2014-2015
Mathematics Education
Graduate Student & Faculty Handbook

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

Poe Hall
Campus Box 7801
2310 Stinson Drive
Raleigh, North Carolina 27695-7801

http://ced.ncsu.edu/academics/departments/stem/mathematics-education

Also see the departmental Graduate Student Services website for answers and links to commonly needed information for graduate students
http://ced.ncsu.edu/stem/gradstudent-services

The Graduate Administrative Handbook contains the most up-to-date information on all Graduate School rules and regulations. All Mathematics Education Rules and Policies fall within the parameters set by the Graduate School policies as of 8/15/2014.

Please refer to the Graduate Administrative Handbook if you have questions about requirements that are university related.
http://www.ncsu.edu/grad/handbook/index.htm

General Information

Introduction

The NC State Mathematics Education graduate programs are competitive and recognized for their quality at the state and national level. In 2007, Reys, Glasgow, Teuscher, and Nevels reported that NC State's doctoral program was ranked (19th) as one of the top programs in the nation for having a "particularly strong doctoral program and one you would recommend." Reys et al. (2007) also reported that the Mathematics Education Ph.D. program at NC State is a top producer of mathematics education doctorates in the United States -- ranked 8th in production since 1990, and 4th since 2000. Also in 2007, the Chronicle of Higher Education reported NCSU's Mathematics Education faculty as ranked 5th in the nation on the Chronicle's computed Faculty Scholarly Productivity Index (http://chronicle.com/stats/productivity/page.php).

The Mathematics Education graduate programs are administered in the Department of Science, Technology, and Mathematics Education in the College of Education. A strong emphasis on pedagogical content knowledge, disciplinary content knowledge and technological innovation in improving schooling is a defining characteristic of our graduate programs. Masters students take their minor courses in the Departments of Mathematics, Statistics, Computer Science, and occasionally Operations Research. Two degrees are offered at the master's' level, a Master of Education (M.Ed.) and a Master of Science (M.S.) and one at the doctoral level, a Doctor of Philosophy (Ph.D.).*****

The mission of the various options offered in Mathematics Education at the **Master's level** is to prepare Master's Degree-seeking students for positions of instructional leadership in Mathematics Education as master teachers of mathematics in either middle grades (6-9), high school (9-12) or post-secondary institutions such as community colleges.

The **Ph.D. Degree** program in Mathematics Education 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 mathematics education,
2) preparation of K-12 mathematics teachers,
3) instruction and development issues in K-16 mathematics, and
4) leadership positions in mathematics 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 mathematics education and pursue related research.

Programs at each level build upon the preparation found in the mathematics education programs of the previous level. The **master's degree** program is built upon and assumes a strong preparation in mathematics and mathematics education at the undergraduate level. The design of the **Ph.D.** program, in turn, assumes the preparation defined in the master's degree program.

[* Note: Students enrolled in the Master of Arts (M.A.T.) program pursuing 9-12 licensure take many classes within our department; however their program is administered through the M.A.T. office. See http://ced.ncsu.edu/mat/mathematics.]

ADMISSIONS PROCEDURES

Applicants to both the Master's and Ph.D. degree programs are strongly preferred to have K-16 teaching experiences. The faculty views such experience as a strong foundation on which to build rigorous advanced degree preparation. Although the Graduate School has made rare exceptions, applicants are expected to have at least a 3.0 undergraduate GPA (out of 4.0) in mathematics education or a related program of study. GRE scores are used as a complement to undergraduate performance; verbal scores at or above the 50th percentile and quantitative scores at the 75th percentile are preferred. Verbal and Analytical Writing scores on the GRE are especially important for Ph.D. applicants as they are deemed as an initial indicator of students' writing ability. Students' writing ability and their suitability for studying mathematics education are also assessed via the writing sample (personal statement) provided by students in the application process. Faculty members discuss each candidate's application folder and vote to admit or not admit. Graduate students who are admitted to our programs typically have an undergraduate GPA above 3.30 and GRE scores above: 151 V (50th percentile), 157 Q (75th percentile), and 4.5 AW. Overall, in 2013, the students that were admitted to our graduate programs had a mean score in GRE Verbal of 152.5 (53rd percentile), and mean score in GRE Quantitative of 159.1 (82nd percentile).

Applications are reviewed twice per year, with all documents submitted for review with deadlines of October 1 and February 15. Applicant's academic record, GRE scores, recommendations, and personal statement are considered jointly in making admission decisions. *Personal statements should include information about experiences in mathematics education but should also include career goals and why the applicant feels that the NCSU graduate program is a good fit for their experiences and career path.*

As applicants to the program are reviewed, faculty considers the applicant's background and interests in relation to faculty expertise. Upon recommendation of the graduate faculty to accept an applicant into the program, a faculty member agrees to be the initial advisor/chair.

Admissions decisions and any offer of financial aid are done as two separate processes. Admission does not guarantee an offer for financial aid.

*****If a currently enrolled Master's student wishes to continue on to pursue a Ph.D., they do NOT 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 of October 1 and February 15. The statement should address why the student wishes to pursue the PhD degree and discuss their progress on their research for their masters degree. *****

IMPORTANT PLACES & PEOPLE

Department of Science, Technology, Engineering, & Mathematics Education
Poe Hall Suites 326, 502, and 510
Main Telephone: **(919)** 515-2238 **919** is area code for all campus numbers
http://ced.ncsu.edu/stem

Department Head Dr. Kathy Trundle kctrundl@ncsu.edu

Aaron Clark
Director of Graduate Programs [DGP] in department
Poe 510
Phone: 515-1771 Fax: 515-6892 Aaron_clark@ncsu.edu

The DGP is the department's liaison to the College of Education and the University Graduate School and helps coordinate flow of information among faculty, students and administration. The DGP corresponds with all potential applicants and oversees the application and admittance process. Dr. Clark has to approve and sign all official paperwork related to a student's education (e.g., Plan of Work, Request for Preliminary or Final Examination, Termination of a Students' Program).

Karen Allen Keene
Graduate Program Coordinator for Mathematics Education
Poe 502
Phone: 513-3374 Fax: 515-6892 kakeene@ncsu.edu

Dr. Keene is responsible for the organizational leadership of graduate programs in mathematics education. She works with faculty and students in mathematics education to ensure all understand the policies and program guidelines so that every student has a positive educational experience. Dr. Keene oversees the review of applications and works with the DGP and Graduate Secretary to process all applications. She is the program liaison to the College of Education (e.g. teacher education, accreditation, and licensure)

Christy Buck
Graduate Administrative Assistant
Poe 510
Phone: 515-1740 Fax: 515-6892 cjbuck@ncsu.edu

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

Tiwa Ashiru
Business Services Coordinator, Department
Poe 326
Phone: 515-6903 toashiru@ncsu.edu

Ms. Ashiru oversees the financial administration of the department. Related to graduate education, she initiates all assistantship offers from departmental funds. She also handles all other financial requests (e.g., reimbursement for travel, forms for part-time work students).

Arnita Adams
Financial and Human Resources Manager, Friday Institute for Educational Innovation
Friday Institute, Centennial Campus
Phone: 513-8537 atadams@ncsu.edu

Ms. Adams handles all financial matters for grants and projects associated with the Friday Institute. Thus, graduate students who are employed through a grant or project at the Friday Institute will see Ms. Adams for the processing of all assistantship offers and paperwork related to employment.

Tim Goodale
Program Coordinator for Mathematics Education in Masters of Arts in Teaching (MAT) program
1525 Partners II Building, Centennial Campus Box 7271
Phone: 515-1065 tagoodal@ncsu.edu
Dr. Goodale coordinates all the M.A.T. programs in the STEM Ed department. Thus, he serves as the advisor for M.A.T. students pursuing high school licensure in mathematics. If you are interested in teaching licensure, please discuss this program with Dr. Goodale.

Michael Maher
Director of Professional Education
Poe 204
Phone: 515-5524 Fax: 515-5901 Michael_maher@ncsu.edu
Dr. Maher, and his administrative assistant (Bonita Apperson bonita_apperson@ncsu.edu) can assist students and faculty in arranging school-based field experiences related to licensure and the completion of all requirements and paperwork to apply for NC licensure, including, initial, advanced, specialist, and doctoral level licenses)

Caroline Ortiz-Deaton
Manager, Student Financial Support Services for Graduate School
2310H COT
Phone: 515-4229 acortiz@ncsu.edu
Chris Buchanan administers the Graduate Student Support Plan. He can answer specific questions related to this plan. Also refer to the GSSP handbook at: http://www.ncsu.edu/grad/support-plan/docs/gssphdbk.pdf

Cashier's Office & Student Accounts: Hours 8am-5pm M-F
Student Accounts: (919) 515-2986
Fax: (919) 515-1164
http://www.fis.ncsu.edu/cashier/

D. H. Hill Library: North campus
Phone: (919) 515-3364 See http://www.lib.ncsu.edu/ for hours and services

College of Education Media and Educational Technology Resource Center: Poe 400
Phone: (919) 515-3191 See http://ced.ncsu.edu/metrc for hours and services

Office of International Services (OIS) - 320 Daniels Hall
Phone: (919) 515-2961 Fax: (919) 515-1402
http://internationalservices.ncsu.edu/
ois@ncsu.edu

MATHEMATICS EDUCATION GRADUATE FACULTY PROFILES

Jere Confrey, Ph.D. (Cornell University)
jere_confrey@ncsu.edu

Dr. Confrey is the Joseph D. Moore Distinguished University Professor. She teaches in the graduate program in mathematics education, and offers courses on learning sciences, curriculum development and evaluation, and related topics in mathematics education. Her current research interests focus on analyzing national policy, synthesizing research on rational number, designing diagnostic assessments in mathematics focused on student thinking, building innovative software linking animation and mathematics, and studying school improvement for under-served youth at the high school level in rural and urban settings. She holds multiple grants from the National Science Foundation and currently serves on the Research Council for NCTM.

Karen Hollebrands, Ph.D. (The Pennsylvania State University)
karen_hollebrands@ncsu.edu Poe 502 513-0505

Dr. Hollebrands is a Professor in Mathematics Education. Her research interests include understanding students' mathematical understandings in technological contexts, as well as preparing prospective and practicing teachers to incorporate technology into mathematics instruction.

Karen A. Keene, Ph.D. (Purdue University)
karen_keene@ncsu.edu Poe 502 513-3374

Dr. Keene is an Associate Professor in Mathematics Education. Her work is focused in two primary areas. She conducts research on the teaching and learning of differential equations at the undergraduate level. She is particularly interested in how students learn in inquiry oriented tertiary classrooms. She also is interested in high school mathematics teaching, including knowledge of mathematics needed for teaching at the high school level and developing a new fourth year high school math course based in operations research.

Hollylynne S. Lee, Ph.D. (University of Virginia)
hollylynne@ncsu.edu Poe 502 513-3544

Dr. Lee is a Professor in Mathematics Education. Her current research interests include teaching and learning of probability and statistics, especially incorporating technology use; designing technology tools that facilitate students' learning of mathematics (e.g., Probability Explorer, applets); and preparing preservice and inservice teachers to use technology in 6-12 mathematics (e.g., PTMT: Preparing to Teach Mathematics with Technology project). She also is a faculty leader on the Noyce Mathematics Education Teaching Scholars program, which prepares highly qualified secondary mathematics teachers to work in high-needs schools.

