

2024-2025

Learning and Teaching in STEM Ph.D. Program

Graduate Student Handbook

Department of Science, Technology, Engineering &
Mathematics Education
College of Education
North Carolina State University

Center for Technology and Innovation
Campus Box 7801
1010 Main Campus Drive
Raleigh, North Carolina 27606

<https://ced.ncsu.edu/stem-ed/doctoral/>

Also see the College of Education Graduate Student Services website for information
<https://ced.ncsu.edu/graduate/graduate-student-services/>

The NCSU Graduate Handbook: <http://catalog.ncsu.edu/graduate/graduate-handbook/>
contains the most up to date information on all University Graduate School rules and
regulations.

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General Information

Introduction

At NC State's College of Education, our doctoral programs aim to develop scholar leaders in fields of education. The *scholar leader* will be a broadly educated individual with deep content knowledge in at least one specialty area and skills in research, policy, equity and diversity, technology and innovation, global understanding and impact, and multimodal communication. The *scholar leader* will be prepared to lead and influence policy decisions at the local, state, national, and international levels to solve the grand challenges of education. The *scholar leader* will be developed around NC State's strengths in technological design, innovation, community engagement, research scholarship, and social entrepreneurship. Throughout the doctoral experience, our aim is to develop a culture of inquiry, evidence, and action in College of Education scholar leaders.

The **Learning and Teaching in STEM Ph.D. program** is administered in the Department of Science, Technology, and Mathematics Education in the College of Education. The Ph.D. program enrolls students who are knowledge-seekers and are eager to pursue educational problems and develop critical thinking skills in a collaborative environment. The program prepares individuals to be knowledgeable about and prepared to accept positions related to:

- 1) scholarly inquiry and discourse in STEM education fields,
- 2) preparation of PK-14 STEM teachers,
- 3) curriculum development and instructional issues in PK-16 STEM fields,
- 4) leadership positions in mathematics, statistics, science, informal science, engineering and technology education.

Close affiliation and research opportunities at the [William and Ida Friday Institute for Educational Innovation](#) provides our students with exceptional opportunities to explore the role of technological innovation in STEM education and pursue related research.

Within the Ph.D. program, there are three concentrations that lead to this degree: 1) **Mathematics and Statistics Education**, 2) **Science Education**, and 3) **Engineering and Technology Education**. Throughout this handbook, if there are specific requirements for a given-concentration, it will be documented in a special section with the name of the concentration.

Admissions Procedures

Potential students apply to a specific Concentration within the Ph.D. program. Applicants are strongly preferred to have K-16 teaching experiences or informal teaching experiences, and a Master's degree. The faculty views such experience as a strong foundation-on which to build rigorous advanced degree coursework and experiences. Although the Graduate School has made rare exceptions, applicants are expected to have at least a 3.0 GPA (out of 4.0) in prior undergraduate and graduate programs in a STEM education field or related program of study. GRE scores are used as a complement to undergraduate performance to make admissions decisions; verbal and quantitative scores at or above the 50th percentile are preferred, and quantitative scores at the 75th percentile are preferred for mathematics education. Verbal and Analytical Writing scores on the GRE are especially important for Ph.D. applicants as they are deemed an initial indicator of a student's writing ability. A student's writing ability and their

suitability for pursuing a Ph.D. in Learning and Teaching in STEM are also assessed by the writing sample (personal statement) provided by students in the application process. Faculty members discuss each candidate's application package and vote to admit or not admit.

See the individual concentration websites for deadline details. Applicant's academic record, GRE scores, recommendations, and personal statement are considered holistically in making admission decisions. Personal statements should include information about experiences in STEM education, but should also include career goals and why the applicant feels that the graduate program at NC State is a good fit for their experiences and career path. As applicants to the concentration area of the Ph.D. program are reviewed, the applicant's background and interests in relation to faculty expertise are considered. Upon recommendation of the graduate faculty to accept an applicant into the particular concentration, a faculty member agrees to be the initial advisor/chair.

If a currently enrolled Master's student at NC State wishes to continue on to pursue a Ph.D., they need to submit a new application. An interested Master's student should submit a personal statement to the graduate program coordinator and graduate administrative assistant before the deadline. The statement should address why the student wishes to pursue the Ph.D. degree and discuss their progress on their research for their Master's degree. Alternatively, a highly qualified student without a Master's degree may be admitted to the Ph.D. program and earn a Master's degree enroute, while in doctoral status. Requirements for this option can be found here:

<http://catalog.ncsu.edu/graduate/graduate-handbook/masters-degrees-doctoral-status/>

Admissions decisions and assistantship offers are two separate processes. Admission decisions are typically made in January or February and assistantship offers are typically made in March or later and require the student to be enrolled full time. *Admission does not guarantee an assistantship.*

Important Places & People

Department of Science, Technology, Engineering, & Mathematics Education

Center for Technology and Innovation, 3rd floor

1010 Main Campus Drive, Raleigh NC 27606

Campus Box 7801

Main Telephone: (919) 515-1061

<http://ced.ncsu.edu/stem>

William Sandoval

Department Head, wsandoval@ncsu.edu

Dr. Sandoval is the head of the department of STEM Education. He is responsible for managing all curricular, personnel, and financial aspects related to the functioning of the department.

Maya Stafford

Graduate Services Coordinator, mistaffo@ncsu.edu

Maya handles all aspects of graduate education, including: admission applications, initial forms for new students, scheduling students in courses based on permission of the instructor, all paperwork for graduate education (e.g., Request for Preliminary or Final Examinations), completion of forms for graduation, and beyond.

Soonhye Park

STEM Education Director of Graduate Programs, spark26@ncsu.edu

Dr. Park serves as the liaison between the Teaching and Learning in STEM Ph.D. program and the Graduate School. She transmits information from the Graduate School to students and submits requests for scheduling preliminary and final oral examinations and graduation checkouts. She is also responsible for approving students' plans of work.

KC Busch

Graduate Coordinator, Science Education, kbusch@ncsu.edu

Dr. Busch is the coordinator of the Science Education Concentration within the Learning and Teaching in STEM Education Ph.D. program. She is responsible for communicating with students prior to admission to the Ph.D. program and facilitating the assignment of students to faculty advisors. She oversees curricula and course actions related to the graduate program.

Daniel Kelly

Graduate Coordinator, Engineering and Technology Education, dpkelly@ncsu.edu

Dr. Kelly is the coordinator of the Engineering and Technology Education Concentration within the Learning and Teaching in STEM Education Ph.D. program. He is responsible for communicating with students prior to admission to the Ph.D. program and facilitating the assignment of students to faculty advisors. He oversees curricula and course actions related to the graduate program.

Erin Krupa

Graduate Coordinator, Mathematics and Statistics Education, eekrupa@ncsu.edu

Dr. Krupa is the coordinator of the Mathematics and Statistics Education Concentration within the Learning and Teaching in STEM Education Ph.D. program. She is responsible for communicating with students prior to admission to the Ph.D. program and facilitating the assignment of students to faculty advisors. She oversees curricula and course actions related to the graduate program.

Financial Aid

The following opportunities are by no means exhaustive. Graduate students are encouraged to discuss opportunities with their advisor and to seek a variety of outlets for financial aid.

Internal Support

1. Teaching and Research Assistantships.

Many assistantships (20 hours per week) covering tuition, health insurance, and paying a stipend are available in STEM Education through a variety of venues. Some students are hired as Teaching Assistants (TAs) in the department to teach undergraduate courses or supervise middle and high school mathematics, science or technology student teachers. TAs are for full-time Ph.D. students. Nine credit hours must be taken per semester (for fall and spring only; summer session is not required, and tuition is not paid by assistantships) to be considered full time. Some students are hired as Research Assistants (RA) to work on particular research projects with faculty. Most RA positions are funded through grant sources that are only available for the duration of a particular grant. Other RA positions are supported by departmental funds or funds through the Friday Institute for Educational Innovation. Some Assistantships are 9-month contracts while others are for 12-months. Thus, the salary range for positions varies and depends on the funding source. Typical salaries are \$20,000-\$28,000 for 9-12 months. All TAs and RAs who are eligible for the Graduate Student Support Program (GSSP) will receive in-state tuition and health insurance; student fees are the responsibility of the student. Those coming from out-of-state are typically eligible for 1 year of support of out-of-state tuition until they meet residency requirements. Please see GSSP and North Carolina Residency information ([Residency](#)).

Interested students can indicate when they apply for admission that they are interested in an assistantship. Upon admission to the program, an assistantship application is sent to the student to be completed and returned to the Graduate Services Coordinator; TA and RA positions may or may not be advertised through a central source. Thus, *it is very important for students seeking assistantships to talk directly with faculty about their interests and possibilities for funding, particularly the graduate coordinator for the relevant program.*

2. Part-time Opportunities

Hourly RA appointments – University professors may have hourly RA appointments available for short durations. Students are encouraged to ask faculty directly about such opportunities. These are great opportunities for becoming involved with research projects on a limited basis.

3. College of Education Scholarships

There are a variety of small scholarships available through the College of Education that master's and doctoral students can apply for. Please see the following webpage for more information: [Scholarship Opportunities](#). You can also call: 515-3325

Norman and J. Conrad Glass, Jr. Fellowship

The Norman and J. Conrad Glass Jr. Fellowship supports doctoral students in Science, Technology, Engineering, and Mathematics Education through one fellowship of approximately \$750, with preference for members of underrepresented groups. Students applying for this fellowship must submit a brief essay articulating how this PhD in Learning and Teaching in STEM meets their needs, what they contribute to the department, and what they expect to

achieve as a result of completing their degree.

John and Nell Penick Fellowship in Science Education

The John and Nell Penick Fellowship is intended to benefit graduate students in science education who have completed at least 20 semester hours of coursework for a doctoral degree and have indicated intent to seek a post-secondary position as a science teacher-educator and researcher. Preference will be given to female candidates. Students may apply directly or may be recommended by a faculty member. Each candidate must submit a research proposal (suggest 1500 words or less) for consideration. The award ranges from \$1500-\$2200.

