | | | | | | | | | |
| Educational Research Courses (12 semester hours) | ESC PS 8610: Quantitative Methods of Ed. Research I ESC PS 8630: Qualitative Methods of Ed. Research I <i>And either:</i> ESC PS 8620: Quantitative Methods of Ed. Research II or ESC PS 9620: Qualitative Methods of Ed. Research II <i>NOTE:</i> C&I 8714: Research in Science Education counts as the departmental research course | | | | | | | | | | | | | | | |
| Dissertation (12 semester hours) | Conducting dissertation research (C&I 9090) includes proposal approval, Institutional Review Board Approval, approval from participants, write up, and oral defense. | | | | | | | | | | | | | | | |
| Electives and/or Minors (12-15 semester hours) | Students elect courses within or outside the College of Education that will help focus and support their research interests (with committee approval). Or students can take a concentrated set of 9-12 credits as a minor. Possible minors include: <ul style="list-style-type: none"> • Educational Policy • Educational Leadership • Educational Technology • Mathematics Education • College Teaching • Learning Theory | | | | | | | | | | | | | | | |
| Research and Teacher Education Competencies (in consultation with Advisor) | <p><i>Research Competencies:</i></p> <ul style="list-style-type: none"> • Conference presentation (single or co- author) • Colloquium participation and presentation • Submission of manuscript to a refereed journal (single or co- author) • Experience with grant writing • Comprehensive examination <p><i>Teacher Education Competencies:</i></p> <ul style="list-style-type: none"> • Teaching/teacher education internship (in your emphasis area) • Experience with teacher professional development (K-16) | | | | | | | | | | | | | | | |

Doctoral Student Annual Review

All Science Education doctoral students who have not completed their comprehensive exams will participate in an annual review. The science education faculty will review your progress toward the doctoral degree. You will prepare a portfolio of your progress, consult with your advisor, meet with the science education faculty, and complete the online Graduate School review at <http://gradschool.missouri.edu/policies/progress/annual-review/>. This process will prepare you for similar annual reviews that you will undergo as a university faculty member.

The purpose of the annual review is for you to describe your short and long terms goals, examine your proposed timeline, and review your progress toward degree completion. The annual review serves as a venue for formative feedback from faculty in regard to your strengths, areas for improvement, and continued focus in your doctoral studies.

The annual doctoral student review is meant to be a conversation between the student and faculty. Please do NOT bring a PowerPoint presentation to your review. Instead, bring 1 copy of your annual review portfolio for each faculty member, which includes the following:

- Name, year started in program, updated Doctoral Program Checklist (see p. 18)
- Program timeline, with comps, proposal, and dissertation defense plans noted as well as plans for conference attendance and presentations, and manuscript submissions
- Plan of Study with progress noted
- Vita (use APA style): presentations, publications, scholarships/fellowships, teaching experiences (including internships), service, awards, etc.
- A brief statement of your short-term program goals and long-term career goals, accompanied by a reflection of your progress toward meeting your short-term goals during the previous year (list significant activities, strengths, and targeted areas for improvement in the upcoming year)

During the annual review, we will discuss your progress in: 1) coursework, 2) research, 3) teaching, and 4) participation in the professional community. Following the annual review, you will receive a letter summarizing the conversation and faculty recommendations for your continued progress in the program.

By July 1 of each year, you will need to update your online data for the Graduate School at <http://gradschool.missouri.edu/policies/progress/annual-review/>.

