**Program:** Mathematics Education (6-9)  
**Program Coordinator:** Dr. Karen Hollebrands

**A. A description of how the proposed program has been re-visioned to reflect the North Carolina Standard for Teachers and the 21st century knowledge, skills, and dispositions embedded in them and the rationale for the changes.**

**Program Description:** The Mathematics Education program (initial license, undergraduate) has undergone substantial review and revision based on the new NC Professional Teaching Standards, 21st Century knowledge, skills, and dispositions, a new general education program for the university, and extensive collaborative review with practitioners and faculty from the College of Education to create a re-visioned teacher education program that prepares math teachers for 6 - 9 classrooms. The re-visioned program is 125 SCH and integrates general education and content courses with a set of core pedagogy courses, field experiences, and required non-credit professional development seminars to provide pre-service teachers with high capacity in the NCPTS as well as a set of knowledge, skills, and dispositions developed through a set of distinctive program parameters for the core pedagogy courses and experiences (Assessment, Collaboration, Diversity, Field Experiences, Technology, Globalization, see Section B).

**North Carolina Professional Teaching Standards:**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Summary</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. <strong>Leadership</strong></td>
<td>In addition to courses specific to mathematics education, core courses that address prospective teachers’ knowledge development in the areas of collaboration, globalization, diversity, technology, assessment, and field experiences also need to be addressed. This knowledge will be developed through a sequence of unit-wide common courses and experiences. Candidates will be expected to document their leadership experiences throughout the program and develop reflection essays on how they have developed confidence and competence as leaders. We will develop teacher leaders through new activities such as teacher-as-leader content and professional learning community (PLC) training and development in core courses, professional development and legacy products (e.g., technology-enriched units) during field experiences and student teaching, and assessment assignments, and instruction in the new assessment course in the core.</td>
<td>Evidence 6</td>
</tr>
<tr>
<td>II. <strong>Respectful Environment</strong></td>
<td>Each of the four mathematics education courses [EMS 203, EMS 480, EMS 474, EMS 470] will have a pedagogical focus. Pedagogical foci include: student thinking, classroom interactions, diversity, creating, selecting and sequencing mathematics tasks, questioning, lesson planning, unit planning, curriculum, assessment, communicating with parents, and classroom management. Teacher candidates will have opportunities to practice developing pedagogical skills in a sequence of field experiences that range from observing to full-time student teaching. Additionally, creating a respectful environment is addressed in core classes such as the ED 200 21st Century Teaching, EDP 301 Assessment core course, ELP 344 Diversity, School and Society as well as through courses listed in the GEP co-requisite for <strong>U.S. Diversity</strong> (USD). In addition to coursework, candidates will demonstrate their ability to establish a respectful environment for a diverse population of students in the lessons/units they design and implement in their field experiences, methods courses, and student teaching experience.</td>
<td>Evidence 3 Evidence 4</td>
</tr>
<tr>
<td>III. <strong>Content</strong></td>
<td>Another change is to provide a mathematical focus to each of the four mathematics education courses. A specific content focus in each of the four mathematics education courses will allow for instructors to provide a deeper examination of each content area and discuss particular pedagogical strategies for teaching concepts in rational numbers, algebra, geometry, data analysis, statistics, discrete mathematics, etc. Teacher candidates who graduate with a degree in Mathematics Education and are recommended for a middle school mathematics license will take a substantial number of mathematics courses [36 hours].</td>
<td>Evidence 1 Evidence 2</td>
</tr>
</tbody>
</table>
Table:

<table>
<thead>
<tr>
<th>Program</th>
<th>Content Courses in Mathematics</th>
<th>Methods Courses in Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMS 203: Introduction to Mathematics Education</td>
<td>EMS 408: Teaching Mathematics with Technology</td>
<td></td>
</tr>
<tr>
<td>EMS 474: Teaching Mathematics Topics in Middle Grades</td>
<td>EMS 474: Teaching Mathematics Topics in Middle Grades</td>
<td></td>
</tr>
<tr>
<td>EMS 470: Methods and Materials for Teaching Mathematics</td>
<td>EMS 470: Methods and Materials for Teaching Mathematics</td>
<td></td>
</tr>
<tr>
<td>CH 101/102: Chemistry - 4</td>
<td>CH 101/102: Chemistry - 4</td>
<td></td>
</tr>
<tr>
<td>BIO 105/106 Biology - 4</td>
<td>BIO 105/106 Biology - 4</td>
<td></td>
</tr>
<tr>
<td>PY 131 Conceptual Physics - 4</td>
<td>PY 131 Conceptual Physics - 4</td>
<td></td>
</tr>
<tr>
<td>Science Elective - 3</td>
<td>MEA 130 Weather and Climate - 3</td>
<td></td>
</tr>
<tr>
<td>[15 credit hours]</td>
<td>[21 credit hours]</td>
<td></td>
</tr>
<tr>
<td>EMS 375: Methods of Teaching Science I [3 credit hours]</td>
<td>EMS 375: Methods of Teaching Science I [3 credit hours]</td>
<td></td>
</tr>
</tbody>
</table>

IV. Facilitate Learning

Mathematics education teacher candidates will enroll in a sequence of core courses and courses specific to the teaching and learning of mathematics [summarized in the following table]. The core courses begin in the freshman year, where teacher candidates will be introduced to ideas central to thinking about teaching in the 21st Century. As sophomores, teacher candidates will be introduced to important topics central to mathematics teaching in EMS 203. This course will include a focus on student thinking, the design and implementation of mathematical tasks of high cognitive demand, the importance of diversity, and an introduction to NCTM’s Principles and Standards for School Mathematics Process Standards. During the junior year, teacher candidates will take three core courses: Educational Psychology, School and Society, and Assessment and one course focused on the use of tools for teaching mathematics (EMS 480). Also during the junior year teacher candidates will take a course that will focus on the teaching of specific middle school mathematics topics with appropriate materials and tools (EMS 474). Teacher candidates will begin their student teaching experience in the spring of junior year, and full-time student teaching will begin in the Fall of their senior year.