Agnes and Garfield Stiff Endowment for Graduate Travel

Supports Doctoral or Master of Science degree students in the Department of STEM Education who make presentations at professional meetings. No single award shall exceed \$1000 or be less than \$500. To be eligible for an award, a graduate student must have a presentation that has been accepted at a regularly scheduled conference, symposium, or workshop sponsored by a national or state professional organization representing the disciplines in the Department. (Poster sessions do not qualify.)

4. Graduate School Scholarships and Fellowships

A number of fellowship and grant programs are administered by the Graduate School. Some of these programs require a student to be nominated by faculty, while others allow a student to apply directly. Please see [Nationally Competitive Graduate Fellowships](#). A few of the programs that students can apply for include:

Diversity Enhancement Program. Students must be full-time US citizens to apply. There are two parts to this program, the UNC Campus Scholarship program for NC residents, and the Diversity Graduate Assistance Grant. Criteria for selection include: academic record, character, creativity, educational and economic background, race and ethnicity, gender, exceptional personal talents, unique work or service experience, and leadership potential. Applicants must add to the goal of increasing diversity in graduate education at North Carolina State University. Grant awards are based on financial need and require a FAFSA (Free Application for Federal Student Aid) form. Stipend amounts are based on financial need up to \$3000 for the academic year. Priority deadlines are typically in early April. See [Graduate School Diversity Enhancement Grant Program](#).

Preparing for the Professoriate program gives faculty and doctoral students the opportunity to engage in a significant mentoring activity over the course of an academic year. It is a central component of NC State's professional development programs for graduate students through providing students with a hands-on teaching opportunity under a distinguished faculty mentor who is recognized for his or her teaching skills. The program is open to doctoral students who plan careers as faculty members at colleges and universities. Students earn a \$500 stipend and valuable teaching experience. See [Preparing the Professoriate](#).

Graduate Research Ethics Fellowship. This fellowship will be awarded to a doctoral student at NC State University who is interested in conducting an in-depth study of

research ethics for one academic year. Applicants should be enrolled in a doctoral program with at least 18 credit hours completed and have had some research experience by the beginning of the fellowship term. Stipend is \$5000. Applications typically due in late September. See [Wilkinson Graduate Ethics Fellowship Program](#)

Southern Regional Education Board (SREB). The establishment of the SREB Doctoral Scholars Program expands NC State's efforts to fully tap this nation's human talent pool by creating a better pathway to the Ph.D. for students from underrepresented groups in science, technology, engineering and mathematics (STEM). Through this program, NC State offers fellowships and professional development opportunities to doctoral students who ultimately will increase diversity in the professoriate. Nominees must be outstanding entering full-time Ph.D. students who both contribute to diversity on campus and have an expressed interest in pursuing a faculty career. Preference will be given to students pursuing the Ph.D. in STEM (including science and math education). Nominees must have been admitted to NC State and still be in the process of deciding where to pursue their Ph.D. Eligibility is limited to U.S. citizens or permanent residents. [Southern Regional Education Board](#).

5. GSA Travel Grants

The Graduate Student Association (GSA) offers travel grants to fund graduate student conference travel. To find more information see [Graduate Student Association](#).

External Support

There are a number of grants provided to graduate students to fund graduate studies. Students are encouraged to visit the websites for more information.

National Science Foundation Graduate Research Fellowship Program The purpose of the NSF Graduate Research Fellowship Program (GRFP) is to help ensure the vitality and diversity of the scientific and engineering workforce of the United States. The program recognizes and supports outstanding graduate students who are pursuing research-based master's and doctoral degrees in science, technology, engineering, and mathematics (STEM) or in STEM education. The GRFP provides three years of support for the graduate education of individuals who have demonstrated their potential for significant research achievements in STEM or STEM education. NSF especially encourages women, members of underrepresented minority groups, persons with disabilities, veterans, and undergraduate seniors to apply. See [NSF Graduate Research Fellowship Program | NSF](#) for more information.

College Foundation of NC. The Foundation has a scholarship-loan program called the North Carolina Student Loan Program for Health, Science, and Mathematics. Deadlines are typically May 1 for initial applications and April 1 for renewals. North Carolina residents may borrow up to \$10,000 per year (masters) and \$14,000 per year (doctoral) if there is demonstrated need. For each year of full-time study supported by the loan, the recipient must teach in a NC public K-12 school or post-secondary institution for one year to forgive the loan. For further information and/or application, please call 1.800.700.1775 and select option "1" or visit [CFNC](#)

National Council of Teachers of Mathematics offers Mathematics Graduate Coursework Scholarships for PK-12 teachers. The purpose of this \$3200 grant is to provide *NCTM members* financial support for improving teachers' understanding of mathematics by completing graduate coursework in mathematics. See links to grant opportunities [Grants](#)

North Carolina Council of Teachers of Mathematics offers Graduate Scholarships to support *NCCTM members* who are elementary or secondary school teachers of mathematics and who are enrolled in a graduate program taking graduate courses in mathematics and/or mathematics education. The Trust Fund Committee awards scholarships of \$1000 to as many qualified applicants as the available investment income from the proceeds of the Trust Fund will permit. Scholarship applications may be submitted during the year, but will be reviewed each October 1 and March 1, with grants made at that time. Please see [Grants & Scholarships](#)

National Association for Research in Science Teaching (NARST) offers scholarships for classroom teachers and informal science educators. These scholarships financially support K-12 science teachers and informal science educators, who collaborate with NARST members on research projects, to participate in and present research papers at the NARST Annual International Conference. Nine scholarships of \$700 each, are available to help defray the cost of attending the NARST International Conference each year.

Association for Science Teacher Education (ASTE) offers the John C. Park National Technology Leadership Initiative Fellowship that was established to honor the late Dr. Park who was a leader in the application of technology in science education, and long-time Science Education faculty member at NC State. The fellowship is to recognize an exemplary presentation on technology at the ASTE annual conference. Fellows from ASTE are invited to present at the [Society for Information Technology and Teacher Education \(SITE\)](#) conference where they receive an award plaque, complementary conference registration, and funds up to \$1200 provided by [Vernier Software and Technology](#) to help defray travel expenses.

The Mid-Atlantic Association for Science Teacher Education (MA-ASTE) offers the Annual Dr. Patricia A. Obenauf Graduate Student Research Presentation Award to recognize outstanding contributions to research by MA-ASTE graduate students. This award will be given to the graduate student who is judged to have delivered the best research presentation at the upcoming Mid-Atlantic Regional ASTE Conference. The award consists of \$750 for travel to the upcoming International ASTE Conference.

Support for Dissertation Research

There are several sources of funds that can help support the financial needs of dissertation research. As you approach the dissertation phase, please discuss these with your advisor.

National Academy of Education/ Spencer Foundation Dissertation Fellowships
These are competitive Dissertation Fellowships for Ph.D. students. The program seeks to encourage a new generation of scholars from a wide range of disciplines and professional fields to undertake research relevant to the improvement of

education. These \$25,000 fellowships support individuals whose dissertations show potential for bringing fresh and constructive perspectives to the history, theory, or practice of formal or informal education anywhere in the world. Applications are generally due in early October for work that can begin as early as the next June. Please see [NAEd/Spencer Dissertation Fellowship Program](#)

Ford Foundation Dissertation Fellowships

Annual awards of approximately 20-30 dissertation fellowships worth \$25,000. The dissertation fellowships provide one year of support for individuals working to complete a dissertation leading to a Doctor of Philosophy (Ph.D.) or Doctor of Science (Sc.D.) degree. Dissertation fellowships are awarded in a national competition administered by the National Research Council (NRC) on behalf of the Ford Foundation. Application deadline is typically mid-November. See the website for details: [Fact Sheet - Dissertation](#).

AERA Minority Dissertation Fellowship in Education Research

The Council of the American Educational Research Association (AERA) established the AERA Minority Dissertation Fellowship in Education Research to provide support for doctoral dissertation research. The purposes of the program are to advance education research by outstanding minority graduate students and to improve the quality and diversity of university faculties. This program offers doctoral fellowships to enhance the competitiveness of outstanding minority scholars for academic appointments at major research universities. It supports fellows conducting education research and provides mentoring and guidance toward the completion of their doctoral studies. For more information go to: [Professional Advancement: Development and Training Opportunities](#).

The College of Education Doctoral Dissertation Support Grant

Applications are reviewed by the College of Education Research Committee, and they generally award several grants up to \$1,500 each to be used to support dissertation research. Grant applications are called for via email, generally due mid-spring and are intended for students who are enrolled as a student during the Spring semester and will be defending their dissertation proposal in the coming 6 months. Historically, the application has called for the following components: Narrative (3-p; problem, theoretical/empirical foundation, research questions, methods, significance), Budget, and Major Professor Recommendation (1-p), all submitted as one pdf by deadline.

The STEM Education Outstanding Dissertation Award

Each Spring, each of the Departments in the College of Education solicits proposals for the Outstanding Dissertation Award for that Department. The application is solicited via email in Spring each year from students who have graduated in the last calendar year, Summer, Fall or who are confirmed to be graduating in the Spring of that year. The award was established in 2019 and the solicitation has historically asked for the following to be submitted for consideration as one pdf, and a monetary prize of \$1,000 has been awarded:

- 1) A three-page (1,500 words maximum) single-spaced summary of the dissertation research (12 pt. Times New Roman font; 1" margins), including tables, charts, etc. References are separate from the 3-page narrative.
- 2) A one-page letter from the committee chairperson(s) commenting on the quality and significance of the work.

Continuous Enrollment and Full-time Status

Once a student is admitted and begins a graduate program, they are required to maintain continuous enrollment. Students must enroll each Fall and Spring semester, excluding Summer terms, until they graduate. If an extenuating circumstance presents itself, students may apply for a leave of absence (LOA). Failure to maintain continuous enrollment results in termination of academic program.