(Revised December, 2005; April 2008)

Teaching Internship and Assistantship Guidelines

Doctoral students in the elementary and middle/secondary tracks are encouraged to seek teaching assistantships to develop their knowledge and skills as teacher educators. The teaching assistantships are associated with the following courses: Early Childhood (TDP 4130); Elementary Science Methods (TDP 4280); Middle/Secondary Science Methods I (TDP 4630 or C&I 8717), II (TDP 4640 or C&I 8718), and Secondary Methods III (TDP 4650 or C&I 8917). Teaching assistantships are associated with teaching internships, which occur in two phrases:

Phase 1: Apprenticeship

During this phase, the student will apprentice with the assigned faculty mentor. The apprenticeship will consist of attending all class sessions of the methods course, as well as assuming limited teaching responsibilities as designated by the mentor. Students should enroll in C&I 8941 *Internship in Science Education* (3 credits). As part of the internship course, the faculty mentor and the student will develop a contract specifying the expectations for internship credit. This apprenticeship phase should occur prior to becoming a teaching assistant. In special cases, the apprenticeship may occur concurrently with the teaching assistantship.

Phase 2: Teaching Assistantship

After a successful apprenticeship, the student is eligible for a teaching assistantship. As a teaching assistant, the student assumes primary responsibility for teaching the assigned methods course. Teaching assistants should enroll concurrently in C&I *Internship in Science Education* for 1 credit hour. The following requirements are designed to support the teaching assistant:

- Before the semester begins, the teaching assistant must submit his/her syllabus, course reading and major assignments to the faculty mentor for approval.
- During the semester, the faculty mentor will complete a minimum of two classroom observations and hold follow-up conferences with the teaching assistant.
- The teaching assistant is responsible for administering both a mid-term and final course evaluation to elicit student feedback.
- At the end of the course, the teaching assistant will submit a course dossier consisting of the following materials: course syllabus, major assignments, student work samples, student evaluations, and a 3-5 page paper reflecting on the teaching experience.
- The faculty mentor will contribute a written, summative feedback to this course dossier.

If you are interested in a teaching assistantship, you should contact the following individuals:

| | |
|----------------------------------|------------------|
| Early Childhood Methods | Sandra Abell |
| Elementary Science Methods | Debi Hanuscin |
| Middle/Secondary Science Methods | Pat Friedrichsen |

*Some teaching assistantships may require pre-requisite coursework. In addition, University of Missouri policy states, "Any graduate student who did primary and secondary education (equivalent of K-12 in the U.S.) in a country or territory where English is not the primary language of the majority of the population is required by state of Missouri law to be assessed for English language proficiency prior to receiving a teaching appointment." See the following URL for additional information:

http://gradschool.missouri.edu/ita/language/ita_policies.html

(added 12/06)

Professional Responsibilities for Attending Professional Conferences

The science education faculty believes that learning is the result of hard work within a community of practice. Therefore attendance at professional conferences is highly encouraged. Some financial assistance for graduate students to attend conferences is provided by the MU Science Education Center, the Department of Learning, Teaching, & Curriculum (LTC), and certain grant-funded projects. This support helps graduate students engage in the science education community by learning about current research, exchanging ideas with researchers from other institutions, and sharing ideas with science teachers at all levels.

When MU students attend professional conferences, they represent not only themselves, but also the University of Missouri, the College of Education, the Department of LTC, and the Science Education Center. To get the most out of the conference experience, and to professionally represent our program, students should take part in as much of the conference as possible. In particular, students are expected to:

- Plan their travel itineraries to be present during the entire conference;
- Take part in conference sessions, including paper sets, plenary lectures, and poster sessions, of relevance to their learning and specific research projects;
- Present their own research and seek advice from other researchers about this research;
- Attend social functions that allow for interaction with the conference community as a whole.

Attending professional conferences is both a learning opportunity and a professional responsibility. The Science Education program as a whole benefits from our collective presence at these events.

(Added 5/08)

Ethical Issues for Researchers

As a science education researcher, you will have to consider several ethical issues throughout the research process. A few of these are highlighted below. For more details, see the *Publication Manual of the American Psychological Association* (5th edition), and the Ethical Standards of the American Educational Research Association (<http://www.aera.net/aboutaera/?id=222>).