Allison McCulloch, Ph.D. (Rutgers University)
allison_mcculloch@ncsu.edu Poe 502 513-2803

Dr. McCulloch is an Associate Professor in Mathematics Education. Her current research interests include understanding the role of the affective domain with respect to teaching and learning in technological contexts; mathematical play; and preparing prospective and practicing teachers to teach in culturally diverse classrooms. Dr. McCulloch also writes curriculum and conducts research around the preparation of teachers to use technology.

Karen Norwood, Ed.D. (Temple University)
karen_norwood@ncsu.edu Poe 502 513-8051

Dr. Norwood is an Associate Professor in the mathematics education program. Her current research endeavors focus on multiple representations and their effect on students' conceptual understanding of the function concept.

Jimmy Scherrer, Ph. D. (University of Pittsburgh)

jscherr@ncsu.edu Poe 317 513-2809

Dr. Scherrer is an Assistant Professor of mathematics education in the department of Elementary Education and is a member of the graduate faculty in mathematics education. His current research focuses on individual learning and identity in the mathematics classroom, organizational learning and identity, measurement, and the role of discourse in social interactions. Recent projects include the development of a mathematics classroom discourse coding scheme, analyzing the impact of intermediary organizations in sustaining instructional innovations, and investigating the use of value-added modeling in teacher accountability systems.

Lee Stiff, Ph.D. (North Carolina State University)
lee_stiff@ncsu.edu Poe 326 515-6909

Dr. Stiff is a Professor of mathematics education and an associate member of the math department. As such, he has taught courses in mathematics and mathematics education, including uses of technology in teaching mathematics, and the mathematics education of African-American children. Dr. Stiff's research and other professional activities have focused on teaching strategies, problem solving, the mathematics education of African-American children, and uses of instructional technologies in mathematics teaching. His research methodologies include experimental design, surveys and interviews, and classroom-based investigations.

Paola Sztajn, Ph.D. (Indiana University)
paola_sztajn@ncsu.edu Poe 602 513-4631

Dr. Sztajn is a Professor of mathematics education and department head of the Department of Curriculum and Instruction and Counselor Education and member of the graduate faculty in mathematics education. Her research program focuses on practicing elementary teachers' mathematics knowledge and professional development. The overarching question that guides Dr. Sztajn's research agenda is: in which ways do practicing elementary mathematics teachers acquire and continue to develop the knowledge needed to teach all students high quality mathematics? She is interested in collaborative studies that allow multi-faceted, in-depth investigations of this complex question.

Temple Walkowiak, Ph. D. (University of Virginia)
tawalkow@ncsu.edu Poe 317 513-0918

Dr. Walkowiak is an Assistant Professor of mathematics education in the Department of Elementary Education and a member of the graduate faculty in mathematics education. Her research focuses on measuring the quality of mathematics teaching, preservice elementary teacher mathematics education and professional development for practicing elementary mathematics teachers.

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

1. Teaching and Research Assistantships

   Many assistantships (20 hrs per week) are available in Mathematics Education through a variety of venues. Some students are hired as Teaching Assistants (TAs) in the department to teach undergraduate courses such as MA 101 (Intermediate Algebra), EMS203, EMS480, EMS470, and supervise middle and high school mathematics student teachers. TAs are typically full-time Ph.D. students. Some students are also hired as Research Assistants 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 $12,000-$22,000 for 9 months. All TAs and RAs who are eligible for the Graduate Student Support Program (GSSP) will receive in-state tuition and health insurance. 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 on page.

   Interested students can complete an application for an assistantship through the Graduate Secretary. 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.*

2. Part-time Opportunities

   Work-study – Work-study jobs are available through the University for qualifying students. See the University's work-study page (http://www.fis.ncsu.edu/workstudy_jobs/workstudy.asp) for more information. The University also maintains a listing of student job opportunities that do not require work-study at http://www.fis.ncsu.edu/student_jobs/selectjobs.html.

   Hourly RA appointment – University professors may have hourly RA appointments available for short durations. These are generally sent out via email and Dr. Keene often has a list of these opportunities. 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. Scholarships available through College of Education

   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 webpage for more information http://ced.ncsu.edu/student_services/scholarship_info.php. You can also call or email questions at 515-3325 or CED_Scholarships@ncsu.edu.

4. Norman Anderson and J. Conrad Glass, Jr. Fellowship

   Provides one scholarship to a Graduate student enrolled in Adult and Higher Education and one scholarship to a Graduate student enrolled in Mathematics, Science, and Technology Education. For

more information, please contact: Margaret R. Blanchard
Email: Meg_Blanchard@ncsu.edu
Deadline: typically early March for the following year. See application at
http://ced.ncsu.edu/student_services/scholarship_info.php

5. Scholarships or Fellowships available through NC Graduate School

A number of fellowship and grant programs which 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 http://www.ncsu.edu/grad/financial-support/opportunities.html. A few of the programs that students can apply for include:

- *Diversity Enhancement Program*. Students must be fulltime 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 that a FAFSA (Free Application for Federal Student Aid) form. Stipend amounts are based on financial need up to $4000 for the academic year, with an option of $500 in additional support for study in the summer. Priority deadlines are typically in early April. See http://www.ncsu.edu/grad/diversity/grants.html.
- *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 $1000 stipend and valuable teaching experience. See http://www.ncsu.edu/grad/preparing-future-leaders/teaching-programs/ptp.
- *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 $2000. Applications typically due in late September. See http://www.ncsu.edu/grad/financial-support/wilkinson.html.

7. Agnes and Garfield Stiff Endowment for Graduate Travel

Annual proceeds from the endowment shall be used to support Doctoral or Master of Science degree students in the Department of Mathematics, Science, and Technology 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.) No award shall be given for a presentation at any meeting held in Raleigh, Durham, Chapel Hill, or otherwise “locally-held” meetings. For more information, please contact: Dr. Margaret R. Blanchard
meg_blanchard@ncsu.edu

8. UGSA Travel Grants

The University Graduate Student Association (UGSA) offers travel subsidy to fund graduate student conference travel. To find more about the grant see http://ugsa.ncsu.edu.

External

1. Scholarships for full-time teachers from
   - National Council of Teachers of Mathematics offers Mathematics Graduate Course Work Scholarships for Teachers.

     The purpose of this grant is to provide financial support for improving teachers' understanding of mathematics by completing graduate course work in mathematics. For 2012–2013, scholarships with a maximum of $2,000 each will be awarded to persons currently teaching. **Primary emphasis is placed on appropriate mathematics content courses.** Mathematics education courses may also qualify if a suitable rationale is provided by the applicant. Proposals must address the following: rationale for the coursework, anticipated instructional improvements, and expected impact on student learning outcomes. The applicant must (1) be a current Full Individual or E-Member of NCTM; (2) have taught school mathematics at least three years; and (3) intend to remain in teaching. Application due in mid November. Please see http://www.nctm.org/resources/content.aspx?id=198&LangType=1033 for details.
   - North Carolina Council of Teachers of Mathematics offers Graduate Scholarships to support practicing teachers.

     The NCCTM Trust Fund Committee semiannually accepts applications from 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 $600 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 https://secure.ncctm.org/grants_scholarships.cfm.

2. 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 $6,500 per year (master's) and $8,500 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 http://www.ncseaa.edu/HSM.htm.

3. Knowles Science Teaching Foundation

   KSTF annually funds science and mathematics Teaching Fellows. Knowles Fellows are young men and women who have received a bachelor's or advanced degree in science, engineering or mathematics and are committed to teaching high school science and/or mathematics in U.S. schools. The fellowship supports them professionally and financially for up to five years through a teacher preparation program to eligibility for tenure. Fellows who were full-time students received up to $10,000 in annual tuition assistance and a monthly stipend while they were working toward a teaching credential. Full-time teachers are eligible for small materials grants and support for a mentor-teacher relationship. All fellows receive funding for summer professional development and summer living stipends. KSTF also supports membership in a professional organization and travel to professional meetings. Application deadline is typically mid-January for awards that will begin in the summer. See website for details http://www.kstf.org/fellowships/

Support for Dissertation Research

1. State Farm Companies Foundation Doctoral Dissertation Awards

   This award is designed to stimulate research and development of new knowledge in the fields of insurance, business, and education, and to increase the number of qualified teachers of insurance, business, and education at U.S. colleges and universities. Each winner receives a $10,000 research grant. The deadline to submit an application is typically in March.
   Eligibility for Doctoral candidates:
   · Have completed a major portion of their coursework and have an approved proposal
   · Have started writing, but have not completed a dissertation
   · Are enrolled in a graduate-degree program and are a U.S. citizen
   For more information and to apply for this award, please visit
   http://www.statefarm.com/about/part_spos/grants/doctoral.asp

2. 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 http://www.naeducation.org/NAED_080200.html

3. Ford Foundation Dissertation Fellowships

   Annual awards of approximately 20-30 dissertation fellowships worth $21,000. 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 will be awarded in a national competition administered by the National Research Council (NRC) on behalf of the Ford Foundation. The awards will be made to individuals who, in the judgment of the review panels, have demonstrated superior academic achievement, are committed to a career in teaching and research at the college or university level, show promise of future achievement as scholars and teachers, and are well prepared to use diversity as a resource for enriching the education of all students. Application deadline is typically mid November. See the website for details http://sites.nationalacademies.org/PGA/FordFellowships/PGA_047959.

4. 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:
   http://www.aera.net/ProfessionalOpportunitiesFunding/FundingOpportunities/AERAMinorityFellowshipProgram.

Full-time Status

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**. Course number does not matter. Students who are registered for less than that required for full-time but are registered for at least 4.5 hours will be considered half-time.

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 $8,000 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 is at http://www.ncsu.edu/grad/support-plan/docs/pocket_chart.pdf. 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 masters 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 masters 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: http://www.ncsu.edu/grad/support-plan/docs/gssphdbk.pdf. All information about GSSP benefits, eligibility requirements, enrollment requirements and any other information can be found in this document.

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 http://www.ncsu.edu/grad/tuition-residency and all students applying for residency should thoroughly read this website. Applications are accepted for the below listed semesters or summer session beginning with the stated date:

For Spring Semester	Opens: September 14th	Closes: 10th day of class, spring semester
For First Summer Session	Opens: March 1st	Closes: 3rd day of class, summer session I
For Second Summer Session	Opens: March 1st	Closes: 3rd day of class, summer session II
For Fall Semester	Opens: March 1st	Closes: 10th day of class, fall semester

Although the last day of any semester or term that the complete residency applications will be received is the last day of exams for that semester or term, **students are encouraged to submit their application as soon as possible and before tuition bills are mailed** in case problems occur and an application is returned for further clarification and to avoid being billed for out-of-state tuition.

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 (http://www.ncsu.edu/oia/) sponsors many activities for international students. Finally, the University maintains a listing of international student programs http://internationalservices.ncsu.edu/ois-programs.

Living

Transitioning to life as a graduate student can be a difficult process. 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* that can be accessed at http://www.ncsu.edu/grad/current-students/survival-guide.html. This web page covers a range of important topics for entering graduate students including how to obtain an AllCampus 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.

There are many opportunities at NCSU to join organizations for graduate students. These can provide both academic and social experiences. The following is a link to some common centers and organizations:

Graduate Student Association
NCSU Student Organizations
NC Council of Teachers of Mathematics (NCCTM) – NCSU Kappa Student Chapter
Association for the Concerns of African American Graduate Students

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. Counseling Center

NC Council of Teachers of Mathematics—Kappa Chapter

The North Carolina Council of Teachers of Mathematics – Kappa Chapter (NCCTM) is a professional chapter of the NCCTM organization. The local organization at NCSU is open to undergraduate and graduate students in mathematics education. Students in elementary education, middle school mathematics education, high school mathematics education, and all graduate students interested in mathematics education are welcome. The group holds 4-5 meetings each semester with speakers who are active teachers, administrators, professors, graduate students and other members of the educational community. Members are involved in service projects including tutoring, STEM family nights, and other campus service activities. For more information contact Allison McCulloch at allison_mcculloch@ncsu.edu or see the club's facebook page (NCCTM-NC State).