Students will be classified as full time if they take at least 9 hours per semester until the semester in which a load between 3 and 8 hours will reach an accumulated total equal to the minimum number of hours required by the program. Full time for that semester will be that load. Full time thereafter will be a minimum of 3 hours per semester. Students who are registered for less than that will be considered part time. More information is available here:

<http://catalog.ncsu.edu/graduate/graduate-handbook/minimum-enrollment-requirements/>

General Expectations

Upon acceptance into the program, the Ph.D. student must:

- **maintain continuous enrollment of 3 credits every Fall and Spring until graduation.** If the student has earned all the credits needed for the doctorate but is just completing a dissertation, then one credit hour is allowed. The student may also request a leave of absence. If a student requires a leave of absence, a request must be filed at least one month before the affected term. A maximum of two semesters of leave is allowed during the program.
- be knowledgeable and competent in the following areas:
 - Using a computer (for word processing, coding data, statistical packages, presentations)
 - Techniques for literature searches, periodicals
 - Familiarity with American Psychological Association (APA) writing style for professional articles
 - Delivering clear, concise oral and written presentations of reviews and research
- participate in activities beyond courses taken; encouraged activities are as follows:
 - Attend state, regional, and national professional meetings.
 - Present a paper or poster (single, or co-authored) at a professional meeting.
 - Write an article (about educational research, philosophy, or teacher activities) and submit for publication in a refereed journal. Collaboration with faculty is encouraged.
 - Assist with on-going faculty research projects, such as proposal writing, development of research instruments, data collection, data analysis, workshop development or presentation.
 - Attend or participate in Department colloquia, Departmental seminars, even when not taken for credit, and Departmental luncheon seminars.

Graduate Students and Advisors should check the official summary in the [Graduate School Administrative Handbook](#) for complete and up-to-date requirements. The maximum time allowed for completion of a doctoral program (i.e., successful defense and approval of the Final Doctoral Oral Examination) at NC State University is 10 years. The

student's degree clock for time to completion starts with the first course approved for inclusion in the Plan of Work (POW), including courses taken as a PBS student or toward a different PhD degree before being formally admitted to STEM Education.

Graduate Student Support Plan (GSSP)

The [Graduate Student Support Plan](#) is a financial package that the university offers to attract and retain excellent graduate students. Under this plan, any eligible students' whose research assistantship (RA) or teaching assistantship (TA) pays at least an annualized salary of \$20,000 qualifies to receive health insurance and tuition coverage. Students must also meet minimum registration requirements for the semesters in which they are eligible. Detailed information about the GSSP timeline can be found here: [Graduate Student Support Plan](#). Please note that GSSP funding is only available for 4-10 semesters depending on your degree program and that the **timeline begins on the date of your initial enrollment** (full or part time). Although students are no longer eligible for tuition beyond the specified number of semesters, they can receive health benefits if they meet minimum registration requirements.

Degree Sought	Full Tuition and Health GSSP Coverage
Master's Only	4 semesters
Ph.D. (Student has previously earned a Masters in related field)	8 semesters
Ph.D. (Student does NOT already have a Masters in related field) **	10 semesters

**If a student starts in a master's program and continues straight through to a PhD program, they are eligible for a total of 10 semesters starting with the date of enrollment in the master's program. To find more information about the GSSP, please see the annual GSSP handbook published by the graduate school. An electronic version can be found at: <https://grad.ncsu.edu/students/gssp/> All information about GSSP benefits, eligibility requirements, enrollment requirements and any other information can be found on these pages.

If students require additional support beyond their allocated GSSP support semesters, they should contact their GSC as soon as they are aware. This allows for ample time to explore the following options:

1. GSSP Exception Requests can be submitted to the Graduate School by the DGP or GSC with compelling justification for students who are deemed ineligible for GSSP benefits. Justifications must be constructed with the student's advisor, DGP, and GSC.
2. GA-1 Third Party Student Sponsorships allow for students working as Research Assistants to receive tuition support and health insurance funded by the grant on which they are working. GA-1 requests are processed by the department GSC and the University Cashier's Office.

North Carolina Residency

Graduate students entering the program who are not residents of North Carolina are highly encouraged to establish legal residency in North Carolina for tuition purposes. Out-of-state students funded as TAs or RAs are typically only eligible for 1 year of out-of-state tuition support until they meet residency. Detailed information about this process is provided at

<https://grad.ncsu.edu/admissions/residency/> and all students applying for residency should thoroughly read this website.

International Student Information

The University and the Graduate School have many web pages devoted to information for international students. The Office of International Services (<http://internationalservices.ncsu.edu/>) has important information on immigration regulations and University policies. The Office of International Affairs sponsors many activities for international students. Finally, the University maintains a listing of international student programs <http://internationalservices.ncsu.edu/ois-programs>.

Living

Becoming a graduate student is an exciting but challenging transition. Acclimating back to academic life, meeting new colleagues, making new friends, and adjusting to life in a new city are just some of the challenges. The graduate school has an excellent *New Student Survival Guide* at <https://grad.ncsu.edu/students/survival-guide/>. This web page covers a range of important topics for entering graduate students including how to obtain an All Campus Card, health insurance, housing, parking, registration, and useful information about moving to Raleigh including utilities, transportation, restaurants, and shopping.

Graduate Student Communities

A large part of the graduate student experience is becoming a member in an academic community. Students should take full advantage of North Carolina State's academic community by joining formal student and professional communities, as well as attending informal and social gatherings with faculty and other graduate students. Having a strong support group of colleagues can make the graduate experience more enjoyable and less stressful. The College of Education's Office of Graduate Student Services serves as an advocate for graduate students while also strategically aligning them with support networks. Visit their web page at <https://ced.ncsu.edu/graduate/graduate-student-services/>.

There are many opportunities at NCSU to join organizations for graduate students. These can provide both academic and social experiences. Some common centers and organizations:

[CED Graduate Student Advisory Board \(GSAB\)](#)
[CED Graduate Student Ambassadors](#)
[CED Graduate Peer Mentoring Program](#)
[Holmes Scholars](#)
[NC State Graduate Student Association](#)
[NCSU Student Involvement - Student Organizations](#)
[NC State Black Graduate Student Association](#)
[Office of International Services](#)

In addition, there are many informal student communities that form around research projects, study groups for classes, and other academic and social activities within the collegelt is recommended that you seek out or even form informal communities. There are also support

networks available for stressful times and the counseling center offers workshops on coping with the graduate school, dissertation support groups, and personalized counseling. Through a shared embedded counselor position, undergraduate and graduate students in the College of Education are able to receive free counseling services on campus and virtually. Learn more [here](#). See [NCSU Counseling Center](#).

Academic Integrity and Research Ethics

All students are expected to follow University rules and procedures in regard to academic integrity and research ethics. Because these rules and policies may not be covered explicitly in your coursework, please carefully read Section 7 of the code of student conduct ([POL 11.35.01 – Code of Student Conduct](#)). Seemingly minor errors such as forgetting to cite a source or claiming another scholar's research conclusions as your own can lead to major disciplinary action such as probation, a reduction in a course grade, or expulsion from the University.

It is important that students involved in a research project or engaging in their dissertation research be familiar with responsible conduct of research, especially as it relates to human subjects. The Responsible Conduct of Research (RCR) Program maintains a website at [Responsible Conduct of Research](#) and offers courses and training. Students working with human subjects need to file appropriate paperwork with the Institutional Review Board for the Protection of Human Subjects in Research (IRB) at [Research Administration and Compliance - For Researchers](#). If data will be collected through a local school district (with teachers or students), then one must follow the review and approval protocols for that school district before collecting any data. For example, see policies for Wake County at [Request for Research Partnership / Request for Conducting Research](#)

Taking Courses for Credit at Local Institutions

NC State participates in an Interinstitutional Registration program with the University of North Carolina at Chapel Hill, the University of North Carolina at Greensboro, University of North Carolina at Charlotte, North Carolina Central University, and Duke University. Under this agreement, NC State graduate students are permitted to register for classes on one of these other campuses, *upon recommendation and approval of their advisory committees*. Please see: [INTER-INSTITUTIONAL APPROVAL FORM](#)

Even though taking a course on another campus, the student is exclusively under the administrative direction of the NC State Graduate School. Enrollment for courses on other campuses will take place on this campus, following procedures at the website listed above. Such courses are considered by the Graduate School to be a part of a student's normal load and the student will be billed for courses through NC State University Cashier's Office. During the summer, the procedure is somewhat different in that a student must be enrolled in at least one course on the NC State campus during the same session as the requested interinstitutional registration.

When the grading system of the other institutions varies from that of NC State, grades received under Interinstitutional Registration will be converted to the NC State system. "H," "P," "L," and "F" grades earned at the University of North Carolina at Chapel Hill and "E," "G," "S" and "F" grades earned at Duke University will be converted to "A," "B," "C" and "F" grades, respectively.

Administrative Forms

All formal actions to your program and degree status require a FORM. A link to all Graduate School forms can be found at [Graduate School Forms | The Graduate School](#).

A comprehensive timeline for submission of forms can be seen at the Graduate School at [3.24 Schedule of Required Documents](#). Note that forms should be turned into the STEM Ed Department Graduate Services Coordinator after obtaining student and advisor signatures. Additionally, it is best to check the current web pages for the most current versions of the forms.

Doctoral Degree Program Requirements

Introduction

Through the doctoral program, students further develop their instructional expertise, extend their knowledge of learners, teaching, teacher education, professional development, technology, equity and policy, deepen their knowledge of STEM disciplines, use, conduct and evaluate educational research at the highest level, and engage in professional leadership activities. In particular, they will develop:

1. A strong foundation in advanced STEM disciplines.
2. A profound understanding of STEM disciplines taught in grades PK-16.
3. A theoretical foundation in the learning of STEM disciplines for a broad range of age groups and diverse populations.
4. An applied foundation in the teaching of science, mathematics, engineering or technology to a range of age groups with diverse populations.
5. The knowledge and ability to lead and contribute to dialogues and debate about historical, philosophical, psychological and sociological perspectives in STEM education.
6. An ability to analyze, critique and conduct research related to the teaching and learning of science, mathematics, engineering or technology education.
7. An ability to apply theoretical knowledge and research results in settings such as: instruction, teacher education, evaluation, supervision, curricula development, technology development and policy making.

There are three phases to a doctoral program: 1) Coursework (includes choosing a Committee and preparing a Plan of Work), 2) Preliminary Exams, and 3) Dissertation. Students must progress through the Coursework and successful completion of Preliminary Exams in 4 years or after 48 credit hours are completed, whichever is later.