1. Human Subjects. Because our research involves human subjects/participants, you are required by law and by the university to complete an application to the Institutional Review Board (IRB) (<http://www.research.missouri.edu/cirb/index.htm>) for every research project. Before completing your first application, you will be required to complete the online training. For all IRB applications, you will need a faculty research advisor. Access to local schools must be obtained through appropriate district processes.
2. Plagiarism. Science education researchers do not claim someone else's words or ideas as their own. Instead they give credit where credit is due. Quotation marks or offset paragraphs indicate the exact words of another author. Exact quotes must include a citation to the work including a page number. Quoting something implies that you have read the original work. If you cannot find the original work, you must quote the secondary source (see APA manual for proper citation format). To learn more about plagiarism, you should complete the tutorial at <http://www.indiana.edu/~istd/>. **Plagiarism is a serious offense at MU and in the research community and you should take every opportunity to learn about it and to police your work.**
3. Authorship. Those who make substantial contributions to a study should be listed as authors. "Authorship should be the consequence of relative creative leadership and creative contribution. Examples of creative contributions are: writing first drafts or substantial portions; significant rewriting or substantive editing; and contributing generative ideas or basic conceptual schemes or analytic categories, collecting data which require significant interpretation or judgment, and interpreting data" (AERA Ethical Standards, p. 76). Lesser contributions to the paper (e.g., advising about the analysis, collecting or entering data, transcribing, recruiting participants) can be listed in an acknowledgement. In terms of authorship, the collaborators should try to decide about how the work will be divided and what the final order of authors will be. This order may be modified as the project proceeds and the contributions shift. The general rule is that the name of the principal contributor comes first, with subsequent names in order of decreasing contribution. (If authors play equal roles, they may comment on that in an author note.) It is typical for students who receive a great deal of supervision and feedback from a faculty member on a project to include that faculty member as last author (e.g., in the presentation or publication of an article from the student's dissertation).
4. Duplication of publication. When you send a manuscript out for review, you should only send it to one journal at a time. Submission implies commitment to publish in the journal if the manuscript is accepted. You may try to publish more than one manuscript about the same research study, as long as the manuscripts address significantly different components of the study or different findings. See the APA manual for the fine details of this issue.

5. Duplication of presentation. In terms of presentations at professional meetings, the ethical issues are less clear-cut than for publication. For example, researchers sometimes present the same study or data set multiple times, but through different papers that address different aspects of the research. Additionally, can sometimes be acceptable to present similar papers at different conferences, if you can justify that the audiences are substantially different. (Note: presenting similar papers at both ASTE and NARST, for example, should be avoided.)

If you are unsure about proper ethical conduct related to any of these or other issues, you should consult with your advisor.

(Added March, 2006; Revised November, 2008)

Comprehensive Exams

1. Eligibility. Once you have completed or are in the final semester of your educational research courses, you are eligible to take the Comprehensive Exam.
2. Purpose. Comprehensive exams demonstrate that you have the knowledge and skills to carry out the doctoral dissertation. Comprehensive exams require analysis, synthesis, and application of knowledge and skills learned in your program to problems that you might encounter in the dissertation and beyond. Passing the comprehensive exams is required before you can move on in the Ph.D. program to the writing of your dissertation proposal. **UNDER NO CIRCUMSTANCES SHOULD A STUDENT WRITE HIS/HER DISSERTATION PROPOSAL BEFORE PASSING COMPREHENSIVE EXAMS.**
3. Process. Together with your advisor and committee members, you will plan the nature of your comps and set a timeline for their completion. Comps are individualized for each student in the program. You begin by discussing your readiness for comps with your advisor. Next you schedule a meeting with your committee to set the guidelines for your exams. Once you receive your final set of questions from the committee (see #4 below), you work on your written comps during the allotted time frame. Finally you schedule your oral exam (see #5 below). Some students find it helpful to do “mock orals” with their peers to prepare for the oral exam.
4. Written Exam. Science Education comps consist of 4 questions prepared by your Doctoral Advisory Committee, in consultation with you and your advisor. The typical comp questions require synthesis and application level activities that help prepare you for your dissertation proposal. Each comp should be written during a 6-week time period and handed in to your advisor upon completion. Thus, barring extenuating circumstances, written comps should be completed within 6 months of receipt of the questions from your committee. Beyond this period, a student must request an extension from the Doctoral Advisory Committee.
5. Oral Exam. The oral section of the comprehensive exam (usually two hours in length) consists of Advisory Committee questions and discussion of your written products. You must schedule the oral exam to take place within one month of completion of your writings. Two weeks prior to the oral, you should submit copies of all comp answers to each member of your committee. The oral exam is open only to you and your committee members. Bring your D3 form (see below) to the oral defense for your committee to sign.
- 6 Evaluation. Evaluation of your written responses will be completed by all members of the Advisory Committee. At the oral exam, the committee will vote to pass your performance, ask you to make minor revisions, or fail your performance. At least four committee members must pass you to complete the Comprehensive Exam.
7. Candidacy. Once you have passed your Comprehensive Exams, completed the majority of course work, and satisfied most competencies in your Program of Study, you will be advanced to Candidacy by committee consensus. At this point, you will be eligible to work on the dissertation proposal (see p. 14).