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 http://etd.ncsu.edu.

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 http://www.ncsu.edu/grad/etd/docs/etd-guide.pdf

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: http://www.grad.ncsu.edu/reports/etd/etdwk.asp

There are helpful templates for MS Word documents or LaTeX documents for creating your thesis or dissertation in the proper format. See http://www.ncsu.edu/grad/etd/templates.html.

Every Master Thesis and 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: http://www.ncsu.edu/grad/etd/deadlines.html

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 in to the ETD editor. This form is completed on line and can only be printed at the time of completion. Doctoral students are also required to complete and submit a *Doctoral Dissertation Agreement Form (DAF).* This two-part form is available on line and also must be submitted to the ETD editor. For more information about both of these forms (including links) and other required doctoral paperwork, please visit the following link: http://www.ncsu.edu/grad/etd/doc-req-forms.html

Academic Integrity and Research Ethics

All students are expected to follow University rules and procedures in regards 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 (http://policies.ncsu.edu/policy/pol-11-35-01). 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 on 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 http://www.ncsu.edu/grad/research-ethics/index.php 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 http://www.ncsu.edu/sparcs/IRB/index.html.

If data will be collected through a local school districts (with teachers or students), then one must follow the review protocols for that school district before collecting any data. For example, see policies for Wake County at http://www.wcpss.net/evaluation-research/external_research/index.html.

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: http://www.ncsu.edu/registrar/inter-institutional/ii/index.html

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 a 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.

MATHEMATICS EDUCATION GRADUATE COURSE ROTATION SCHEDULE

Use the following rotation schedules to aid in advising and creating plans of work. This schedule was created and adopted May 8, 2013 will remain in effect until faculty or resources deem it necessary to change the schedule. Other masters level special topics (EMS 592) and PhD Special Topics (EMS 792) courses may be offered as needed. PhD level courses are indicated in bold.

Calendar Year	**Spring**	**Fall**
Even years (2014, 2016, 2018,...)	*EMS/ST 519* *EMS 581* *EMS 572/472* *EMS 570/470* **EMS 711** **EMS 712 (starting in 2016)** **EMS 802** (for experienced doc students)	*EMS 514* *EMS 512* *EMS 580/480* *EMS 572/472* *EMS 570/470* **EMS 704** **EMS 802** (for early doc students)
Odd years (2015, 2017, 2019,...)	*EMS 510* *EMS 581* *EMS 572/472* *EMS 570/470* **EMS 705** **EMS 802** (for experienced doc students)	*EMS 513* *EMS 512* *EMS 580/480* *EMS 572/472* *EMS 570/470* **EMS 770** **EMS 802** (for early doc students)

TEACHER LICENSURE

Many students pursuing graduate degrees in Mathematics Education are also interested in gaining teaching experience in K-12 settings and/or fulfilling requirements for a NC teaching license. Four levels of licenses are possible: 1) “A” initial license for those becoming initially certified to teach mathematics, 2) “M” advanced licensure for those fulfilling master’s level advanced competencies, 3) “S” specialist licensure for those with coursework beyond the M license, and 4) a “D’ doctoral level licensure for those with doctoral degrees. Only students holding a previous level of license are eligible for the next higher level. Students are not required to pursue licensure as part of their graduate program, it is a personal choice, but one that may have financial benefits if one chooses to teach in NC public schools. In addition, many universities desire to hire mathematics education faculty that are fully licensed and have teaching experience in K-12 settings.

A student should indicate to their advisor within 9 hrs of taking coursework if they intend to pursue a license at any of the four levels. At the end of the program and once all evidences are complete (for A and M), the student should submit a licensure application and graduate transcripts to the office of teacher licensure.

- For an A level license, a student must meet all requirements and submit evidences that are also required by undergraduate initial licensure candidates.
- For an M level license, a student must already hold an A level license in either 6-9 or 9-12 mathematics and must meet all degree requirements in a masters program in mathematics education and submit the two evidences required for an M license.
- For an S level license, **a student must have a** minimum of 60 semester hours of coursework beyond the Bachelor's Degree, with **at least 24 semester hours** beyond the Master's Degree. At least 9 of the hours must be in mathematics or mathematics education. Must already hold an "M" license in either 6-9 or 9-12 Mathematics.
- For a D level license, a student must complete a doctoral degree program. Upon graduation, submit a licensure application and transcript to the office of teacher licensure.

FORMS

A link to all Graduate School forms can be found at http://www.ncsu.edu/grad/faculty-and-staff/forms-list.html. A comprehensive timeline for forms can be seen at the Graduate School at http://www.ncsu.edu/grad/handbook/section3_24.php. Note that forms should be turned into Graduate Student 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.

1. Request to Schedule Oral Examination-*filed by M.S. and Ph.D. student at least 12 working days before exam date.*
   Master's Students:
   http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/sched-mas-oral.pdf
   Doctoral Students:
   Preliminary Request Form
   http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/doc-or-exam.pdf
   Final Request Form
   http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/doc-final-report.pdf

2. Oral Exam Reports-completed by *M.S. and Ph.D.* committee members at oral exam.
   Master's Students:
   http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/mas-oral-report.pdf
   Doctoral Students:
   http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/doc-prelim-report.pdf

Optional Forms

1. Leave of Absence Request Form-*MUST BE SUBMITTED 1 month before semester of leave*.
   http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/leave.pdf

2. Request to Transfer Credit from Another Institution-
   http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/transf-credit.pdf

3. Change of Degree Status or Curriculum-
   https://www3.acs.ncsu.edu/gsoars/chng-deg-curr_files/cc_admin.php

Master's Degree Program in Mathematics Education

INTRODUCTION

The Master's program offers two degrees, a Masters of Education (M.Ed.) and Masters of Science (M.S.).* Through the master's program, students will further develop their instructional expertise, extend their knowledge of learners, deepen their subject matter knowledge, use educational research methods and engage in professional leadership activities. In particular, they will develop:

1. A greater understanding of K-12 school mathematics and how to teach it;
2. A foundation in the teaching and learning of mathematics to a range of age groups with diverse populations;
3. A broader foundation in advanced mathematical sciences;
4. An ability to interpret and critique research related to the teaching and learning of mathematics; and
5. An ability to apply theoretical knowledge and research results in practical settings such as: mathematics instruction, mathematics teacher professional development, evaluation and assessment, supervision of teachers, curricula development and technology development.

EXPECTATIONS

Upon acceptance into the program, the master's student must:

- Maintain continuous enrollment (at least 3 credits) every Fall and Spring until graduation. Failure to do so will result in termination of one's program. 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.
- Become 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 APA writing style for professional articles
    - Delivering clear, concise oral and written presentations of reviews and research
- Complete all degree requirements within 6 years. The student's degree clock for time to completion starts with the first course approved for inclusion in the plan of work, including courses taken as a PBS student before being formally admitted.
- A Master of Science Degree requires a thesis (at least 3 hrs of EMS 695). A Master of Education Degree (Option B) does not have a thesis requirement and can be earned by taking course work and completing a masters-level evidence, only if needed for licensure.
- All students fulfill the requirements for a common core of coursework. Then each of the four options (9-12, 6-9, post-secondary, 9-12 A+M) have additional specific requirements. See curriculum display.

TIMELINE

The following timetable outlines the different aspects of the master's degree program. Each aspect is explained in more detail after the timeline.

[* Note: Students enrolled in the Master of Arts (M.A.T.) program pursuing 9-12 licensure take many classes within our department; however their program is administered through the M.A.T. office. See http://ced.ncsu.edu/mat/mathematics]

Timeline for Master's Studies				
Phase	Coursework and Culminating Product			
Program Requirements	Complete all required coursework M.Ed. students should complete work for Evidences required for Advanced licensure (if desired)* M.S. students should complete their thesis Present Scholarly Inquiry evidence or Thesis at research symposium in final semester			
Advising/ Mentoring	Meet with advisor and create initial POW	Select committee chair (everyone) and committee members (thesis only) Finalize Plan of Work	Discuss topics of interest with advisor and select a topic for thesis	Meet and consult with committee chair and committee throughout the thesis or Scholarly Inquiry project
Professional Development	Attend conferences Engage in Scholarly Outreach Conduct professional development for colleagues Become active in state and national organizations			
Planning for the Future	Develop CV and update regularly Identify professional goals and discuss with advisor/mentor			
Administrative	Sign Patent Agreement File Plan of Work in MyPack Portal	M.S. students should attend Electronic Thesis and Dissertation (ETD) Workshop	M.S. students request Permit to Schedule Master's Oral Examination Submit Scholarly Inquiry evidence to committee chair	Apply for Graduation in MyPack Apply for licensure (if desired) Submit thesis to graduate school Diploma Order Request Card

MASTERS PROGRAM REQUIREMENTS

Coursework

A Master's Degree in Mathematics Education requires that a student meet the course expectations as outlined below. The Graduate School requires every student to have a minimum of 30 semester hours of coursework in their Plan of Work. At least 20 semester hours must be at or above the 500-level. A Master of Science Degree requires a thesis (at least 3 hrs of EMS 695). A Master of Education Degree (Option B) does not have a thesis requirement and can be earned by taking course work and completing a masters-level evidence, only if needed for licensure. All students fulfill the requirements for a common core of coursework. Then each of the four options (9-12, 6-9, post-secondary, 9-12 A+M) have additional specific requirements.

Core Courses (12 Hours)

All students must take one of the following technology courses:

EMS 480/580 Teaching Mathematics with Technology
This course prepares prospective mathematics teachers to use technology in their classrooms to assist students in formulating and solving math problems in the middle and high school mathematics curricula.

EMS 581 Advanced Application of Technology in Math Education (EMS480/580 or equivalent prerequisite)
This is a research-based course on applications of technology tools in secondary and middle school mathematics. Students are introduced to use of various technology tools for learning and teaching mathematics, including design of technology environments, appropriate investigation tasks, and professional development.

Students then choose 3 courses from the following list:

EMS 512 Teaching Mathematics in Elementary and Middle School: Bridging Theories and Practice
This course focuses on the theory, research, and methodology of teaching and learning mathematics in elementary and middle grades with an emphasis on the development of a foundation for understanding and assessing mathematical growth and learning through historical and psychological sources, research, and reflective practice. Students will also develop an understanding of how children come to learn elementary mathematics meaningfully and what this necessarily implies about the way mathematics is taught and how elementary and middle grades education can be improved.

EMS 513 Teaching and Learning Algebra
This course covers how students develop algebraic ideas from upper elementary grades through Algebra I from a developmental perspective. Students will learn research-based methods for developing algebraic thinking, structure and processes used in algebra.

EMS 514 Teaching and Learning Geometry
This course focuses on the development of geometric thinking in grades K-12 using multiple instructional approaches, including technology, and considered using different theories of learning and frameworks (e.g., Van Hiele, SOLO taxonomy). Topics may include: measurement, similarity, congruence, properties of 2 and 3 dimensional figures, circles, non-Euclidean geometries. Synthetic, analytic and transformational, formal and informal approaches will be highlighted.