The following diagram illustrates the different aspects of a doctoral program in the College of Education and a proposed timeline along the sides for a full-time student. Of course, this would be adjusted for a part-time student.

FULL-TIME STUDENTS



Figure 1. Common Elements of PhD Programs across College (Full-time)

Phase 1: Coursework Requirements

The coursework phase introduces the student, both broadly and deeply, to significant concepts and methods in mathematics, science, technology or engineering education research. As different students may focus their work in different ways, it is crucial to choose elective and research methods courses with consultation of the advisor and committee members. Required coursework, including general education, methodology, and concentration requirements are listed as follows. Students should expect coursework to take between two to three years of full-time study depending on previous coursework experience at the master's level. Specific coursework requirements may change based on decisions by the graduate faculty with specified dates of applicability. All students must demonstrate at least 72 hours taken beyond the bachelor's degree and no student will be awarded a Ph.D. with fewer than **54 semester hours of coursework taken at NCSU** in the Ph.D. Plan of Work.

Common College and Department Requirements

All Learning and Teaching in STEM Ph.D. students take common college and department and courses, which are listed below.

College of Education Scholar Leader Core Course Requirements	21 hours
<i>all doctoral students in the College of Education must meet the following requirements in their course of study</i>	
Scholar Leader Core Courses	6 hours

ED 755 Scholar Leader: Diversity and Equity in Schools and Communities	3
ED 756 Scholar Leader: Systemic Change in Education and Society	3
Research Methods Courses	15 hours
First level Applied Quantitative Methods <ul style="list-style-type: none"> • ED 710 Applied Quantitative Methods in Education • ED 711 Applied Quantitative Methods in Education II (for students who already took ST 507/511, ED 710 or equivalent course) * 	3
ED 730 Introduction to Qualitative Research in Education, <i>or its equivalent</i>	3
One Advanced Methods ED 711 Applied Quantitative Methods in Education II or equivalent ED 750 Mixed Methods Research in Education ED 731 Advanced Qualitative Research and Data Analysis in Education, <i>or an equivalent advanced methods course</i>	3
Two additional advanced research courses taken from the following: <ul style="list-style-type: none"> • ED 731 Advanced Qualitative Research and Data Analysis in Education • ED 712 Survey Methods in Educational Research • ED 750 Mixed Methods Research in Education • ED 795 Special Topics in Education Research (e.g., Causal, Structural Equation Modeling, Narrative Research) • A design-based research course • courses in the Department of Statistics or Psychology at the level 500 or above (e.g., ST 505, ST 712, PSY 880) Special concentration requirements: Mathematics and Statistics Education requires 3 hours of EMS 893 as an advanced applied Research Methods Experience. A student engages in supervised research with a faculty member, often connected with a research project. Students can also engage in research or evaluation projects external to the department or university that is agreed upon and supervised by a faculty member. Science Education requires EMS 731 as an advanced research methods course	

*Students in the **Mathematics and Statistics Education Concentration** begin with ED 711 as they generally have had an introductory quantitative methods course at the Master's level. Students in other PASs may also begin with ED 711 based on past course experiences.

Learning and Teaching in STEM Required Courses	
<i>All students in the Ph.D. program, regardless of the specific Concentration, take the following courses. These courses develop our students' competencies in the broader foundations of STEM Education.</i>	
	6 hours
EMS 780 Foundational Learning Theories in STEM Education	3
EMS 791 Contemporary Topics and Issues in STEM Education <i>Topics will change</i>	3

Dissertation Research	9 hours
EMS 895 Doctoral Dissertation Research (typically taken over 1-3 semesters)	9

NOTE: For doctoral students either part-time or full-time who are working on their dissertation. Writing the dissertation requires a major commitment of time and effort on both the part of the doctoral student and the faculty advisor. There should be consultation between the student and the dissertation chair about what is expected to be accomplished, and how much time is to be invested before the student registers. The College of Education strongly recommends that students who are registering for dissertation research (895) or preparation (899) register for at least 3 semester hours per semester, when appropriate.

Specific Concentration of Study Requirements

Each-concentration-- **Mathematics and Statistics Education**, **Science Education**, or **Engineering and Technology Education**-- have specific requirements for the 24 hours related to the program area of study listed in the following sections.

Mathematics and Statistics Education Concentration

Mathematics and Statistics Education students can focus their concentration in learning and teaching mathematics and/or statistics at one of the following three levels: upper/advanced secondary and collegiate level, middle or secondary level (grades 6-12), elementary level (grades PreK-5). Your choice should influence courses and experiences with which you engage, your dissertation focus, and the requirements for your mathematics and statistics background.

Mathematics and Statistics Education Specific Courses	24 hours
Foundations course: choose 1 EMS 770 Foundations of Mathematics Education or EMS/ST 7** Foundations of Statistics and Data Science Education EMS 792 Special Topics in Mathematics Education	3
Teaching and Learning course: choose 1 EMS 711 Teaching and Learning of Mathematics 6-14 EMS 712 Teaching and Learning of Mathematics K-8 (Pre-Req: EMS 794 learning theories or a prior psychology course)	3
Two additional Doctoral level (700 level) courses in Mathematics and Statistics Education EMS 704 Curriculum Development in Math and Science; EMS 705 Education and Supervision of Teachers of Science and Mathematics EMS 792 Special Topics in Mathematics Education; and Any course not chosen in Foundations or Teaching and Learning categories.	6
Experiences in Mathematics Education: <i>Each doctoral student comes to the program with varying experiences in the field of mathematics and statistics education and also vary in their career trajectories. The intent of these 3 hours is to enrich and expand the doctoral student's practical knowledge base in K-20 content teaching, university-level teacher education. The exact choices will vary by student and should be approved by the advisor and Graduate</i>	3

<p><i>Advisory Committee. A student may not use a paid experience as an RA or TA or a teaching job in a K-16 classroom to fulfill the requirements for a practicum or internship. These experiences are designed to enhance your background and prepare you for future careers. You can take all 3 credits with one experience, or do a combination of 1 hour and 2 hours.</i></p> <p>EMS 841 Practicum in Science and Mathematics Education--K-20 Content teaching experience (See Appendix for placement procedures in K-12 schools)</p> <p>EMS 851 Internship in Science and Mathematics Education--University teacher education experience</p>	
<p>Seminars and Preliminary Exam</p> <p>EMS 802 (Intro Seminar in Mathematics Education--1 credit, taken first semester of program)</p> <p>EMS 802 (Advanced Seminar in Mathematics Education-1 credit, taken near end of program)</p> <p>EMS 890 (Doctoral Prelim Exam - 1 credit minimum)</p>	3
<p>Specialty Courses</p> <p>Take graduate courses (500 or above level) that deepen or broaden your understanding of issues related to the focus of your research, grade level, and future career interests. Courses should be chosen in consultation with your advisor and/or committee members</p>	6

All doctoral students need to demonstrate understanding and competency in teaching and learning with technology. This could be from a course chosen in their program, prior experiences, courses in a master's degree, or potentially as part of the prelim exam.

Mathematics and Statistics Content Requirement

Between masters and Ph.D. courses, students must show equivalent of the following coursework for their chosen career focus. These requirements are designed to enhance students' foundation in mathematical sciences and prepare them for a highly competitive job market in mathematics and statistics education. Credits listed below could have been taken during a master's degree. If not, then students may take some as part of their program (e.g., 6 credits could be taken as Specialty Courses), or credits could be above and beyond the hours required in the Ph.D. plan of work.

Focus at the upper secondary and collegiate level (grade 10-16) should earn a master's degree in mathematics, applied mathematics, or statistics, or a *strong equivalent* of 30 credit hrs.

Focus at the middle or secondary level (grades 6-12) at least 18 credit hours of graduate level mathematics or statistics courses (24 hours recommended to be competitive).

Focus at the elementary level (grades PreK-5) at least 18 hours of masters or PhD courses in mathematics or statistics content. At least 9 hours must be focused on elementary mathematics content (e.g., from ELM 500 series in mathematics education).

Science Education Concentration

Graduates of the Science Education Concentration become nationally recognized leaders in science education and related fields as science teacher educators, informal educators, curriculum supervisors, community college and higher education science faculty, science education researchers, and evaluators.

Science Education Specific Courses	24 hours
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EMS 732 Theoretical and Critical Perspectives of Science Education	3
EMS 775 Foundations of Science Education	3
EMS 832 Research Applications in Science Education	3
EMS 851 Internship in Science and Mathematics Education	3
Specialty Courses (deepen understanding in focus area) Take graduate courses (500 or above level) that deepen or broaden your understanding of issues related to the focus of your research and grade level, and future career interests. Courses should be chosen in consultation with your advisor.	12

Science Content Requirement

The Science Education concentration requires a minimum of 18 hours of master's level science courses from all graduate work. This may be waived by the committee if determined to be sufficient based on previous Master's coursework and sufficient hours, and if the total number of required hours are reached. Students can take science content courses as part of the 12 hours of specialty courses.

Engineering and Technology Education Concentration

Graduates of our program become rising leaders in engineering and technology education in K-12 formal and non-formal settings. Through scholarly pursuits in the field, learning and teaching, and public policy they take positions as scholars, supervisors, teacher educators, non-formal science/engineering educators, entrepreneurs, designers, and as faculty members in institutions of higher education.

Engineering and Technology Education Specific Courses	24 hours
TED 751 Technology Education: A Discipline	3
TED 752 Curricula for Emerging Technologies	3
TED 755 Developing and Implementing Engineering and Technology Education	3
TED 756 Planning of Change in TED	3
TED 758 Teaching Creative Problem Solving	3
Specialty Courses Take graduate courses (500 or above level) that deepen or broaden your understanding of topics related to the focus of your research and future career interests. Courses should be chosen in consultation with your advisor	9

Plan of Work and Graduate Advisory Committee

The initial advisor should help the student develop an initial Plan of Work (POW) based on program requirements and considering the student's individual background from their bachelors and master's degrees. The initial advisor does not necessarily need to become a student's Chair of their Graduate Advisory Committee. Students should carefully consider their own research interests, and the interests and research programs of faculty as they select their chair and committee. A student then makes a request of the faculty they wish to chair to ensure they will be accepted by them and that they have adequate time and expertise for their interests. Once the new chair has accepted, the student should discuss their intentions with the previous chair to briefly explain their reasons. The student should identify candidates for a **Graduate Advisory Committee (GAC)**, in consultation with their Chair, as soon as possible after one begins taking course work and *ideally before completing 18 hours of graduate work* but no later than the third term of enrollment toward the Doctorate. This ensures that all of the courses that are taken meaningfully contribute to the degree program and minimizes the possibility that additional coursework will be required.