Other relevant University policy:

- The comprehensive exams must be completed at least 7 months before the final defense of the dissertation.
- If a student fails the comprehensive exam, a second exam can be taken after at least a 12-week period. Failure to pass two comprehensive examinations automatically prevents candidacy.
- The doctoral degree program must be completed within 5 years of passing the Comprehensive Exams.
- The Advisor files **Form D-3, Comprehensive Exam** (available at: <http://gradschool.missouri.edu/policies/doctoral/requirements/candidacy-enrollment.php>), with the Graduate School within 1 month of exam completion.

(revised April, 2004; October, 2007)

Continuous Enrollment & Deferment Status

After comprehensive exams are completed, and through the semester when the dissertation is defended, students must be enrolled in a minimum of 2 hours of C&I 9090 each fall and winter semester and 1 hour during the summer. Students who hold graduate assistantships will be required to meet the minimum registration.

Beginning SS 2003, doctoral students who wish to be automatically enrolled and/or qualify for the doctoral loan deferment will need to complete the Doctoral Degree Candidate Application for Continuous Enrollment & Deferment Status Form. If doctoral students complete this form and return it to the Graduate School, they will be automatically enrolled each term and they will automatically qualify for the doctoral loan deferment. This form will only need to be completed one time.

Students who do not complete the application will not be automatically enrolled nor will they qualify for the loan deferment. However, students not completing the application are still responsible for maintaining the continuous enrollment requirement- they will just have to register themselves each term.

All doctoral students will be mailed and emailed a letter from the Graduate School outlining the new policy along with a copy of the continuous enrollment/deferment application once they pass comprehensive examinations. The Doctoral Degree Candidate Application for Continuous Enrollment & Deferment Status Form will be added to the Graduate School website as page 2 of the **Form D3** (<http://gradschool.missouri.edu/policies/doctoral/requirements/candidacy-enrollment.php>).

The Dissertation Proposal

6. With assistance from your Dissertation Advisor, you should narrow your research question and possible methodology.
7. Next, you develop a written proposal and submit it to your Advisory Committee for review. The written proposal is a thorough plan for your dissertation study that consists of a rationale for your study, a review of the literature, and the proposed methods. The proposal is often thought of as containing the first 3 chapters of the dissertation, and is typically 30-50 pages in length, excluding the bibliography. (See the next page for a recommended outline for the proposal).
8. Once your Advisor has approved your proposal, you should coordinate a meeting date with your Advisory Committee to review the written proposal. Allow at least 2 weeks after the written proposal has been disseminated before holding the proposal meeting. We also encourage you to present your proposal to the Science and Mathematics Education Colloquium prior to your formal committee review.
9. During the proposal meeting, the committee members can make one of the following recommendations: a) proceed with the study as proposed, b) make minor revisions as recommended by the committee, or c) make major revisions, resubmit the revised proposal, and reconvene the committee prior to beginning the study.
10. Once the proposal is approved, your Advisory Committee signs the **C&I D-Prop Form**, which is then filed with the Curriculum & Instruction Graduate Studies Office. The D-Prop must be accompanied by application to the Institutional Review Board (<http://www.research.missouri.edu/cirb/index.htm>).