EMS 519 Teaching and Learning Statistical Thinking
This course focuses on how students develop statistical ideas from upper elementary grades through AP Statistics. Students will discuss the differences between mathematical and statistical thinking and learn research-based methods for developing statistical thinking.

EMS 510 Interactions in Mathematics Classrooms
This course focuses on successful instruction depends on the quality of the interactions among students and teacher engaged in meaningful mathematical problems. Forms of interactions will include whole class instruction, small group activity, and facilitating classroom discussion.

EMS 592 Special Topics
These courses are occasionally offered by faculty on various topics and can be used as an elective or as a substitution for other core courses upon approval by the committee.

Note: EMS 581 can be taken as an option in the choice of 3, if EMS 580 was used for the technology category.

Research Courses (3 Hours)
Students choose between ST 507, ST 511. Other courses could be substituted here if approved by the committee. (e.g., ST 513, ST 515)
Depending on a student's prior research background, it may be possible to count EMS 695 (thesis hrs) as a research course.

Elective (3 Hours)
Master's students may choose to take any 400-level or above course in education, psychology, or the mathematical sciences (e.g. MATH, STAT, CSC) for their elective.

Those pursuing an M.S. degree must enroll for at least 3 hrs of EMS 695. These 3hrs could serve as their elective.

Additional Requirements for Each Emphasis Option

Middle School Emphasis
Students concentrating in middle school choose to take either ECI 550 or 551. These courses prepare students for thinking about advanced instructional theories in middle school. Students take 15 semester hours of mathematical science courses beyond the requirements for admission (at least 18hrs of undergraduate math is required for admission). Only 6 of these hours may be 400-level classes. They also complete a masters level evidence if they intend to apply for an M license.

High School Emphasis
Students concentrating in high school take 18 semester hours of mathematical science courses beyond the undergraduate requirements (only 6 of these hours may be 400-level classes). They also complete a masters level evidence if they intend to apply for an M license.

Post-Secondary Emphasis
Students concentrating in post-secondary take 18-24 semester hours of mathematical science courses beyond the undergraduate requirements (only 6 of these hours may be 400-level classes). While only 18 hours are required, we encourage students to take up to 24 hours in mathematical sciences to better prepare them for collegiate level teaching. (these extra 6 hrs could be fulfilled by choosing a mathematics course as your elective and using a ST course for the research hrs.

"A+M" Licensure Emphasis

The fourth option in the Master's program is an extended program (typically about 42-48 credit hours) in which students with a **degree in a mathematical science** can earn an M.Ed or M.S. degree and meet state requirements for both initial "A" and "M" advanced license. These students take the 18 hrs of Core Courses in the Master's program, 12 credit hours in mathematics or statistics (only 3 hrs can be at 400-level). The mathematics or statistics courses chosen should ensure that the student has meet the disiplinary content requirements for licensure (see below) and 18 hours of professional education courses to fulfill licensure requirements. The exact courses needed may vary per student depending on courses taken in their undergraduate degree or as a post-baccalaureate student.

Professional Education Courses for A Licensure (18 hrs)

ECI 416	Teaching Exceptional Children in Mainstreamed Classrooms	
Or		3 hr
ECI 579	Organizational and Behavioral Management of Diverse Classrooms	
ED 508	Exploring Diversity in Classroom and Community	
Or		3 hr
ELP 515	Education and Social Diversity	
ED 507	Principles of Developing and Interpreting Assessments	2 hr
EMS 572	Teaching Mathematics Topics in Senior High School (with field placement)	3 hr
EMS 570	Methods and Materials for Teaching Math	3 hr
ED 569	Teaching Internship MAT	4 hr

Note: Students completing the A+M option program must submit all "evidences" that meet the guidelines for the M License as well as any guidelines required by the undergraduate "A" licensure program. See your advisor and university supervisor for details and questions.

COURSE REQUIREMENTS APPROVED MAY 2013
MATHEMATICS EDUCATION – MASTER'S

Core Courses (12 Hours)

_____ EMS 580 Teaching Mathematics with Technology
OR EMS 581 Advanced Application of Technology in Math Ed

Then choose 3 of the following courses:

_____ EMS 512 Teaching Mathematics in Elementary and Middle School: Bridging Theories and Practice
_____ EMS 513 Teaching and Learning Algebra
_____ EMS 514 Teaching and Learning Geometry
_____ EMS 519 Teaching and Learning Statistics
_____ EMS 510 Interactions in Mathematics Classrooms *****
_____ EMS 592 Special Topics in Mathematics Education (offerings vary)
_____EMS 581 Advanced Application of Technology in Math Ed (if EMS 580 was taken above)

* For those pursuing the A+M licensure option, EMS510 should be used as a Core Course if possible

Research Course (3 Hours)

_____ ST 507 OR ST 511 OR ST513 or other course approved by committee

Elective (3 Hours)

_____ Course 400-level or above in EMS, education, psychology, sociology, or mathematical sciences

Middle School Focus
Choose one:
ECI 550 Foundations of Middle Years Education
ECI 551 (550 is prereq) Teaching/Learning Approaches for Emerging Adolescents

Mathematics: Minimum of 15 semester hours beyond undergraduate requirements in mathematical sciences (MA, STAT, CSC). Only six hours may be at 400-level

_____1:_____
_____2:_____
_____3:_____
_____4:_____
_____5:_____

OPTIONAL
Evidence for Licensure
Evidence required for an "M" license. See page 51

High School Focus
Mathematics: 18 semester hours beyond undergraduate requirements in mathematical sciences (MA, STAT, CSC) at the 400 level or above. Only six hours may be at 400-level

_____1:_____
_____2:_____
_____3:_____
_____4:_____
_____5:_____
_____6:_____

OPTIONAL
Evidence for Licensure
Evidence required for an "M" license. See page 51

Post-Secondary Focus
Mathematics: 18 semester hours beyond undergraduate requirements in mathematical sciences (MA, STAT, CSC) requirements. Only six hours may be at 400-level

_____1:_____
_____2:_____
_____3:_____
_____4:_____
_____5:_____
_____6:_____

STRONGLY suggest student take an additional 6 hrs of a mathematics sequence at the 500-level or above if they desire to teach at a community college or small liberal arts college.

No Evidence for Licensure required for those completing a Post-Secondary Emphasis Master's Degree.

"A + M" Licensure
Professional Education: *(some may have been fulfilled in B.S. degree)* 18 hours (9 of which must be at 500 level) see specific requirements on previous page*. *One course can be used as the Elective above.*

_____1:ECI 416 or ECI 579
_____2: ED 508 or ELP 515
_____3: ED 507 (2 hrs)
_____4:EMS 572 (with field pl.)
_____5: EMS 570
_____6: ED 569 (4 hrs)

Mathematics: 12 hours beyond undergraduate requirements in mathematical sciences (MA, STAT, CSC) at 400 level or above, 9 hours of which MUST be in mathematics. Only 3 hours may be at 400-level

_____1:_____
_____2:_____
_____3:_____
_____4:_____

Evidence for Licensure
Evidences required for an "M" license as well as all needed for "A". See page 51

Advising/Mentoring

Each student will initially be assigned a faculty member in Mathematics Education to help him or her develop a preliminary plan of course work and to organize a graduate advisory committee (if M.S.). The initial advisor helps the student develop a plan of graduate study that meets the requirements of the graduate program and ensures that no student is left without a faculty member to chair his or her thesis (M.S.). However, as students progress through the program and their research interests become more refined and focused, they are welcome to switch advisors/chairs and build a committee appropriate to their research interests. At times, students switch advisors/chairs because of their TA or RA positions and the opportunity to complete a thesis/dissertation focused around their assistantship work.

Students should meet with their advisor/chair *at least* once a semester. *Initiating these meetings and conversations is the responsibility of the graduate student.* In these meetings you should:

- discuss plans for courses, (see Rotation Schedule, p.18)
- help with the Student Information System for registration,
- develop/revise a plan of work in SIS and timeline for completion of the degree,
- discuss funding opportunities,
- discuss progress towards the degree
- discuss professional goals and opportunities for gaining experiences to be competitive for the job market.
- discuss licensure options for public school teaching

Minor

All M.S. students must have a minor in their program. *M.Ed. students are not required to declare a minor.* There are 3 options for minors in the Master's program: 1) Mathematics, 2) Statistics, and 3) Interdisciplinary.

- A **Mathematics** minor requires at least 9 hrs of 500-level or above courses to be taken at NCSU and one faculty member in the Mathematics department to serve as the Minor Representative on a students' Graduate Advisory Committee.
- A **Statistics** minor requires 9 hrs in a specific set of courses in Statistics and one faculty member in the Statistics department to serve as the Minor Representative on a students' Graduate Advisory Committee. Please see http://www.stat.ncsu.edu/programs/grad/grad_minors.php
- An **Interdisciplinary** minor (9 hrs) can be a mixture of 500-level and above courses from Mathematics and Statistics or other Mathematical Sciences (e.g., Computer Science, Operations Research). The student can choose an appropriate faculty member from one of the Mathematical Sciences to serve as the Minor Representative on a students' Graduate Advisory Committee.

Plan of Work and Graduate Advisory Committee

The initial advisor should help the student develop an initial Plan of Work based on program requirements and considering the student's individual background from their B.S. degree or prior post-baccalaureate coursework. The initial advisor does not necessarily need to become a student's Chair of their Graduate Advisory Committee. If the student is pursuing an M.S., the student should identify candidates **for a Graduate Advisory Committee** as soon as possible after one begins taking course work and *before completing 18 hours of graduate work* toward the Master's. Failure to do so may result in work previously taken not counting toward the degree. The Graduate Advisory Committee and the student meet formally to develop and agree upon the final Plan of Work for Graduate Study.

Students pursuing an M.Ed. without a minor only need a single faculty member in Mathematics Education to serve as the chair of the Graduate Advisory Committee. Students pursuing an M.Ed. with a

minor or an M.S. degree must have 3 members on their Graduate Advisory Committee. Two of these members must be Mathematics Education graduate faculty and the third should represent their Minor area. When designating a committee and chairperson, the student should consider the nature of the student's proposed research and the number of committees already being chaired by various departmental faculty members.

- The worksheet on page 26 should be used to make sure all requirements in the program are fulfilled, either from courses taken at NCSU, during a different master's degree at NCSU or another institution, or as a PBS student.
- Master's students may only transfer in 12 credits of courses towards fulfilling program requirements and meeting the degree requirements in the Master's degree program. These 12 hours can be a combination of courses taken at a different institution and those taken as a Post Baccalaureate Student (PBS). Additional info can be found here: http://www.ncsu.edu/grad/handbook/sections/3.1-minimum-degree-requirements.html#transferother
- All master's students must take a minimum of 24 hours at NCSU.
- M.S. students must have at least 3 hrs of EMS 695 in their Plan of Work
- Some courses taken at NCSU may fulfill two requirements. For example, ST 511 can fulfill a Research course requirement and a Mathematical Science requirement; however, the ST 511 course only contributes 3 hrs to the minimum required (36 hrs) in the Plan of Work.

See Graduate Handbook policies at http://www.ncsu.edu/grad/handbook/sections/3.1-minimum-degree-requirements.html

Students must maintain above a 3.0 GPA throughout their program, or face probation, suspension, or termination. **In addition, only courses in which a student earns a C- or better may count towards graduate credit in the Plan of Work.** Please see http://www.ncsu.edu/grad/handbook/section3_18.php and http://www.ncsu.edu/grad/handbook/section3_19.php in the Graduate Administrative Handbook.