The Graduate Advisory Committee needs to consist of *at least* 4 faculty members, 2 of whom must be graduate faculty members from the Concentration (e.g., Mathematics and Statistics Education concentration members for a mathematics education committee). Up to 2 additional faculty members from any field can also serve on the committee to complement the student's research interests, although at least one of the members needs to be outside of the student's Department. **The student and GAC meet formally to develop and agree upon the final Plan of Work for Graduate Study.**

All Ph.D. students must take a minimum of 54 hours at NCSU in the official Plan of Work for the Ph.D. 18 Hours from previous relevant coursework from another institution or Master's degree can count towards fulfilling program requirements.

When a student meets with the Graduate Advisory Committee to discuss the Plan of Work (POW) and have them sign on their agreement with the plan. This will facilitate discussions on how the student is meeting all requirements in the program. After the student meets with their committee, the Plan of Work form should be submitted for approval online through MyPack Portal (using the Student Information System). The form includes a place to record the courses, semesters planned to take, and grades for all courses in a student's plan. Ideally, this POW meeting takes place before the completion of 18 graduate hours, and then the POW is formally submitted for the committee to approve.

Minors

Ph.D. students are **not** required to pursue a Minor. However, there are options to minor in a field of study from other departments. If interested, please consult with your advisor. For-example, a [minor in statistics](#) is popular among many Ph.D. students wanting to specialize in quantitative approaches.

Online Graduate Certificates

Across the university, many departments offer graduate certificates that can be used to enhance your doctoral program and provide documentation of a specialization that interests you. For example: Climate Adaptation, Biology for Educators, Data Science Foundations, Learning Analytics, Materials Science and Engineering, or Youth Development and Leadership. See full list at <https://online-distance.ncsu.edu/programs/list/?level=graduate-certificates>

The STEM Education department offers two graduate certificates that students may pursue alongside their doctoral studies.

The Learning STEM in Informal Contexts graduate certificate is designed to increase student knowledge and skills relating to learning in informal settings. The program offers the opportunity for students to learn about educational theory, research in practice, and how to evaluate learning in informal contexts and engage in community-engaged scholarship through co-developed projects with community partners who provide informal learning experiences. Learn more at <https://online-distance.ncsu.edu/program/learning-stem-in-informal-contexts/>.

The Mathematics Teaching and Learning graduate certificate is designed to enhance student expertise in mathematics education with a focus on teaching and learning processes. The program offers the opportunity for students to deepen their understanding of mathematical concepts, explore effective instructional strategies, and examine current research in mathematics education. Students will engage in coursework that fosters the development of innovative teaching practices tailored to diverse learning environments. Learn more at <https://ced.ncsu.edu/graduate/programs/certificate/mathematics-teaching-and-learning/>.

The Department of Statistics also offers the following graduate certificate.

The Statistics education graduate certificate program provides convenient online access to the statistical training that is oftentimes required for career advancement. In this certificate program, students will learn statistical concepts and methods and pedagogical techniques for teaching these statistical topics at the college or high school level. The emphasis of the program is on the effective use of modern technology for teaching statistics. Learn more at <https://online-distance.ncsu.edu/program/graduate-certificate-in-statistics-education/>.

Grades in Courses and Overall GPA

Students must maintain above a 3.0 GPA throughout their program, or face probation, suspension, or termination. This rule is in effect for all students who began their PhD program in Summer 2011 or later.

Phase 2: Preliminary Examination

The purpose of the preliminary examinations for candidacy is to evaluate the extent to which a candidate appears well-qualified and ready to transition from the coursework phase of study to more independent work in their doctoral dissertation research. While doctoral students will have already demonstrated much of the necessary competencies in the program goals, through the combination of course work, research participation, and internships, there are additional skills and proficiencies necessary to assess before undertaking their final doctoral study.

A student should engage in the preliminary exam process during or shortly after the final semester of coursework. However, exceptions may be granted, with approval of the Graduate Advisory Committee, for those with 1-2 remaining courses that their schedule does not permit taking until a later semester. The examining committee shall be made up of the Graduate Advisory Committee (GAC) as noted on a student's file and approved Graduate Plan of Work. The GAC must include a minimum of four graduate faculty members (with at least two from the student's program concentration area). If a doctoral graduate committee has no outside representation beyond the student's graduate program by a member of the graduate faculty, a Graduate School Representative is required. This representative is not required to serve in a voting committee member role. Additionally, if a student has declared a minor, one of the committee members must

be from the minor field.

<https://catalog.ncsu.edu/graduate/graduate-handbook/advisory-committees/>

Preliminary Written Exam

Each of the Learning and Teaching in STEM Concentrations have somewhat different recommendations for the preliminary exam. Please refer to the appropriate concentration below ([Mathematics and Statistics Education](#), [Science Education](#), and [Engineering and Technology Education](#)). There are two phases to the preliminary exam process: a written exam, and an oral exam. Each Concentration has a different procedure for the written preliminary exam.

Mathematics and Statistics Education Written Exam

The written exam consists of 3 questions designed and agreed upon by the chair(s) and committee members. The three questions are designed to assess the following skills:

- DEPTH OF KNOWLEDGE--The ability to synthesize literature in a well-defined topic area that demonstrates depth of understanding about the critical issues in that topic and ability to bring together multiple perspectives. This well-defined topic is almost always aligned with the students' dissertation topic.
- BREADTH OF KNOWLEDGE -- The ability to examine a broad issue in mathematics or statistics education to develop well-delineated arguments both in terms of supporting and conflicting points of view.
- CRITIQUE OF RESEARCH -- The ability to examine a broad issue in mathematics or statistics education to develop well-delineated arguments both in terms of supporting and conflicting points of view.

The student meets with their committee to discuss potential foci for the written exam questions. The three questions are written and approved by the students' chair(s) and committee members. Once received, the student has up to six weeks to submit the written responses. Each question should require approximately one week of full-time work to complete. Thus, upon agreement between a student and their GAC, the exams may be completed in either three weeks of full-time work, or up to six weeks of part-time work. The student works independently to prepare the responses to the Written Exam questions and submits these responses in hard copy and electronic copy to the Chair(s) by the designated due date and time.

The documents submitted for evaluation will be submitted to each member of a students' Graduate Advisory Committee. Each of the 3 responses will be assessed as either PASS or FAIL and will include helpful comments. The exact grading timeline is agreed upon by the committee members. The committee will prepare a memorandum summarizing the outcomes and general comments. *The GAC members must come to consensus on the final scores given on the Preliminary Written Exam Report.* Once finalized, the memorandum will be given to the student and Director of Graduate Program indicating the outcomes and comments on all 3 questions.

To pass the written portion of the preliminary exam, a student must earn a PASS on all 3 questions. If a student earns a Fail on any of the 3 questions, they will have *one* retake opportunity per failed question. For each question failed, the student will be given one new question designed by the Chair(s) and approved by the GAC to meet the

competencies in the area(s) failed. This could be a new question or a revision, modification, or focused version of the original question. The student will have 2 weeks per new question to complete the written response. Thus, for one failed question, the student will have 2 weeks to respond to one new question. For two failed questions, the student will have 4 continuous weeks to respond to the two new questions. For three failed questions, the student will have 6 continuous weeks to respond to the three new questions.

The scheduling of the retake questions must be agreed upon between the students and Chair(s). This process must be completed within one calendar year of the submission date of the original exam questions. Failure to earn a PASS on all new questions within that calendar year will result in failure of the preliminary exam and termination of a student's Ph.D. program in Mathematics Education.

Science Education Written Exam

Starting Fall of 2022, the science education program no longer requires a minor written exam. A major written exam is required for the preliminary exam. Waiver of the minor exam for those who were admitted before Fall of 2022 and are currently enrolled in the program will be determined by their advisor.

Major Written Exam

The major exam is a written product that is designed by the chair of the graduate advisory committee in consultation with the other members of the committee. A written proposal of the major exam is circulated to the committee, after consultation with the chair, and then a timeline is developed for the product. Typically, the major exam takes place over one semester of study: fall, spring, or summer. Among the skills to be assessed in the preliminary major written exam are:

- The ability to independently conduct research; or
- The ability to synthesize relevant scholarly literature for the topic that is addressed, in a way that meaningfully builds an argument, involves the use of relevant theoretical and/or conceptual frameworks; or
- The ability to conduct a critical analysis and review of the work of others, as one does when writing journal reviews, reviewing grants, or otherwise evaluating the scholarship of professionals in the field.

There are two formats for the major written exam: traditional written exam and paper of publication quality. Students can request, but the committee decides the format of the written major exam.

Traditional written exam: The student and the chair meet to discuss potential foci for the written exam questions. The chair constructs the Written Exam with consultation from graduate advisory committee members. The committee members individually decide the questions and if open or closed book. The final questions must be approved by all members of the student's graduate advisory committee. The timeline and format of the traditional exam is decided by the graduate advisory committee.

Paper of publication quality: The student develops a written proposal of the major exam, in consultation with the chair, and circulates it to the entire committee for approval. Then, a timeline is developed for the product. The product is generally developed to enhance the skills of the student, which can take the form of a pilot study, data analyses and writing, a stand-alone literature review paper, or a similar product. The student writes the paper without help from the chair, other graduate students, other faculty, and without hiring an editor.

When the major written exam is complete, it is submitted by the student to the chair and all participating members of the graduate advisory committee. The student needs to give committee members at least 2 weeks to read the written exam. These committee members send a grade (High Pass, Pass, Low Pass, or Fail) to the chair. The chair collates the written feedback from these committee members and shares it with the student. In addition, the chair first shares the overall grade of the performance with all of the members of the student's graduate advisory committee and then shares it with the student upon the committee's agreement. If the student fails, the committee can allow the student to make changes to the product and re-submit it to again be evaluated. The student needs to earn at least a Low Pass in order to move onto the Preliminary Oral Defense.