(Revised May, 2004)

Dissertation Proposal Recommendations

The format for the dissertation proposal may vary depending upon the type of study being proposed and the methodology to be employed. Thus, the specific format for the proposal should be worked out in consultation with your Dissertation Advisor. Nevertheless, the dissertation proposal should include the following components in some form.

Title Page. A one-page cover sheet that includes relevant information (proposal title, your name, committee, members).

I. **Opening Section/Rationale.** The primary function of the opening section of the proposal is to build a rationale for the proposed study. In this section, the purpose of the study is explained and its relationship to the relevant scholarship is described. In addition, this section establishes the theoretical framework for the study. The opening section of most proposals will include the following components in some form:

Introduction/Statement of Purpose. A brief description of the project and its main purpose.

Statement of the Problem. A detailed discussion of the problem to be addressed by the proposed project in the context of the current state of scholarly understanding of the issue in question. This section clearly establishes the need for the proposed project.

Theoretical Framework. A discussion of the theoretical framework of the proposed study. This section establishes a theoretical orientation for the study and sets forth the assumptions on which the study rests and the limitations of the framework.

Research Questions and/or Hypotheses. A clear statement of the research question(s) and/or hypotheses on which the proposed study will be based. These should grow out of the statement of the problem and the review of the relevant literature.

II. **Background/Review of Literature.** A review of the research and scholarship that informs the proposed study. This section links the project with the body of knowledge in which it is grounded. Although this review is not expected to be as extensive as the review in the dissertation itself, it should be thorough enough to demonstrate the connections between the proposed study and related scholarship and empirical research.

III. **Methods.** This section describes the research methods to be employed in the proposed study. It should establish the appropriateness of the chosen methods for addressing the questions identified in the previous section. Proposals for quantitative studies may require detailed discussion of specific research techniques; proposals for qualitative studies may require a rationale for the methods to be employed and discussion of how methods may evolve from the particular problem to be addressed. A matrix that connects the research questions to the proposed methods can be helpful. The following elements may be included in this section, depending upon the type of study being proposed:

- Design of the study
- Research tradition/paradigm (including ontological, epistemological, and methodological assumptions)
- Context of the study
- Sample/Participants (including criteria for selection, sampling techniques)
- Data collection and management techniques
- Data analysis techniques
- Role of the researcher
- Potential limitations of the proposed methods

IV. **Proposed Outline and Timetable for Dissertation.** An annotated outline of the dissertation and a timetable for the project. The outline included in this section should be detailed enough to convey an adequate sense of what shape the dissertation might take. The timetable should include estimated completion dates for IRB approval, data collection, data analysis, and writing and defending the dissertation.

V. **Writing Style.** APA (5th ed.) style format should be used as long as it aligns with requirements stated in "Thesis and Dissertation Guidelines," available from the Graduate School (<http://web.missouri.edu/~gradschl/downloads/downloads.htm>)

VI. **Bibliography.** Full APA bibliographic citations for articles, books, monographs, etc. referred to in the proposal must be included.

VII. **Appendices.** Instruments, interview protocols, and the like can be included in appendices.

(Revised May, 2004)