The Plan of Work form should be filed online through MyPack Portal (using the Student Information System) before completing 18 hrs towards the degree. The form includes a place to record the courses, semesters planned to take, and grades for all courses in a student's plan. See http://www.ncsu.edu/grad/faculty-and-staff/docs/GRAD-SIS-training-manual-students.pdf for help in using the system.
SIS Plan of Work (POW) questions should be sent to Christy_buck@ncsu.edu.

Major courses consist of courses taken at NCSU to meet requirements in Mathematics Education, Research, and an Elective on the Master's Program worksheet. **Minor** Courses consist of all courses counting towards a student's minor in a mathematical science. Thus, courses that are being counted as Mathematical Sciences should be listed as a minor course only if the student is declaring a minor (M.S. students must do this, most M.Ed. students do not declare a minor).

A student should meet with the Graduate Advisory Committee to discuss the Plan of Work and have them sign on their agreement with the plan, using the Master's Program Worksheet should as a guide. This will facilitate discussions on how the student is meeting all requirements in the program.

PROFESSIONAL DEVELOPMENT

Students enrolled in the Master's program are encouraged to gain professional development experiences outside of typical coursework at the university. Early in the master's program, students are encouraged to attend local and national conferences, if possible. It is also recommended that students become active members of local or national organizations that are of interest to you. Not only will membership in these

organizations give you access to their journals and current research in the field, it also provides a venue for professional networking.

Students should seek opportunities to attend a variety of professional development outside of school and to also conduct professional development workshops for their colleagues.

Planning for the Future

As soon as possible, students should meet with their initial advisor to outline their professional goals, and develop and regularly update a resume or 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, it is important for master's students to attend conferences, become involved in leadership activities both locally and nationally, and maintain professional contacts in the field. Master's students planning to enter doctoral study should also consider joining a research project as a research assistant (RA), presenting at conferences, and publishing papers with faculty members or other graduate students.

The career center is also a good resource for exploring career possibilities (http://www.ncsu.edu/career/). Math education job postings are listed on many professional organization's web pages including:

- The Chronicle of Higher Education (http://chronicle.com/),
- National Council of Teachers of Mathematics (http://www.nctm.org/jobs.aspx), and
- North Carolina Department of Public Instruction (http://www.dpi.state.nc.us/work4ncschools/).

Students seeking a teaching position in NC should explore specific county web pages.

Administrative—Schedule of Required Documents

Please see the Graduate School page that describes when required documents should be completed http://www.ncsu.edu/grad/handbook/sections/3.25-required-documents.html.
Please remember that submitting a required form to the Graduate Administrative Assistant in our department should be done 5 working days BEFORE the document is required to be received by the Graduate School.

Doctoral Degree Program in Mathematics Education

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 mathematical sciences, 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 mathematical sciences.
2. A profound understanding of K-12 school mathematics.
3. A theoretical foundation in the learning of mathematics for a broad range of age groups and diverse populations.
4. An applied foundation in the teaching of mathematics 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 mathematics education.
6. An ability to analyze, critique and conduct research related to the teaching and learning of mathematics.
7. An ability to apply theoretical knowledge and research results in settings such as: mathematics instruction, mathematics teacher education, evaluation, supervision, curricula development, technology development and policy-making.

EXPECTATIONS & RESIDENCY

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 effected 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 APA writing style for professional articles
    - Delivering clear, concise oral and written presentations of reviews and research
- complete a residency requirement consisting of 2 consecutive semesters (either Spring and Fall or Fall and Spring, with Summer excluded) **during which one carries a minimum of 6 semester hours each semester (our rules are more restrictive than those stated in the graduate school handbook). During each of these two semesters, the student must be enrolled in at least one course and at least one experience (EMS893, EMS851, EMS841-see page 35**). In addition to courses taken, expected activities during residency are as follows:
    - Attend state, regional, and national professional meetings.
    - Present a paper (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.
- Must 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.
http://www.ncsu.edu/grad/handbook/sections/3.1-minimum-degree-requirements.html#E

TIMELINE

Doctoral students at North Carolina State University take courses for *at least* two full time years (depending on the level of previous preparation) and then prepare for the preliminary examination, which is offered near the completion of coursework. Following successful completion of the examination, the student moves onto the dissertation phase, which includes submission of a proposal, a proposal defense, independent research and writing, and submission and final oral defense of the dissertation.

The following timetable outlines the different phases of the doctoral degree program. Each phase is explained in more detail in sections after the timeline.

Timeline for Doctoral Studies

Note: This timeline is provided only as an example. Each student's timeline will differ.

Graduate School Timeline: http://www.ncsu.edu/grad/dss/index.php

<table>
<tr><th></th><th>Coursework</th><th>Preliminary Exams</th><th colspan="4">Dissertation</th></tr>
<tr><th></th><th></th><th></th><th>Proposal</th><th>Research</th><th>Writing</th><th>Defense</th></tr>
<tr><td>Program Requirements</td><td>Complete required coursework & internships
Present at Math Ed Research Symposium
Annually submit Progress Towards Degree information
Participate in EMS seminars</td><td>Prepare responses to written exams in 3-6 weeks.</td><td colspan="4">Register for at least 12 hours of EMS 895</td></tr>
<tr><td>Advising/ Mentoring</td><td>Meet with initial advisor and create initial POW
Select committee chair and committee members
Finalize and Submit Plan of Work (POW)
Meet with committee to schedule written and oral preliminary exams</td><td></td><td colspan="4">Meet and consult with committee chair and committee throughout the dissertation process</td></tr>
<tr><td>Scholarship</td><td colspan="2">Explore topics of interest
Engage in scholarly reading outside of coursework
Attend Seminars
Attend Proposal and Final Exams of other graduate students
Select dissertation topic</td><td colspan="4">Engage in dissertation scholarship</td></tr>
<tr><td>Research Experience</td><td colspan="3">Find out about current research in department
Apply/volunteer to be a research assistant (RA) on a project
Seek opportunities to publish with faculty and other graduate students</td><td colspan="3">Focus on dissertation proposal and research</td></tr>
<tr><td>Teaching</td><td colspan="2">Serve as a Teaching Assistant (TA)
Volunteer to serve as a guest instructor for a course or teach a class/ professional development workshop on your own
Seek opportunities to supervise student teachers</td><td></td><td></td><td></td><td></td></tr>
</table>

Professional Development	Attend conferences Present at conferences Submit papers for publication Become active in state and national organizations Conduct professional development for teachers					
Job Search	Develop CV and update regularly Identify professional goals and discuss with advisor/mentor	Begin to develop dossier for job search		Conduct job search		
Administrative	Sign Patent Agreement File Plan of Work (POW)	Attend Electronic Thesis and Dissertation (ETD) Workshop				Submit dissertation to graduate school File Intent to Graduate

PH.D. 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, including courses taken as a PBS student or towards a different PhD degree before being formally admitted to Mathematics Education. Graduate Students and Advisors should check the official summary in the Graduate School Administrative Handbook for complete and up-to-date requirements. http://www.ncsu.edu/grad/handbook/sections/3.1-minimum-degree-requirements.html#E

There are three phases to a doctoral program: Coursework (which includes choosing a Committee and preparing a Plan of Work), Preliminary Exams, and Dissertation. Students must progress through the Coursework and successful completion of Preliminary Exams in a maximum of 6 years.

Coursework

The coursework phase introduces the student, both broadly and deeply, to significant concepts and methods in mathematics education research. Students are strongly urged to pursue and research topics of interest to them within or outside of their coursework requirements. As students approach the end of the coursework phase, they should focus work on areas of concentration leading to the preliminary examination. 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 fulltime study depending on previous coursework experience at the master's level. Requirements for each phase are below. Specific coursework requirements may change based on decisions by the graduate faculty with specified dates of applicability. All students must demonstrate at least 72 hrs of coursework taken beyond the bachelor's degree and no student will be awarded a Ph.D. in Mathematics Education with fewer than **54 semester hours of course work** taken at NCSU in the Ph.D. Plan of Work. These are NCSU Graduate program policies.

Master's Degree

Students may enter with a master's degree in a variety of fields, such as: Mathematics, Applied Mathematics, Statistics, Mathematics Education, Instructional Technology, Educational Psychology, Elementary Education, or Curriculum and Instruction. Each of these degree programs gives students different strengths and knowledge in mathematics, mathematics education, and teaching and learning issues.

Students will have completed a master's thesis, or its equivalent, or will complete the equivalent early in PhD program using the research course EMS 893.

Mathematics Education Courses (18 Hours)

Take the following course (3 hrs)

EMS 770 Foundations of Mathematics Education
This course provides students with a foundation in historical and current perspectives and practices in mathematics education, including issues related to policy, curricula, instruction, and teacher education. The course emphasizes how to interpret and synthesize literature in the field through understanding foundational influences and multi-disciplinary perspectives.

Choose one of the following courses (3 hrs)

EMS 711 Research on the Teaching and Learning of Mathematics at the Secondary and Early College Levels

This course familiarizes students with theories and research related to mathematical thinking, learning and teaching at the secondary and early college levels with a focus on the following topics: function, expressions and equations, geometry, proof, limit, calculus, differential equations, and linear algebra. Students will apply theories to analyze secondary and early college students' mathematical thinking, synthesize research findings, explain difficulties students experience, and design and conduct research. Restriction: At least 18 hrs of 400-500 level mathematics and a PhD student in Mathematics Education.

EMS 712 Teaching Mathematics In Elementary and Junior High School

Comprehensive study of teaching mathematics in elementary and junior high schools. Major emphasis on building skills in teaching arithmetic, elementary algebra and intuitive geometry. Thorough search of literature relative to mathematics curricula conducted, designing and sequencing of learning activities, teaching mathematical concepts and relationships, building skill in computation, reading mathematics, problem solving and measurement.

Choose two of the following courses (6 hrs) or you may take EMS711 or 712 (whichever was not used above)

EMS 704 Curriculum Development and Evaluation In Science and Mathematics

Critical study of elements of curriculum design and theory in mathematics education and science education and examination of evaluation procedures for assessing educational innovations.

EMS 705 Education and Supervision Of Teachers Of Mathematics and Science

Critical analysis of theories, programs and techniques designed to promote interpersonal interactions leading to more effective teaching of science and mathematics.

EMS 792 Special Topics

These courses are occasionally offered by faculty on various topics in Mathematics Education (e.g. Teaching and Learning of Statistics) and can be used as an elective or as a substitution for other EMS courses *upon approval by the committee*. Course must be focused on Mathematics Education issues to count as a core Math Education course. For example, some recent offerings of EMS 792 have included:

Choose 2 courses that fulfill the following (6 hours)

E A learning theories or learning sciences course**

(must have at least one psychology course in childhood and/or adolescent development as a prerequisite)

E A course focused on technology use in a STEM field (above EMS580)**

(highly suggest EMS 580 or equivalent as a prerequisite) EMS 581 is most likely choice.

Experiences in Mathematics Education (6 hrs)

Each doctoral student comes to the program with varying experiences in the field of mathematics education and also vary in their career trajectories. The intent of these 6 hours is to enrich and expand the doctoral student's practical knowledge base in three types of activities in which mathematics educators engage (K-12 teaching, teacher education, research). Students may choose

two of the three choices below for 3 hours each, or they may engage in all three experiences for 2 hours each to comprise the 6 hours of experiences. The exact choices will vary by student and should be approved by the advisor and Graduate 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. The purpose is to provide additional experiences that strengthen a doctoral student's knowledge base and range of experiences*

EMS 841 School Based Practicum 2-3 hr
Student engages in a field-based practicum at the K-12 setting that is significantly different from their prior teaching experience. This practicum (generally 45 contact hours in a classroom with students, plus meetings with supervisors and preparation time needed) is intended to allow the doctoral student to connect their understanding of learning theories to instructional practice. ***See sample letter to teacher and administrators in Appendix section.*** Please follow the procedures.