Engineering and Technology Education Written Exam

The written exam will consist of 3 questions designed by the chair and committee members and approved by the committee to assess the three skills listed below. Students have up to 4 weeks to complete the qualifying examination. (Page numbers indicated are estimates of the expected text needed to thoroughly answer each question) The three questions will be referred to as:

1. TOPICAL ASSESSMENT (BREADTH & DEPTH) 15-20 pgs.
2. METHODS 10-15 pgs.
3. RESEARCH DESIGN 10-15 pgs

The documents submitted for evaluation will be submitted to each member of a students' Graduate Advisory Committee. Each of the 3 responses will be assessed as either PASS or FAIL with the primary responsibility of assessment with the question submitter and will include helpful comments.

Each grader will initially send the graded papers with comments and outcomes to the Chair(s). The Chair(s) will prepare a memorandum summarizing the outcomes and general comments. This will first be given to GAC faculty members for further comment and suggested changes. *The GAC members must come to a consensus on the final scores given on the Qualifying Written Exam Report.* Once finalized, the memorandum will be given to the student and Director of Graduate Program indicating the outcomes and comments on all 3 questions.

To pass the written portion of the qualifying exam, a student must earn a PASS on all 3 questions. If a student earns a Fail on any of the 3 questions, they will have *one* retake opportunity per failed question. For each question failed, the student will be given one new question designed by the Chair(s) and corresponding author of the failed question and approved by the GAC to meet the competencies in the area(s) failed. (At the rescheduling of the retake), The student will have 1 week per new question to complete the written response. Thus, for one failed question, the student will have 1 week to respond to one new question. For two failed questions, the student will have 2 continuous weeks to respond to the two new questions. For three failed questions, the student will have 3 continuous weeks to respond to the three new questions.

The scheduling of the retake questions must be agreed upon between the student and Chair(s). This process must be completed within one semester from the submission date of the original exam questions. Failure to earn a PASS on all new questions within that calendar year will result in failure of the preliminary exam and termination of a student's Ph.D. program

in Engineering and Technology Education.

Preliminary Oral Exam for All Students

When the student has passed all sections of the preliminary written exam for their concentration, or when the completion is imminent, the student schedules a Preliminary Oral Exam date and time that is agreeable to all members of GAC and the student. The Oral Exam typically **occurs within 6 weeks** of the submission date of the Written Exams or within the next semester. The Preliminary Oral Exam **only occurs after the written exam(s) have earned a PASS** and the student and chair(s) complete the Request to Schedule Doctoral Oral Examination ([Request to Schedule Doctoral Oral Examination](#)).

Prior to submitting the request for the Preliminary Oral Exam, the student's Graduate Plan of Work (POW) must be correct, complete, and approved by all committee members and the Director of Graduate Programs. The request for the Preliminary Oral Exam must be submitted to the Graduate Service Coordinator and Director of Graduate Programs **at least 10 business days** prior to the Oral Exam date.

All members of GAC and the student meet for the Oral Exam. During the Oral Exam, the student may be asked questions on any of the written responses or on any other issue related to disciplinary content, research methodology, or STEM education appropriate to the candidate's coursework and preparation.

At the completion of the Oral Exam with a score of PASS, the GAC will sign the Doctoral Preliminary Exam Report Form.

If a student earns a FAIL at the Oral Exam, at the discretion of the graduate advisory committee, they may have *one* retake opportunity, to be scheduled within a month of the prior date. If a student does not earn a PASS at the retake Oral Exam, they will have failed the Preliminary Examination, resulting in termination of a students' Ph.D. program.

Phase 3: Dissertation Research

A student is admitted to candidacy by passing the written and oral preliminary examination. Once a student is admitted to candidacy, they should be advancing their dissertation research. Students must enroll in EMS 895 for the first 9 credits of Doctoral Dissertation Research. If the student is still working on a dissertation after 9 credits, they can register for either EMS 895 or EMS 899 (Doctoral Dissertation Preparation). EMS 899 is to be used for students who have completed all credit hour requirements for their degree (including research credits and the oral preliminary examination) but need to maintain continuous registration to complete their research and/or write and defend their dissertation.

Electronic Thesis and Dissertation (ETD)

At NC State, all dissertations and theses are submitted and published electronically. The software used by the University allows all theses and dissertations to be saved as a PDF, submitted to the graduate school electronically for approval and then sent electronically to the library for cataloging and uploaded to the University server. The Graduate School has a comprehensive website concerning ETDs at NC State at [NCSU Electronic Theses and Dissertations](#). One of the most

important documents at this website, the ETD Guide, walks graduate students through the exact process and formatting requirements for a thesis or dissertation. Please see: [NCSU ETD Guide](#).

ETD Workshops are offered several times each semester. It is imperative to go to an ETD workshop to acquaint yourself with the publication process including formatting and timelines. For a current list of available dates and information about workshop registration, use the following link: <https://grad.ncsu.edu/professional-development/workshops-and-series/>

There are helpful templates for MS Word documents or LaTeX documents for creating your thesis or dissertation in the proper format. See: [ETD Templates](#)

You should start writing your proposal document using an approved ETD template.

After the Doctoral Final Exam when the student defends their completed dissertation, every Doctoral student has 3 ETD deadlines to meet:

- (1) ETD **Review** Deadline (*A choice of 2 review deadlines to pick from; 1. No Registration Required or 2. Registration Required*)
- (2) **Final** Error Free ETD Deadline (*For both No Registration Required and Registration Required*)
- (3) **Final** Committee Approval Deadline (*For both No Registration Required and Registration Required*)

All deadlines for submission are updated each year and can be accessed by visiting the following link: [ETD Deadlines | The Graduate School](#)

In addition to the standard requirements for ETD submission, doctoral students have a few additional requirements that need to be fulfilled to complete the process. Prior to the awarding of the doctoral degree, the *Survey of Earned Doctorate (SED)* survey must be completed and turned into the ETD editor. This form is completed online and can only be printed at the time of completion. Doctoral students are also required to complete and submit a Doctoral Graduation Attendance Notification (DGAN). This two-part form is available at go.ncsu.edu/dgan. For more information about both of these forms (including links) and other required doctoral paperwork, please visit the following link: [3.24 Schedule of Required Documents](#)

Research Process

The dissertation research has four formal components: Proposal defense, Obtaining institutional review board approval, Research and writing, and Final oral examination.

Proposal Defense

The dissertation proposal typically includes a literature review, framework, and details about methodology, including proposed methods of analysis. The public defense of the proposal must be attended by all committee members and is open to all Graduate faculty and students. The proposal defense is typically held within 6 months of admission to candidacy after approval is obtained by the committee chair(s) that the candidate is ready for such a defense. A copy of the written proposal must be submitted to committee members at least 2 weeks in advance of the scheduled defense. **The earliest date for the public proposal defense is the same day in which the Preliminary Oral Exam meeting is held.**

Successful completion of the Proposal Defense is granted upon final approval by the entire committee on the reasonableness and soundness of the proposed study. This approval indicates that the student is ready to proceed with the study as planned or modified based on

committee suggestions and approval. If the defense is not successful, as deemed by the committee members, then the student should make needed improvements to the proposal document and reschedule another proposal defense.

Obtaining Institutional Review Board Approval

If your research involves data from human subjects or the use of secondary data sources, you need to complete all necessary processes to obtain IRB approval for your study. No data can be collected or analyzed without IRB approvals. See <https://research.ncsu.edu/administration/compliance/research-compliance/irb/>

Research and Writing

This occurs over an extended period of time and should include frequent discussions with the committee chair(s). Students will draft chapters of their dissertation and review them with their chair(s). Typically, a dissertation includes an introduction and problem statement, a literature review, a methodology chapter including the research design, a results chapter (sometimes two or more), and conclusions and future directions. Modifications of this format occur based on the topic and type of the dissertation in consultation with the chair(s) and the other committee members. For example, some students opt to write their results chapters in the form of 2-3 journal-ready manuscripts ready to submit to specific journals in their field. Once the chair(s) has approved it, the students should share their drafts with other members and keep all membership updated on progress.

Final Oral Examination

The final defense is scheduled after the dissertation study is complete and well written with approval by the committee chair(s), except for such revisions as may be necessary as a result of the examination. The Final Doctoral Oral Examination must be attended by all committee members and is open to the entire University community. The Final Doctoral Oral Examination may not occur earlier than one semester or its equivalent (**4 months**) after successful completion of the Proposal Defense. After approval by the committee chair(s) and **at least 10 business days** in advance of the requested date, the student, through the Graduate Services Coordinator and DGP, submits a [Request to Schedule the Doctoral Oral Examination](#), indicating that he/she wishes to schedule the final oral examination. The student must submit a copy of the dissertation to all committee members within 2 weeks of the scheduled date. See below for the format of this examination. The chair and doctoral candidate are responsible for announcing the date and time of the dissertation defense to the community of Graduate faculty and students in the department via message distributed by the Graduate Services Coordinator at least 1 week in advance of the date of the defense.

Though the format of the doctoral examination may vary according to the culture of individual graduate programs, all examinations include three elements. Throughout the process, the chair of the candidate's advisory committee has the obligation to maintain a scholarly atmosphere and to keep academic integrity and the student's best interest foremost.

- **Presentation by the candidate.** The candidate typically presents the methodology used, the data collected, and the conclusions reached as reported in the dissertation. For the purpose of dissemination of research, it is required that the presentation of the dissertation be open to the university community.
- **Questioning of the candidate.** Any member of the university community is allowed to ask questions of the candidate. If the need arises, graduate faculty

members not on the advisory committee may meet in a restricted session after the presentation to ask additional questions of the student and express any concerns they have to the committee and student. The questioning phase may continue with a closed session in which the advisory committee questions the candidate.

- **Deliberation and decision.** Only the advisory committee and the Graduate School representative, if one has been appointed, are present.
- **Passing the final oral examination.** A unanimous vote of approval of the advisory committee is required for passing the final oral examination.
 - Approval may be conditioned, however, on the student's meeting specific requirements prescribed by the student's advisory committee.
- **Failure to pass the final oral examination.** Failure of a student to pass the examination terminates his or her work at this institution unless the advisory committee recommends a re-examination. No re-examination may be given until one full semester has elapsed and only one re-examination is permitted.