The Dissertation and Defense

1. After the proposal has been approved, but before the study takes place, you must apply for and be granted approval by the Institutional Review Board (IRB): http://www.research.missouri.edu/web_research/compliance/human_subjects.html).
2. You should follow format guidelines prepared by the MU Graduate School: Thesis and Dissertation Guidelines <http://gradschool.missouri.edu/policies/thesis-dissertation/guidelines/>
3. After completing the study and writing the dissertation, you submit your dissertation to all committee members. You should schedule a final oral defense to occur no less than 2 weeks after submitting the dissertation to your committee. You should advertise the defense to other faculty and students in the Science Education Program, and in other programs, since the first part of the defense is public. (TIP: Schedule the defense to allow sufficient time to make edits to your thesis as requested by committee before the final deposit deadline.)
4. Prior to the defense, students may be asked by committee members to address any concerns with the dissertation.
5. The first part of the defense is an oral public presentation of your research. This portion of the defense is typically ½ hour long, and includes questions from the audience. The second part of the defense is a closed meeting with your committee members.
6. Following the oral defense, one of the following decisions will be made: a) the dissertation is approved with possible minor edits/revisions, b) the dissertation is tentatively approved with the requirement the student make substantive revisions - upon completion of the revisions, written copies of the dissertation are again distributed to committee members, or c) the dissertation is not approved and plans for successful completion are developed.
7. As soon as possible after the defense, the advisor should file **Form D-4, Dissertation Defense**, with the Graduate School (available at: <http://gradschool.missouri.edu/policies/doctoral/requirements/d4.pdf>).
8. You work with the Graduate School to file your final complete dissertation. We encourage electronic as well as paper submission.

(Revised May, 2004)

Graduation

The MU Graduate School requires all students to apply for graduation online. Application for Completion of Degrees, Certificates and Minors, and the dates for the application availability can be found by term on the Graduate School's website at <http://gradschool.missouri.edu> and listed under Policies and Forms by degree type.

Doctoral Program Checklist

| Name | Semester/Year Started |
|---|------------------------------|
| Major Activity | Date Completed |
| Student admitted to Science Education Program and assigned a Program Advisor. | |
| Student takes the Orientation to the PhD course during the first year of study and has the opportunity to meet and interview faculty. | |
| Advisor and student form an Advisory Committee of 5 members. File D-1. | |
| Student meets with Committee to approve Plan of Study. | |
| By end of second semester of study, student submits Form D-2, Plan of Study, to graduate school. | |
| Student identifies Dissertation Advisor and, if necessary, revises Dissertation Advisory Committee. | |
| Student completes coursework: <ul style="list-style-type: none"> • Prerequisites • Science education courses • Science content courses • Educational research courses • Electives/minors | |
| Student completes residency requirement (2 semesters of 9 hrs each or 3 semesters of 6 hrs each within an 18 month period). | |
| Student successfully completes research competencies. <ul style="list-style-type: none"> • Conference presentation (single or co- author) • Colloquium participation and presentation • Submission of manuscript to a refereed journal (single or co-author) • Experience with grant writing • Comprehensive examination | |
| Student successfully completes teacher education competencies. <ul style="list-style-type: none"> • Teaching/teacher education internship (in your emphasis area) • Experience with teacher professional development (K-16) | |
| Student participates in annual doctoral student review: <ul style="list-style-type: none"> • Year 1 • Year 2 • Year 3 • Year 4 | |
| Student completes written Comprehensive Exams. | |
| Students passes written and oral Comprehensive exam (oral takes place within one month of the writtens and at least 7 months prior to the dissertation defense). Advisor files D-3 form with Graduate School. | |
| Student defends proposal. D-Proposal form filed in C&I Grad Studies Office. | |
| With advisor, student applies for approval by the Institutional Review Board for dissertation research. | |
| Student completes, defends, and deposits dissertation. Advisor files form D-4. | |
| Student completes C&I Exit Survey (Turn in Part A with D-4, and file Part B with C & I Graduate Office). | |

Graduate School Timeline Suggestions available at: <http://gradschool.missouri.edu/policies/doctoral/requirements/>