1. Students and advisors should discuss what grade level/content experience makes sense for the student to enhance their understanding/experience with K-12 classrooms. Recall that an EMS841 experience should include about 45 hrs for 3 cr. and 30 hrs for 2 cr of classroom contact time with students. But the scheduling of these hrs 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.

2. Perhaps INFORMALLY contact classroom teachers you know who could provide such an experience (not necessary but highly suggested to take advantage of teachers known to faculty and students). Have teachers discuss this possible opportunity with their administration.

3. Complete the Graduate Professional Internship Request for Math Education form (See Appendix. add as much info as possible, including approximate begin and end dates, info for requested district, school and teacher, and a brief description of the frequency of visits or class periods and expectations). BOTH STUDENT AND ADVISOR MUST SIGN THIS FORM.

4. Student must see Ms. Bonita Apperson to submit the SIGNED Graduate professional Internship Request Math Education form and to complete a criminal background check.

5. Complete the following paperwork to submit to Ms. Apperson, IF NEEDED (this will be determined based on placement details)
   a. Triangle Alliance Form
   b. Health certification form (required by law in NC schools)

6. Register for 2-3 credits of EMS 841, whichever applies.

EMS 851 Teacher Education Internship 2-3 hrs
Student engages in a teacher education internship supervised by a faculty member. This typically involves co-teaching an undergraduate methods course and/or supervising student teachers in mathematics. This internship (generally 45 contact hours with students, plus meetings with faculty and preparation time needed) is intended to allow the doctoral student to develop an understanding of issues related to the preparation of mathematics teachers and to gain valuable teaching experience.

EMS 893 Doctoral Supervised Research 2-3 hrs.
Student engages in a supervised research experience 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. The intent of this experience is to allow doctoral students to expand their understanding of applying research methods and analysis techniques to problems in mathematics education that will support their further development as a researcher.

Graduate 1 hour seminars

EMS 802 Seminar in Mathematics Education 2 hrs.
Student takes this course their first fall semester as an introductory seminar to the PhD Mathematics Education program at NC State and then again in the spring semester of their second year in preparation for their dissertation and preliminary exams.

Research Methods (12 Hours)

Two quantitative methods courses (beyond ST 507 or 511). If student has not taken ST507 or 511, it can be taken as part of the mathematical sciences requirement. Consider courses such as:

ST 508 Statistics for the Behavioral Sciences II, or ST 512 Experimental Statistics For Biological Sciences II (ST 511 prereq) or ST 514 Statistics For Management and Social Sciences II (ST 513 prereq)
ST 432 Introduction to Survey Sampling
ST 505 Applied Nonparametric Statistics (ST 511 prereq)
ST 708 Applied Least Squares (ST 512 prereq)
ST 731 Applied Multivariate Statistical Analysis (ST 512 prereq)
ST 732 Applied Longitudinal Data Analysis (ST 512 prereq)
ED 710 Applied Quantitative Methods in Education I (ST 507/511 or ED 700 prereq)
ED 711 Applied Quantitative Methods in Education II (ED 710 prereq)
PSY 880 seminar courses offered through psychology:
Quantitative Methods in Psychology, (*cannot get credit for this and ST 507/ST511*)
Applied Multiple Regression in Psychology (*cannot get credit for this and ST508/512/514*)
Applied Multivariate Statistics in Psychology
Multilevel Modeling in Psychology.

Qualitative methods courses (One required):

Intro Level courses **(can not take more than one as these have overlapping content)**
ED 730 Introduction to Qualitative Research in Education
SOC 715 Qualitative Sociological Methods and Analysis
Second courses **(can not take more than one as these have overlapping content)**
ED 731 Advanced Qualitative Research and Data Analysis in Education
ELP 737 Advanced Qualitative Applications in School Administration and Policy
EAC 788 Applied Qualitative Data Analysis or
EAC 790 Advanced Qualitative Research Methods

The fourth research methods course may be an additional advanced level quantitative or qualitative course *from the lists above or other courses such as:*

ED/EDP 700 Mixed Methods Research in Education
ELP 754 Qualitative Education Research Data Analysis Using Personal Computers,
ED 795 Special Topics in Education research
SOC 712 Advanced Survey Research Methods

Specialty Professional Courses (6-12 Hours)

The two general professional elective courses can be chosen from any 500-level course or above of interest to the student and approved by the doctoral committee. Students should choose courses that support their career goals and research interests. For example, many may choose ECI 705 Instructional Supervision of Teachers if they intend to work in teacher education or be in a supervisory role in a district. Some may take additional EMS courses in mathematics or science education that are of interest to them. Psychology or Sociology courses may provide needed theoretical background to support one's research interests in learning. A variety of courses in ECI (Curriculum and Instruction) are offered that may enhance one's ability to develop, evaluate, or research curriculum issues, particular those with an instructional technology component. Some students may also take additional Research Methods courses.

Mathematics and Statistics Courses

Depending on the choice of emphasis, K-5, 6-12, or Upper Secondary/Collegiate, more mathematics and statistics courses may be taken. The requirements (see pg 39 worksheet for details) of the mathematics courses can be met through courses taken at other times or during the doctoral program. For example, if the PhD student has a masters in mathematics already when beginning, with 30 hours of mathematics, those courses can be used here. If a student has a master's where they passed 9 hours of mathematics, then additional courses in mathematics or statistics would be part of the program. However, mathematics courses that fulfill this requirement but where passed when not in the program do NOT count towards the 54 hours required for the PhD by the graduate school.

Plan of Work and Graduate Advisory Committee

The initial advisor should help the student develop an initial Plan of Work based on program requirements and considering the student's individual background from their B.S. 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)** as soon as possible after one begins taking course work and *before completing 18 hours of graduate work* toward the Doctorate. Failure to do so may result in work previously taken not counting toward the degree.

The Graduate Advisory Committee needs to consist of *at least* 4 faculty members, 2 of which must be Mathematics Education graduate faculty members. Up to 2 additional faculty members from any field can also serve on the committee to complement the student's research interests. **The student and GAC meet formally to develop and agree upon the final Plan of Work for Graduate Study.**

The worksheet on page 39 should be used to make sure all requirements in the program are fulfilled, either from courses taken at NCSU, during a master's degree at NCSU or another institution, or as a Post Baccalaureate Student (PBS). **All Ph.D. students must take a minimum of 54 hours at NCSU in the official Plan of Work for the Ph.D.** but the Mathematics Education requirements are 56-62 hours. Coursework from another institution does not transfer to NCSU to count towards the 54 hour minimum; however such courses can count towards fulfilling program requirements.

The Plan of Work form should be filed online through MyPack Portal (using the Student Information System) before completing 18 hrs towards the degree. The form includes a place to record the courses, semesters planned to take, and grades for all courses in a student's plan.

See http://www.ncsu.edu/grad/faculty-and-staff/docs/GRAD-SIS-training-manual-students.pdf for help in using the system. SIS Plan of Work (POW) questions should be sent to Lindsay_Gentile@ncsu.edu.

When a student meets with the Graduate Advisory Committee to discuss the Plan of Work and have them sign on their agreement with the plan, the Doctoral Program Worksheet should be completed. This will facilitate discussions on how the student is meeting all requirements in the program.

Minors

All Ph.D. students do not have to have a Minor. However, if they would like to earn one, they can look at the requirements in other departments to complete a minor. (This is a change from past years.)

Grades in Courses and Overall GPA

Students must maintain above a 3.0 GPA throughout their program, or face probation, suspension, or termination. **In addition only courses in which a student earns a B- or better may count towards graduate credit as MAJOR courses listed in the Plan of Work.** This rule is in effect for all students who began their PhD program in Summer 2011 or later. If program started before Summer 2011, courses in the Major category must have a C- or better.

Approved May 2014

Doctoral Program Requirements Mathematics Education – Ph.D. 56-62 hrs

Master's Degree

Students may enter with a master's degree in a variety of fields, *such as*: Mathematics, Applied Mathematics, Statistics, Mathematics Education, Instructional Technology, Educational Psychology, Elementary Education, or Curriculum and Instruction. Each of these degree programs gives students different strengths and knowledge in mathematics, mathematics education, and teaching and learning issues.
Students will have completed a master's thesis, or its equivalent, or will complete the equivalent early in PhD program using the research course EMS 893.

Core Requirements in Mathematics Education (26 Hours)

All must take the following (12 hrs)
_____ EMS 770 Foundations of Mathematics Education 3 cr.
_____ E** A learning theories or learning sciences course 3 cr.
(at least one psychology course in childhood and/or adolescent development as prerequisite)
_____ *** A course focused on technology use in a STEM field (above EMS580) 3 cr.
(highly suggest EMS 580 or equivalent as a prerequisite)
____ EMS 71* Teaching and Learning of Mathematics in
Secondary and Early College Level (EMS 711) Or *Elementary and Junior High (EMS 712)*
Choose 2 of the following courses (6 hrs): (either 711 or 712 can also be chosen here if not taken above)
_____ EMS 704 Curriculum Development and Evaluation In Science and Mathematics 3 cr.
_____ EMS 705 Education and Supervision Of Teachers Of Mathematics and Science 3 cr.
_____EMS 792 Special Topics in Mathematics Education (must be focused on Math Education Issues) 3 cr.
Experiences in Mathematics Education (6 hrs)
_____ EMS 841 School Based Practicum 2-3 cr.
_____ EMS 851 Teacher Education Internship 2-3 cr.
_____ EMS 893 Doctoral Supervised Research 2-3 cr.
Seminar in Mathematics Education (2 hrs)
_____ EMS 802 (1 cr, taken within 1 year of start of program)
_____ EMS 802 (1 cr, taken near end of coursework or preliminary exams)

Research Methods (12 Hours)

Quantitative Research Methods courses
_____ 1. _____ _____ 2. _____
_____ **One Qualitative Research Course**: _____
_____ **An additional Quantitative or Qualitative course** : _____

Specialty Courses (6-12 Hours)

Take graduate courses (500 or above level) that deepen 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 and/or committee members.
_____1. _____ _____2. _____

_____3. _____ _____4._____

_____EMS 890 Preliminary Exam (3 hrs)
_____ _____ _____ EMS 895 Dissertation Research (9 hrs)

Mathematical Sciences Requirements:

Between your masters and PhD coursework, must show the equivalent of the following coursework for your chosen career focus. These requirements are designed to enhance your foundations in mathematical sciences and make you highly competitive in the job market for academic positions)

Focus on Mathematics or Statistics Education at the upper secondary and collegiate level	**Focus on Mathematics or Statistics Education at the middle or secondary level (grades 6-12)**	**Focus on Mathematics or Statistics Education at the elementary level (grades PreK-5)**
should earn a masters degree in mathematics, applied mathematics, or statistics, or a strong equivalent of 30 hrs. 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____ 9. _____ 10. _____	at least 18 hrs of graduate level mathematics or statistics courses, with 24 recommended. *A minor in mathematics or statistics is recommended 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____ 7. _____ 8. _____	Equivalent of the 6 courses in Elementary Mathematics Education (18 hrs) or at least 9 hrs of other graduate level mathematics or statistics courses. 1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____

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 and internships, there are additional skills and proficiencies necessary to assess before undertaking their final doctoral study. Among the skills to be assessed in the preliminary exam are:

- The ability to examine a broad issue in mathematics education to develop well-delineated arguments both in terms of supporting and conflicting points of view.
- 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.
- The ability to conduct a critical analysis and review of the work of others, as one does when writing journal reviews, reviewing grants, or evaluating the work of future students.