At the completion of the final oral exam, the GAC members must complete, sign, and submit the Final Exam Report form. The Dissertation Evaluation Rubric must also be completed and signed by all GAC members.

Supporting Doctoral Students Through Advising and Mentoring

The goal of the College of Education PhD programs is to prepare scholar leaders to address the grand challenges of education.

Initial Academic Advisor

After the Graduate School admits a student into a PhD program, the department will assign the student an Initial Academic Advisor (IAA). Students will meet regularly with their IAA to discuss program and career goals. The IAA will come from the Concentration to which the student was admitted and, when possible, will have research interests similar to the student's. The IAA is responsible for guiding the overall academic career of the student but may or may not continue to be the student's advisor for the duration of their program. If, due to a change in circumstances, the IAA is no longer able to advise the student or the student wishes to change his/her advisor (e.g., due to lack of common research interests), faculty in the concentration will guide the student in finding an appropriate replacement.

Progress Towards Degree Report

Annually, Ph.D. students are reviewed each year by program faculty to discuss each student's progress and any concerns. In addition, comments could be added into MyPack portal that are either public to the student or not. In addition, students should be meeting with their advisor at least once each semester for advising and to track your progress in coursework, and the various realms of graduate education such as teaching experiences, publications, presentations, work on research projects, etc. Students should discuss with their advisor and other faculty members their experiences from the past year and any plans

that should be made to work on deficient areas in the coming years.

Initial Planning Process

Upon admission, new doctoral students meet with their initial advisor to plan courses and a draft Plan of Work (POW), outlining the steps toward degree completion.. In consultation with his/her/their IAA, the student is expected to outline areas of academic/professional interests, plans for cultivating research skills, and potential topics for the dissertation at the same time as submitting a draft of the Plan of Work (MyPack portal).

The purpose of this meeting is for faculty to provide advice about credit-earning research, teaching, and extension experiences, in addition to courses, which will help prepare the student for dissertation research and meet the student's career goals. For students engaged in interdisciplinary research, faculty members involved in the review may come from inside or outside the student's concentration and should be prepared for the meeting with the information provided by the student from MyPack portal.

Sample Steps for Planning:

- Students submit an outline (areas of academic/professional interests, plans for cultivating research skills, potential topics for the dissertation, and a draft Plan of Work (POW). Do not submit the POW.
- Begin to consider possible committee members.
- The expectation is that by the end of the second semester (18 hours completed) for full-time students, or third-fourth semester for part-time students, students will have a committee in place.
- Hold an initial committee meeting with the newly assembled committee, and following this meeting approve the student's Plan of Work.
- Here is a link to the NCSU Graduate Student Handbook
<http://catalog.ncsu.edu/graduate/graduate-handbook/plan-work/>

Ongoing Advising and Review

Each faculty advisor is expected to meet with his/her advisees each semester to assess their progress toward completion. The goals and expectations of the meeting will be similar to those of the first-year review with adjustments made corresponding to students' progress in meeting milestones and addressing their individual needs. The student and advisor are expected to document this meeting in written form.

In addition to this, at the end of the fourth semester (full time) and sixth (part-time) (36 credit hours), a student's doctoral committee should review the student's progress during an end-of-semester meeting. It is recommended that this meeting follow a similar structure/process as the initial review. In consultation with his/her IAA, the student is expected to submit a revised draft of the Plan of Work (in MyPack), if needed. Committees may require additional material (e.g., writing sample) from students.

In the years following, students will meet with members of their committee once or twice a year (either individually or as a group). Meetings will not require formal documentation and will be aimed at discussing progress towards degree completion and preparing for their future career.

Graduate Advisory Committee (GAC)

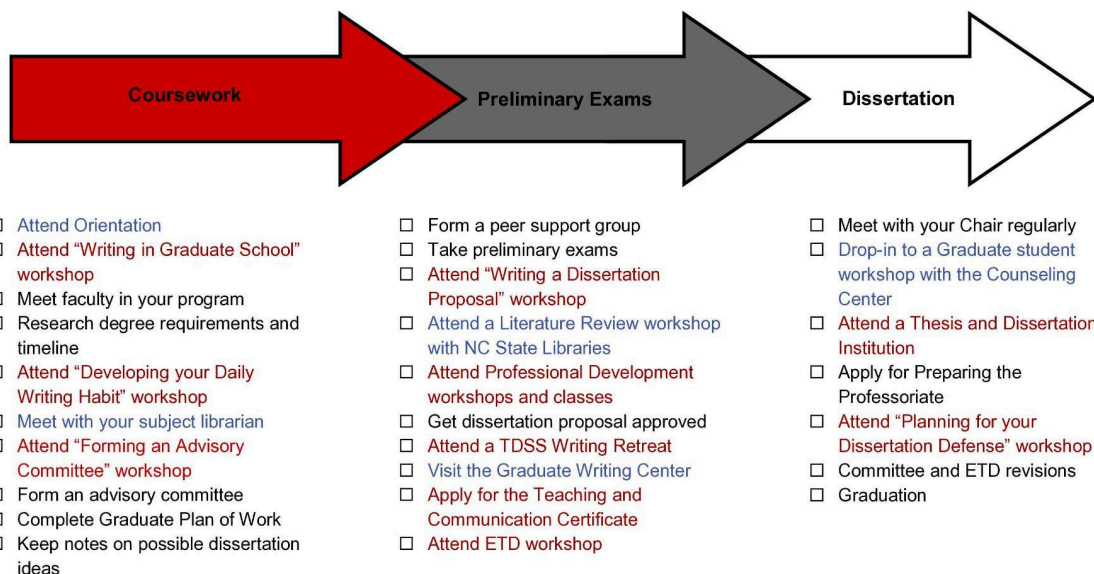
Doctoral committees should be organized around two key elements—the concentration and thematic or disciplinary threads that ensure commitment to research and individuality. Students should select a minimum of four committee members who are particularly well qualified to provide guidance on the student’s advanced coursework, scholarly professional interests, and dissertation topic. Committee members can be drawn from graduate faculty members across the University. The College recommends that at least two of the members of the Dissertation Committee, the chair and another member, come from the student’s program and no more than three members may come from the program itself. Associate faculty members or those from outside the program may co-chair the Committee. Through the DGP and the approval of the Graduate School, a faculty member from another university (who is not an interinstitutional graduate faculty member) or a professional from industry or government with credentials comparable to those required for membership on the graduate faculty, may serve as an external member, in addition to the number of committee members normally required. The expectation is that students meet with his/her advisor as they near completion of 18 hours of coursework in order to discuss committee membership. Committees are responsible for guiding students to successful degree completion. Specifically, they are responsible for making sure students have completed the necessary coursework, outlined and administered comprehensive exams, preliminary proposals, and dissertations. As part of this, the expectation is that the doctoral committee will monitor the student’s progress toward degree completion and provide guidance that will support the student to achieve his/her future career goals.

Guiding Your Own Doctoral Student Success

The following diagram is from the University Graduate School. It gives an overview of the three phases of a doctoral program and steps one should take in each phase to ensure their success.

Timeline for Doctoral Student Success

Student actions, TDSS and Graduate School programming, and additional NC State resources to guide you throughout your graduate school experience.



Please note: This timeline is offered as a suggested guideline for graduate student success, and all milestones are approximate. Each doctoral program has different requirements, so be sure to research and follow the specific guidelines and deadlines of your own program.

Download an [interactive version of this diagram in PDF.](#)

Scholarship

Upon entering the program, students should start exploring and reading about topics in STEM education of interest to them. Students should also work with course instructors to design final course projects that align with their research interests. Outside of coursework, students should engage in scholarly reading either on their own or as part of a reading group with other graduate students or faculty members. Participating as a research assistant (RA) is another excellent way to explore new topics and literature and can be undertaken either as a paid position (competitive) or unpaid (with permission of the research director). As students approach the preliminary examination, they should communicate to their committee chair(s) possible dissertation topics so that examination questions can help them focus on this topic.

Throughout their program, doctoral students should attend proposal defenses and final oral exams (dissertation defense) made by other graduate students in STEM education. Students should also engage in research talks and seminars that are offered by the University. The Friday Institute for Educational Innovation offers a series of brown bag lunches and Voices of Innovation lectures during the academic year that features renowned national scholars. A complete listing of brown bags and lectures can be found at the Friday Institute's website <https://www.fi.ncsu.edu/>. Other departments (e.g., Physics) offer regular

seminar series, as well as the College of Education. Doctoral students are also strongly encouraged to attend job candidate presentations when they occur. These will help prepare you for your own job application process.

Research Experience

Unlike a master's or bachelor's degree, a Ph.D. is a research degree. Hence, learning to conduct research is an essential element of obtaining the doctoral degree. Students are encouraged to seek out opportunities to work as a research assistant (RA) on a project or grant as soon as possible. Not all graduate assistantships are within the STEM education department, so students should check with other sources, such as the Department of Teacher Education and Learning Sciences, Engineering, Biology, Mathematics, Statistics, the Friday Institute, and the Science House, among others. Besides providing funding via the graduate student support program, being part of a research project provides invaluable experience that cannot be gained in any other way. Students learn how faculty identify research problems, find sources of funding, write grant proposals, write proposals for talks and papers, form relationships with schools, get approval for data collection, collect, store and analyze data, work in a research team, negotiate preparation of annual reports, run advisory meetings and conferences, consult and collaborate with colleagues, analyze data and write findings and final reports. These are critical elements of professional practice as a researcher. Students with or without research assistantships should also constantly seek opportunities to publish conference papers and journal articles with faculty and other graduate students. These experiences will be invaluable as students move onto the proposal and dissertation phases of the doctoral program.