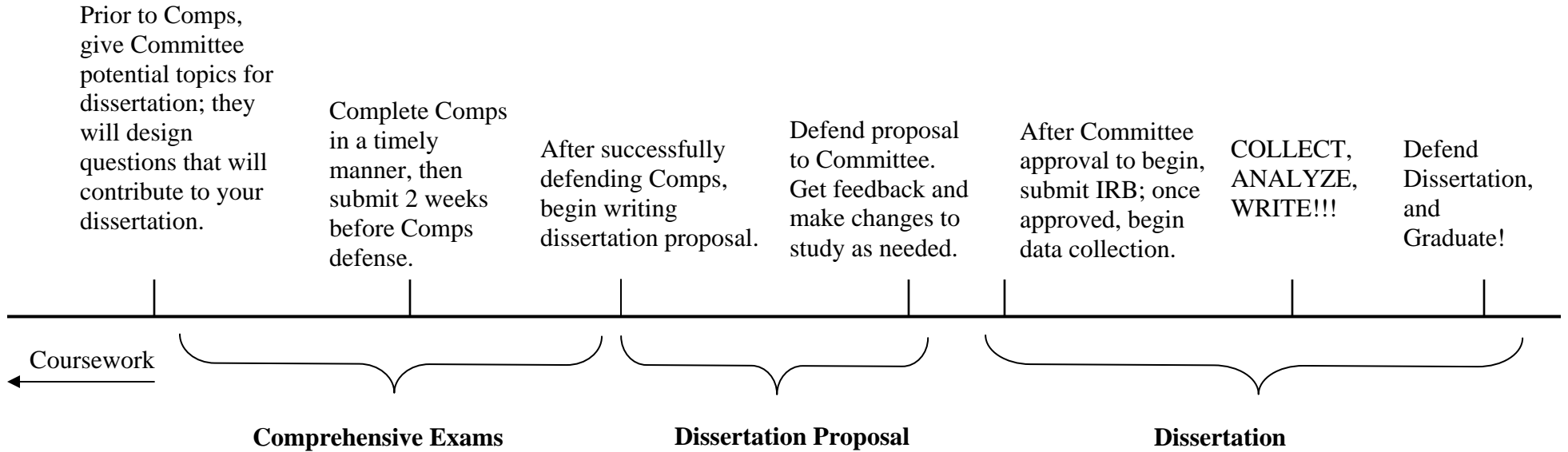
Sample Full Time Program Plan

| <i>Year One</i> | <i>Year Two</i> | <i>Year Three</i> | <i>Year Four</i> |
|---|---|---|---|
| <ul style="list-style-type: none"> • Prerequisites (ESC PS7100, 7170) • C&I 8710, 8712 • Science methods course • ESC PS 8610 or 8630 • Science content courses • Science Education PhD Orientation | <ul style="list-style-type: none"> • C&I 8714, 8900 • Science methods course • ESC PS 8610 or 8630 and an advanced research course (8620, 9620) • Science content courses | <ul style="list-style-type: none"> • Comprehensive exams • Research and Teacher Education Competencies • Dissertation Proposal | <ul style="list-style-type: none"> • Dissertation • Research and Teacher Education Competencies |

Science Education Course Offerings 2009-2013 (tentative)

| Courses | 2009-2010 | | | 2010-2011 | | | 2011-2012 | | | 2012-2013 | | |
|------------------|------------------|----------|----------|------------------|----------|----------|------------------|----------|----------|------------------|----------|----------|
| | F | W | S | F | W | S | F | W | S | F | W | S |
| 8710 (Nature) | | | | X | | | | | | X | | |
| 8712 (Inquiry) | | | | | X | | | | | | X | |
| 8714 (Research) | X | | | | | | X | | | | | |
| 8900 (Seminar) | X | X | | X | X | | X | X | | X | X | |
| 8720(Elementary) | | | X | | | X | | | X | | | X |
| 8722 (Secondary) | | X | | | | | | | X | | X | |
| 8724 College | | X | | | X | | | X | | | X | |

Sample Timeline in Science Education Program (from Comps to Dissertation)



Key Points to Remember:

1. Your Comps are designed to **SUPPORT** you in completing your dissertation, not hold you back.
2. Do not begin writing your dissertation proposal until you have completed your Comps.
3. Do not begin work on your dissertation until your Committee has approved your proposal.
4. While the dissertation is a test of your independence in conducting research, take advantage of the multiple resources available! Committee members, peers, recent graduates' dissertations, and most importantly—keep open lines of communication between you and your advisor.