A student should take the preliminary exam during or shortly after the final semester of course work. *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 filed and approved Graduate Plan of Work. The GAC must include at least 2 members of the Mathematics Education graduate faculty, one of which serves as Chair (or two serving as co-chairs) and one faculty member representing the minor area.

Steps in completing the preliminary exam:

1. The student and Chair(s) meet to discuss potential foci for the written exam questions.
2. The Chair(s) constructs the Written Exam questions within the guidelines below with consultation from GAC members. The final questions must be approved by all members of the students' GAC.
3. The student is given the Written Exam questions in electronic and hard copy. 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.**
4. 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.
5. The GAC faculty will grade the responses and prepare a Preliminary Exam Grade Report. The GAC members must come to consensus on the scores given on the Preliminary Exam Grade Report. **Exact grading timeline must be agreed upon by all members of the GAC**.
6. The student schedules an Oral Exam date and time that is agreeable to all members of GAC and the student. The Oral Exam **should occur within 6 weeks** of the submission date of the Written Exams, **and only occurs after all three questions have earned a PASS**. GAC members must complete a Preliminary Exam Grade Report, and the student and chair(s) complete the Request to Schedule Doctoral Oral Examination (http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/doc-or-exam.pdf). Both documents must be submitted to the Graduate Secretary and Director of Graduate Programs **at least 15 business days** prior to the scheduled Oral Exam date.
7. All members of GAC and the student meet for the Oral Exam. Other faculty members are welcome to attend and engage in the examining process after questioning by the GAC. At the completion of the Oral Exam with a score of PASS, the GAC will sign and submit the Doctoral Preliminary Exam Report Form (sample shown at http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/doc-prelim-report.pdf).

Structure of Written Exams

The written exam will consist of 3 questions designed by the chair(s) and approved by the committee to assess the three skills listed above. The three questions will be referred to as:

1. BREADTH OF KNOWLEDGE
2. DEPTH OF KNOWLEDGE, and
3. CRITIQUE OF RESEARCH

Evaluation of Written Responses:
The documents submitted for evaluation will be submitted in hard (to chair only) and electronic copy 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. **See form in Appendix.**

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 consensus on the final scores given on Preliminary Written Exam Report. (see Appendix)* 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.**

In the Event of a Fail on a Written Response
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. 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 students' Ph.D. program in Mathematics Education.

The Oral Exam
All members of GAC and the student meet for the Oral Exam. Other faculty members are welcome to attend and engage in the examining process after the GAC has queried the student. During the Oral Exam, the student may be asked questions on any of the written responses or on any other issue related to mathematics, statistics, research methodology, or mathematics 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 (sample shown at http://www.ncsu.edu/grad/faculty-and-staff/docs/forms/doc-prelim-report.pdf). This form should be given to the department's Graduate Secretary for processing.

If a student earns a FAIL at the Oral Exam, they may have *one* retake opportunity, to be scheduled within 2 weeks 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 in Mathematics Education.

Dissertation

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 12 credits of Doctoral Dissertation Research. If the student is still working on a dissertation after 12 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.
The dissertation research has two formal components:

1) **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 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 oral preliminary examination meeting is held. **The chair and doctoral candidate are responsible for announcing the date and time of the proposal defense to the community of Graduate faculty and students in the department (e.g., flyers, email) at least 1 week in advance of the date of the defense.**

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 successful, the title page of the proposal should be signed by all committee members and the student, with modifications needed noted on the back of the page. A copy of this is filed in the students' official record folder. The members of the GAC also need to complete the Proposal Defense Rubric and submit to the Director of Graduate Programs for program evaluation purposes.* ***See form in Appendix.***

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 defense.

2) **Research and Writing of a Dissertation** occur 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, 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. Once the chair(s) has approved it, the students should share their drafts with other members and keep all membership updated on progress.

3) **Final Doctoral Oral Examination** 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 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 15 business days** in advanced of the requested date, the student, through the Graduate Secretary 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 format of this examination. **The chair and doctoral candidate are**

responsible for announcing the date and time of the proposal defense to the community of Graduate faculty and students in the department (e.g., flyers, email) at least 1 week in advance of the date of the defense.

From the Graduate Administrative Handbook (Ch 3.6C):
http://www.ncsu.edu/grad/handbook/section3_6.php

Format of Final Doctoral Examination. Though the format of the doctoral examination may vary according to the culture of individual graduate programs, all examinations include three elements.

i. **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.
ii. **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.
iii. **Deliberation and decision.** Only the advisory committee and the Graduate School representative, if one has been appointed, are present.

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.

Outcome of final examination

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 (**see form in Appendix**) and submitted to the Graduate Secretary.

ADVISING/MENTORING

Each student will initially be assigned a faculty member in Mathematics Education to help him or her develop a preliminary plan of course work and to organize a graduate advisory committee. The initial advisor helps the student develop a plan of graduate study that meets the requirements of the graduate program and ensures that no student is left without a faculty member to chair their thesis (M.S.) or dissertation (Ph.D.). However, as a student progresses through the program, learns about different research programs, and refines and focuses their research interests, they are invited and welcome to switch advisors/chairs and build a committee appropriate to their research interests. At times, students switch advisors/chairs because of their TA or RA positions and the opportunity to complete a thesis/dissertation focused around their assistantship work.

Students should meet with their advisor/chair *at least* once a semester. *Initiating these meetings and conversations is the responsibility of the graduate student.* In these meetings you should:

- discuss plans for courses (see Rotation schedule p. 18)
- learn to use SIS for registration and inputting Graduate Plan of Work

- develop/revise a plan of work and timeline for completion of the degree,
- discuss funding opportunities,
- discuss licensure options for public school teaching
- discuss progress towards the degree, specifically the results from the annual Progress Towards Degree report filed by the student (see Administrative section) and
- discuss professional goals and opportunities for gaining experiences that will make them competitive for the job market they desire.

Scholarship

Upon entering the program, students should start exploring and reading about topics in mathematics 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 mathematics 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 bachelors 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 mathematics education program, so students should check with other sources, such as the Department of Elementary Education, Friday Institute, the Center for Research in Mathematics and Science Education 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

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 such as EMS 203, EMS 480, and EMS 470. 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 that 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 a requirement for faculty that 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. Note that although the doctoral program requires you to do a teaching internship, this one experience will be limited in what it can provide for your preparation as a future member of the academy.

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 http://www.ncsu.edu/grad/preparing-future-leaders/teaching-programs/ptp/.

PROFESSIONAL DEVELOPMENT

The following table summarizes the major mathematics 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.

MATHEMATICS EDUCATION RELATED PROFESSIONAL ORGANIZATIONS			
Organization Name	**Website**	**Affiliated Journals**	**Typical Timeframe of Annual Conference**
National Council of Teachers of Mathematics (NCTM)	www.nctm.com	• 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	• The Centroid	October
Research in Undergraduate Mathematics Education (RUME)	www.rume.org	• Online Proceedings	February/March
Association of Mathematics Teacher Educators (AMTE)	www.amte.net	• 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	• School Science and Mathematics Journal	October/November
Society for Information Technology and Teacher Education	http://site.aace.org	• Journal of Technology and Teacher Education (JTATE) • Contemporary Issues in Technology and Teacher Education (CITE)	March

American Educational Research Association (AERA)	www.aera.net	• American Educational Research Journal • Educational Researcher • Review of Educational Research • Review of Research in Education	
International Group for the Psychology of Mathematics Education (PME)	www.igpme.org	• Online proceedings and archived in ERIC (www.eric.gov)	July
Psychology of Mathematics Education-North American Chapter (PME-NA)	www.pmena.org	• Online Proceedings and archived in ERIC (www.eric.gov)	October/November
International Commission on Mathematical Instruction (ICMI) • International Congress on Mathematics Education (ICME) • ICMI Studies	www.mathunion.org/ICMI/	• ICMI Bulletin • ICME online proceedings • ICMI-studiesonline proceedings • Kluwer Volumes	• ICME held every 4 years • ICMI studies held often
International Society of the Learning Sciences	www.isls.org/icls.html	• Journal of the Learning Sciences • International Journal of Computer Supported Collaborative Learning	International Conference of the Learning Sciences held every 2 years

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.

Math education job postings are listed on many professional organization's websites including:

- Association of Mathematics Teacher Educators (http://amte.net/resources/joblistings)
- The Chronicle of Higher Education (http://chronicle.com/),
- AERA Research in Mathematics Education SIG (http://sigrme.org/xopenpositions.html)
- National Council of Teachers of Mathematics (http://www.nctm.org/jobs.aspx), and
- North Carolina Department of Public Instruction (http://www.dpi.state.nc.us/work4ncschools/).

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 the academy (http://www.ncsu.edu/career/).

ADMINISTRATIVE

All new doctoral students must submit a patent agreement online via MyPack Portal. After an initial meeting with your advisor and committee, you are expected to obtain necessary signatures and submit a formal Plan of Work online in MyPack Portal, which then gets submitted to the graduate school.

Annually, Ph.D. students are required to submit a Progress Towards Degree report in the Graduate Student Online Annual Report System (GSOARS) . This report allows you and your advisor to track your progress in coursework, and the various realms of graduate education such as teaching experiences, publications, presentations, work on research projects, etc. This report is filed in late Fall to report activities for a calendar year. Students are then able to use results from this report in discussions with their advisor and other faculty members on their experiences from the past year and any plans that should be made to work on deficient areas in the coming years.

As described earlier in the handbook, the university requires all theses and dissertations to be submitted and approved electronically. For this process to be completed accurately and efficiently, all students are encouraged to attend an ETD workshop early in their doctoral program. A schedule of workshops offered is posted each semester on the graduate school's website. Registration can be completed on line.

As doctoral students near the end of the dissertation process, there are a number of forms that must be completed and filed with the graduate school in order for your dissertation to be published and for you to be awarded your final degree. A list of all forms including links to each form is provided in this handbook. Be sure to review the requirements for each form in detail to ensure that all paperwork is completed and submitted on time. Please see website at the Graduate School that describes the process for each of the required forms. http://www.ncsu.edu/grad/etd/doc-req-forms.html.

It is important to note that doctoral students are required to initiate the filing of many of these forms. Although regular meetings and discussion with your advisor are critical as you reach this stage of the dissertation process, keep in mind that it is the responsibility of the student to keep track of all paperwork that needs to be filed, acquire necessary signatures in a timely manner and submit paperwork to The Graduate School.

Appendices

Description and rubric for Masters Inquiry Project for M License 6-9 or 9-12

Forms useful for faculty and graduate students in PhD program

- APPLICATION FOR GRADUATE PROFESSIONAL INTERNSHIP IN NC K-12 SCHOOLS
- SAMPLE LETTER TO TEACHER AND ADMINISTRATOR - EMS 841 SCHOOL BASED PRACTICUM
- PRELIMINARY WRITTEN EXAMS EVALUATION REPORT
- EVALUATION RUBRIC: DISSERTATION PROPOSAL PRESENTATION
- EVALUATION RUBRIC: DISSERTATION FINAL ORAL EXAM

MATHEMATICS EDUCATION

MASTERS INQUIRY PROJECT FOR M LICENSE 6-9 OR 9-12.