Teaching Experience

Because teaching courses is an essential component of the professoriate, doctoral students are encouraged to seek out opportunities to teach. Early in the doctoral program, students should seek opportunities to serve as a teaching assistant (TA). Our department has a number of available positions annually for students to serve as a TA for undergraduate teacher education courses. Not only do TA positions allow for funding through GSSP, but they also will give you experience with planning lectures and engaging with students. Later in the doctoral program, students should seek opportunities to serve as a guest instructor for a course, undergraduate or master's level. This kind of experience will allow you to design and deliver instruction for a specified period of time under the supervision of a faculty member. Approach faculty members who are teaching courses with which you have some interest or previous experience. Students are also encouraged to spend time supervising student teachers. Because supervision of student teachers is often a requirement for faculty who teach in teacher education programs, doing this as a part of your doctoral program will give you some initial experience in what is involved with this process.

The Graduate School offers the *Preparing for the Professoriate* program to give faculty and doctoral students the opportunity to engage in a significant mentoring activity over the course of an academic year. It is a central component of NC State's professional development programs for graduate students through providing students with a hands-on teaching opportunity under a distinguished faculty mentor who is recognized for his or her teaching skills. The program is open to doctoral students who plan to have careers as faculty members at colleges and universities. Students earn a \$1000 stipend and valuable teaching experience. See:

Professional Growth Through Publications and Presentations

The following table summarizes the major STEM education related professional organizations along with their publications and conferences. Students should familiarize themselves with the websites of these organizations. In the beginning stages of doctoral work, students should plan on attending local conferences or national conferences when close to Raleigh. As students' progress in their work, they should consider submitting posters and individual papers to conferences of interest.

STEM Education Related Professional Organizations		
Organization Name and Website	Affiliated Journals or Conference	Typical Timeframe of Annual Conference
National Council of Teachers of Mathematics (NCTM) https://www.nctm.org/	<ul style="list-style-type: none"> • Teaching Children Mathematics • Mathematics Teaching in the Middle School • Mathematics Teacher • Journal for Research in Mathematics Education (JRME) 	April
North Carolina Council of Teachers of Mathematics (NCCTM) www.ncctm.org	<ul style="list-style-type: none"> • The Centroid 	October

Research in Undergraduate Mathematics Education (RUME) http://sigmaa.maa.org/rume/Site/News.html	<ul style="list-style-type: none"> • Conference in Research in Undergraduate Mathematics Education with Online Proceedings 	February/March
Association of Mathematics Teacher Educators (AMTE) www.amte.net	<ul style="list-style-type: none"> • Contemporary Issues in Technology and Teacher Education (CITE) • Journal of Mathematics Teacher Education (JMTE) 	January/February
School Science and Mathematics Association (SSMA) www.ssma.org	<ul style="list-style-type: none"> • School Science and Mathematics Journal 	October/November

<p>Society for Information Technology and Teacher Education</p> <p>http://site.aace.org</p>	<ul style="list-style-type: none"> • Journal of Technology and Teacher Education (JTATE) • Contemporary Issues in Technology and Teacher Education (CITE) 	<p>March</p>
<p>American Educational Research Association (AERA)</p> <p>www.aera.net</p>	<ul style="list-style-type: none"> • American Educational Research Journal • Educational Researcher • Review of Educational Research • Review of Research in Education 	<p>March/April</p>
<p>International Group for the Psychology of Mathematics Education (PME)</p> <p>www.igpme.org</p>	<ul style="list-style-type: none"> • Online proceedings and archived in ERIC (https://eric.ed.gov/) 	<p>July</p>
<p>Psychology of Mathematics Education-North American Chapter (PME-NA)</p> <p>www.pmena.org</p>	<ul style="list-style-type: none"> • Annual conference with Online Proceedings and archived in ERIC (https://eric.ed.gov/) 	<p>October/November</p>
<p>International Commission on Mathematical Instruction (ICMI)</p> <p>www.mathunion.org/ICMI/</p>	<ul style="list-style-type: none"> • ICMI Bulletin <ul style="list-style-type: none"> • International Congress on Mathematics Education (ICME) • ICME online proceedings • ICMI-studies online proceedings • Kluwer Volumes 	<ul style="list-style-type: none"> • ICME held every 4 years • ICMI studies held often
<p>International Society of the Learning Sciences</p> <p>https://www.isls.org/</p>	<ul style="list-style-type: none"> • Journal of the Learning Sciences • International Journal of Computer Supported Collaborative Learning 	<p>International Conference of the Learning Sciences held every 2 years</p>

<p>International Association of Statistics Education</p> <p>https://iase-web.org</p>	<ul style="list-style-type: none"> • Statistics Education Research Journal • International Conference on Teaching Statistics 	<p>ICOTS held every 4 years in July</p> <p>Satellite and Roundtable conferences held often</p>
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<p>American Statistical Association http://amstat.org</p>	<p>Section on Statistics and Data Science Education Annual Joint Statistics Meeting with online proceedings AMSTAT News American Statistician Journal of Statistics Education</p>	<p>July/August</p>
<p>Consortium for the Advancement of Undergraduate Statistics Education https://www.causeweb.org</p>	<p>E-Conference on Teaching Statistics US Conference on Teaching Statistics</p>	<p>May/June</p>
<p>National Association for Research in Science Teaching (NARST) https://narst.org/</p>	<p>Journal of Research in Science Teaching</p>	<p>March/April</p>
<p>Association for Science Teacher Education (ASTE)</p>	<p>Journal of Science Teacher Education</p>	<p>January</p>
<p>Mid-Atlantic Association for Science Teacher Education (MA-ASTE) https://ma.theaste.org/</p>	<p>MA-ASTE Facebook</p>	<p>September</p>
<p>National Science Teaching Association (NSTA) https://www.nsta.org/</p>	<p>Science & Children: Elementary School Science Scope: Middle School The Science Teacher: High School Journal of College Science Teaching: Postsecondary Connected Science Learning: Informal</p>	<p>March/April Three Area Conferences: Fall STEM Forum & Expo: July</p>
<p>North Carolina Science Teachers Association (NCSTA) https://www.ncsta.org/</p>	<p>NCSTA Blog</p>	<p>October/November</p>

<p>Association for the Advancement of Computing in Education http://aace.org</p>	<p>Many conferences and journals that publish STEM Education research. For example: Society for Technology and Teacher Education (SITE) Conference https://site.aace.org/</p>	<p>Varies</p>
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International Technology and Engineering Education Association	<ul style="list-style-type: none"> • Technology and Engineering Teacher • The Elementary STEM Journal • Journal of Technology Education https://www.iteea.org/	March
American Society of Engineering Education	<ul style="list-style-type: none"> • Journal of Engineering Education • Advances in Engineering Education https://www.asee.org/	June
Technology and Engineering Education Collegiate Association	<ul style="list-style-type: none"> • https://teecaeast.com/ 	November
Engineering Design Graphics Division	<ul style="list-style-type: none"> • Engineering Design Graphics Division Journal https://edgd.asee.org/	January

Job Search

As soon as possible, students should meet with their initial advisor to outline their professional goals, and develop and regularly update a curriculum vitae (CV). Regular meetings with the advisor will help students to develop a dossier for the job search. Although every job search will vary depending on type, it is important for students (especially those that intend to pursue a job in the academy) to attend and present at conferences, become involved in leadership activities both locally and nationally, submit papers for publication, and maintain professional contacts in the field. Job postings in STEM Education are listed on many professional organization's websites, and sent out via listservs, which you can sign up to receive. These include:

- North Carolina Department of Public Instruction
<http://www.dpi.state.nc.us/work4ncschools/>
- American Educational Research Association (<https://careers.aera.net/>)
- Association for Supervision and Curriculum Development (ASCD)
<http://www.ascd.org/Default.aspx>
- HireEd Jobs <https://www.higheredjobs.com/>
- Association of Mathematics Teacher Educators <http://amte.net/resources/joblistings>
- AERA Research in Mathematics Education SIG
- National Council of Teachers of Mathematics <https://nctm-jobs.careerwebsite.com/>
- American Chemical Society - Division of Chemical Education <http://www.divched.org>
- American Physical Society <https://www.aps.org/>

- American Society for Engineering Education <http://www.asee.org>
- Chronicle of Higher Education <https://jobs.chronicle.com/>
- International Technology and Engineering Educators Association (ITEEA) <https://www.iteea.org/>
- National Association of Biology Teachers <http://www.nabt.org>
- National Association of Research in Science Teaching (NARST) <http://www.narst.org>
- National Science Teachers Association <http://www.nsta.org>
- Royal Society of Chemistry - Education <http://www.rsc.org/Education/index.asp>

Constantly consulting with faculty and advanced graduate students is perhaps the best way to learn about professional opportunities, preparing for interviews, and presenting work to search committees. The Graduate School conducts professional development seminars, a listing of which can be found at <http://pfl.grad.ncsu.edu/>. The career center is also a good resource for exploring career possibilities, especially those outside higher education. (<https://www.ncsu.edu/students/career-services/>).

Appendix A: School-Based Practicum

Many graduate students wish to expand their experiences teaching in K-12 settings. Through enrolling in EMS 841, they can engage in a field-based practicum at the K-12 setting that is significantly different from their prior teaching experience. EMS 841 is one of the options for field experiences in the **Mathematics and Statistics Education** Concentration. This practicum is intended to allow a doctoral student to connect their understanding of learning theories to instructional practice.

Because this is a field experience, students must follow specific procedures. Students and advisors should discuss what grade level/content experience makes sense for the student to enhance their understanding/experience with K-12 classrooms. This practicum is generally 15-45 contact hours in a classroom with students, plus meetings with supervisors and preparation time needed. But the scheduling of these hours can be very flexible (e.g., an intense 2-week experience, a once-a-week experience over an entire semester). The advisor and student should discuss the explicit expectations that are needed for the student to complete. For example, how much time should be spent observing, working with small groups, co-teaching and co-planning, as well as expectations for how many lessons the student should be responsible for planning and implementing during the experience. This will vary across students to meet their needs for their professional goals.

If students have a request to be in a particular school, they can communicate that desire to Ms. Paige Goos (Field Placement and Licensure office) or their advisor. However, students are not allowed to communicate directly with schools nor to arrange their own placements.

Students must see Ms. Paige Goos (professionaled@ncsu.edu) to submit all forms and to complete a criminal background check and Health certification form (required by law in NC schools)

Once approved, the student registers for 1-3 credits of EMS 841, whichever applies. Your supervisor (often your advisor) should send a letter to the teacher explaining the expectations of the field

experience.