Details and Grading Rubric for *Evidence 1: Inquiry Project* and *Evidence 2: Dissemination of Inquiry Project*

In either **EMS 513, 514, or 519**, a graduate student will conduct an inquiry project to better understand an issue related to teaching and/or learning some aspect of mathematics. (e.g. Students' understanding of and ability to construct proofs, implementation of a new teaching strategy and its impact on students; a comparison of students' learning from two different instructional approaches; the introduction of a project and its effects on student learning; teacher's self-efficacy or knowledge for teaching algebra, trends in AP Stats enrollment, achievement in data and chance on large-scale assessments, students' understanding of variability, etc). Data may be in the form of quantitative data (scores from tests or surveys), or qualitative data (video of students' work on computer, students' work on a task, poster presentations from a task, class discussions, interviews with students or teachers). Student should submit a **13-17 page report** on the project (not including references and appendices). Student must also submit documentation of how they disseminated the inquiry project (e.g., final class presentation, poster session, round table discussion, conference presentation, journal article, etc).

NOTE: If a students' M.S. thesis involves the collection and analysis of data of learners, it can also be submitted to fulfill the Masters Inquiry Project.

Evidence 1: Inquiry project

Section of Paper	Points Possible	Comments and your points
Introduction: Describe the topic(s) or issue(s) which are the focus of your analysis. Describe why you are interested in the topic/issue and use references from literature to describe the topic or issue and its importance, (e.g., include references to NCTM, GAISE, and Common Core). State the focus research question(s) that you are exploring. 2-3 pages	15	
Methods Describe the context in which data was collected, participants, and tasks or instruments used. Describe a way of framing your analysis that may help you in characterizing students' understanding of the topic or the issue you are investigating. For example, if the focus topic is on students' understanding of proof, there may exist literature that describes "levels of understanding proof" that could be used to characterize students' work on a task on constructing a proof. You may need to develop your own framework based on the focus of your work and what you know from literature. Describe the analysis procedures used with references to appropriate citations to support techniques used. Techniques should be appropriate for the type of data collected and may combine quantitative and qualitative techniques. 3-4 pages	20	
Analysis and Results Describe your analysis of data and important findings. When appropriate, use tables and graphs to illustrate your points and organize your work. This section should be organized around central themes or findings and not just a	40	

running record of what you did. In what ways can/did the results from your project have positive impacts on student learning or teaching? Support your findings/results with data to back your claims. Insert samples of work or quotes to support claims or illustrate your points. 6-7 pages		
Discussion Answer your focus question(s) and discuss what you learned about the teaching or learning of the topic(s) or issue(s) of interest. Connect your findings with findings from other research about the focus topic(s) or issue(s) of interest. What new questions about the topic(s) or issue(s) have you formulated that you would like to explore? 2-3 pages	20	
References and Grammar Provide a reference list of literature used in proper APA format. Minimum of 6 research references should be used. Points in this section will also apply to the use of proper citations in APA format within the body of the paper. Your report should be organized, and of high quality. Please include a table of contents and proper headings. Points in this section will also apply to the use of proper grammar and spelling within body of paper.	5	

Evidence 2: Dissemination of Inquiry Project--Documentation Needed

Artifact needed	**Possible Points**	**Your Score and Comments**
Audience—what is the nature of the group in which you presented your action research project? Describe the meeting and its purposes. (e.g., final class presentation, round table discussion, conference presentation, poster presentation, journal article, etc) (2-3 sentences)	5	
Presentation format—How did you present your inquiry project? Presentation formats can include: a power point presentation, web page/site, handouts, other audio or visual representations, etc. **Submit electronic versions of presentation format, if posted online, links to websites are allowed.** (Note: The specifics of how these 75 points are graded depend on the instructor of the course)	75	
What was the reaction to your inquiry project?—You will need to collect feedback from your presentation. Summarize the feedback and reaction(s) of your audience. Was the reaction what you expected? What about the audience's reaction surprised you? What are some examples of comments you heard? Be specific. (1 page)	20	

APPLICATION FOR GRADUATE PROFESSIONAL INTERNSHIP

Mathematics Education Graduate Program

A. PERSONAL DATA: COMPLETE ALL ITEMS

LAST NAME:	**FIRST NAME:**	**MIDDLE/MAIDEN:**
EMAIL:		**PHONE NUMBER:**
ADVISOR:		**STUDENT ID:**
ASSIGNMENT DATES :_____**TO** _____		**FIRST DAY TO REPORT TO SCHOOL:** _____
ARE YOU A PUBLIC SCHOOL EMPLOYEE: **YES** ☐**NO** ☐	**NAME OF SCHOOL AND SCHOOL SYSTEM WHERE EMPLOYED:**	
Please indicate any transportation, health or other issue that should be taken into consideration when assigning your placement.		

B. ASSIGNMENT REQUEST: COMPLETE ALL ITEMS

REQUESTED DISTRICT, SCHOOL AND TEACHER (if known):	**SUBJECT AND/OR GRADE(s):**
PROVIDE DESCRIPTION OF APPROXIMATE SCHEDULE FOR CLASSROOM VISITS (e.g., once a week, two periods a day for 4 weeks, every day during math class for 9 weeks, etc) AND EXPECTATIONS OF CLASSROOM DUTIES, OBSERVATIONS, LESSON PLANNING AND INSTRUCTION (must be discussed and agreed upon with advisor) :	**CHECK ONE:** ___ **EMS 841, 3 cr (45 hrs of contact time)** ___ **EMS 841, 2 cr (30 hrs of contact time)** ___ **OTHER (please describe)**

STUDENT SIGNATURE: _____ **DATE:** _____

ADVISOR SIGNATURE: _____ **DATE:** _____

(Complete part C as well, next page)

C. BACKGROUND QUESTIONS FOR PROSPECTIVE STUDENT INTERNS

Do you have the minimum 3.0 GPA **Yes ☐No ☐**
Have you ever had a certificate or license revoked or suspended by any state or other governing body? If yes, a statement giving full details and official documentation of the action taken must be provided. **Yes ☐No ☐**
Are you now involved in the use or sale of illegal drugs? **Yes ☐No ☐**
Have you ever been disciplined by NC State University or any other college or university, and/or are there no pending student misconduct charges against you? [If there has been discipline, please provide full details. A disciplinary history does not necessarily disqualify an applicant.] **Yes ☐No ☐**
Do you have any physical or emotional problems that would interfere with your role and duties as a teacher? **Yes ☐No ☐**
Do you have any attitudes that would interfere with your ability to work with any student, whatever his/her sex, race, or educational classification. **Yes ☐No ☐**
Please name your supervisor if employed at a school, _____and initial here ____ if we may contact that person for a reference check. *For post-baccalaureate licensure only applicants, one of your letters of recommendation must be from the school or central administration of the school system.*
I hereby grant consent for all educational institutions that I have attended to release all my transcripts and disciplinary records to the Director of Professional Education at North Carolina State University for purposes of reviewing my qualifications for admission into coursework, a licensure program, or an academic degree program.
I further affirm that I have provided full and truthful details on this document. Failure to do so may be grounds for dismissal from the program. Signed: _____ Printed Name: _____Date: _____

SAMPLE LETTER TO TEACHER AND ADMINISTRATOR
EMS 841 SCHOOL BASED PRACTICUM

To: <Teacher Name> and Administrators at <School Name>
From: <Graduate Faculty Member in Math Education>
Re: Volunteer Field Experience for <Graduate Student> in Fall 2009

<Graduate Student> is a Ph.D. candidate for a degree in Mathematics Education at NC State. As part of our doctoral program, students often complete a volunteer field-based experience in a classroom/school that is significantly different than their prior teaching experience. The purpose of this experience is to allow them a chance to make connections between theory they have learned in their advanced coursework and the practices of teaching and learning. Thus, we try to find classrooms situations that can aid in the doctoral student's development in this area. In the field-based experience we expect the student to be able to complete the following:

- About 40-45 hours of classroom contact with students. This can include such activities as aiding in classroom practices, helping individual students, teaching or co-teaching particular lessons, evaluating student assessment.
- Meet with the classroom teacher outside of class time with students to discuss practices, students' work, and to develop any lesson plans to be taught or assessments to be given.
- At a minimum, teach 2-5 lessons, 1 of which will be observed by a university faculty member. If a classroom visit is not possible, the class may be videotaped for a stimulated recall discussion to be held later with the university faculty.
- Engage in professional discussions with university faculty regarding the classroom experiences and connections to theories learned in their program as well comparisons and contrasts to their prior teaching experiences.

We leave the exact details of how and when the 40-45 hours of classroom time can be met to the student and the hosting teacher in which the volunteer work will be done.

We greatly appreciate the opportunity at your school and appreciate the teachers welcoming our doctoral student into a classroom for this volunteer experience. I am sure the partnership will be mutually beneficial. If you have any questions, please contact me with the information below.

Sincerely,

<Graduate Faculty Name and Contact Info>

MATHEMATICS EDUCATION
PRELIMINARY WRITTEN EXAMS
EVALUATION REPORT

Student:_____ID#:_____

Date(s) of Exam: _____ to _____

	Fail	**Pass**
1. BREADTH		
Comments:		
2. DEPTH		
Comments:		
3. CRITIQUE		
Comments:		

The Committee Members listed below all agree with the decisions written above.

Chair:_____ date:_____

Member:_____

Member:_____

Member:_____

Minor Representative Member: _____

This report needs to be sent to the DGP before or with the Request to Schedule Preliminary Oral Exam form.

MATHEMATICS EDUCATION

EVALUATION RUBRIC: DISSERTATION PROPOSAL PRESENTATION

DATE: _____ Doctoral Candidate: _____

	DEVELOPING 1	ACCEPTABLE 2	TARGET 3
•reviews the literature in a way that demonstrates a comprehensive understanding of the research in the area of study			
•identifies research questions or problems pertinent to the field of study, providing a focus for making a significant contribution to the field			
•provides a plan for gathering, organizing, and analyzing data using a conceptual framework appropriate to research question and field of study			
•demonstrates a good understanding of how the research results may contribute to the field of study and to teaching and learning in mathematics			
•communicates proposal effectively and professionally, using language appropriate to the field of study			
•establishes a productive research agenda that could prepare student to extend his or her research beyond graduate school			

Committee Chair(s):_____

Committee Members: _____

_____

_____

This form should be submitted to the Graduate Secretary or Director of Graduate Programs to be used for program evaluation.

MATHEMATICS EDUCATION

EVALUATION RUBRIC: DISSERTATION FINAL ORAL EXAM

DATE: _____Doctoral Candidate: _____

	DEVELOPING 1	ACCEPTABLE 2	TARGET 3
•reviews the literature in a way that demonstrates a comprehensive understanding of the research in the area of study			
•identifies research questions or problems pertinent to the field of study, providing a focus for making a significant contribution to the field			
•gathers, organizes, analyzes, and reports data using a conceptual framework appropriate to the research question and the field of study			
•interprets research results in a way that adds to the understanding of field of study and relates findings to teaching and learning in mathematics			
•communicates research effectively in both written and oral forms using language appropriate to the field of study			
•has established a productive research agenda that prepares student to extend his or her research beyond graduate school			

Committee Chair(s):_____

Committee Members: _____

_____

_____

This form should be submitted to the Graduate Secretary or Director of Graduate Programs to be used for program evaluation.