The new Senior Seminar will focus on the parameters (assessment, diversity, collaboration, technology, field experience, and globalization) we have established for ourselves in regards to creating and dispersing digital information. The new technology parameter especially is a means to specifically strengthen the means by which our teacher candidates can better facilitate student learning. Candidates will be held to the 21st century standard of teaching content and skills with technology and having students demonstrate that capacity. It is our intention to prepare our candidates so they will be versed in information, communications, and technology not yet
Reflection is a critical feature of the entire process of preparing to become a mathematics teacher. In each course, teacher candidates will complete assignments that require them to prepare written reflections. Reflections will be different depending on the nature of the course and field experience. Examples include: reflections on their own mathematical thinking and learning, the mathematical work and thinking of a single student or pair of students, the learning of a mathematical idea by a class of students, and the implementation of a single lesson or sequence of lessons.

Analyzing data, reflecting on lesson plans, participating in professional development seminars, and considering new ways of improving their teaching delivery are all key elements to shaping teachers who are reflective. Our Methods courses, student teaching experience, and Professional Development seminars are designed to enable pre-service teachers to recognize the ways in which an early attentiveness to professional growth is critical to enabling them to achieve their professional goals.

21st Century Knowledge, Skills, and Dispositions

<table>
<thead>
<tr>
<th>Standard</th>
<th>Summary/Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Comprehension</td>
<td>Intensive instruction in academic writing and research. Basic principles of rhetoric and strategies for academic inquiry and argument. Instruction and practice in critical reading, including the generative and responsible use of print and electronic sources for academic research. Exploration of literate practices across a range of academic domains, laying the foundation for further writing development in college. Continued attention to grammar and conventions of standard written English.</td>
</tr>
<tr>
<td>Written Communication</td>
<td>Grade of ‘C’ or better in speech / oral communication courses.</td>
</tr>
<tr>
<td>Oral Communication</td>
<td>Grade of ‘C’ or better in any course(s) from the University Approved GEP course list</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Any deficiencies in the curriculum will be addressed with Professional Development opportunities.</td>
</tr>
<tr>
<td>Science</td>
<td>In addition to courses specific to mathematics education, core courses that address prospective teachers’ knowledge development in the areas of collaboration, globalization, diversity, technology, assessment, and</td>
</tr>
<tr>
<td>Social Studies</td>
<td></td>
</tr>
<tr>
<td>Fine and Performing Arts</td>
<td></td>
</tr>
</tbody>
</table>
field experiences also need to be addressed. This knowledge will be developed through a sequence of unit-wide common courses and experiences. The MathEd group is supportive all core courses with the exception of the 2-credit 200-level course. The Lesson Study cannot be conducted in a generic course and needs to be content specific. This shift would suggest a 1-credit common course and a 2 credit subject specific course with a common artifact.

Learning and Innovation Skills
Evidences 3 & 5 require candidates to develop, implement, and assess lessons that incorporate either Learning and Innovation or Life and Career Skills.

Information, Media, and Technology Skills
To better reflect the practice of secondary mathematics teachers, who do not separate the use of technology from the use of other materials for teaching, a change is recommended that will incorporate technology in all four methods courses to model for prospective teachers the ways in which technology can be used to facilitate students’ learning of mathematics. This will enable mathematics education instructors to incorporate technology tools, as appropriate, and compare and contrast the use of technology with the use of other types of manipulatives and engage in discussions about how a teacher chooses appropriate materials for teaching a particular mathematics lesson.

In addition to specific programmatic technology requirements all teacher education programs will begin transitioning toward a 1:1 computing environment in Fall 2010.

<table>
<thead>
<tr>
<th>Current Math Curriculum</th>
<th>Proposed Math Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional Education</td>
<td>ED 101, EMS 203, ED 301, ELP 344, EDP 304, EMS 480, EMS 474, EMS 470</td>
</tr>
<tr>
<td>Content-Math Curriculum</td>
<td>29-35 credit hours of mathematical sciences (MA, ST).</td>
</tr>
<tr>
<td>Field Experiences</td>
<td>Our current candidates complete an intense six-weeks training during the fall semester block we call the professional semester and then begin their ten-week student teaching immediately afterwards. Our middle grades students will still do full-time student teaching in the Fall since that is what a survey of cooperating teachers prefer. In the Junior year of the spring semester when student teachers are taking their third methods course they will have an associated placement in a middle grades classroom. During the Fall of the senior year, teacher candidates will observe the beginning of school and then receive intensive training in their fourth methods course during the first six weeks, while observing in the afternoons, and then participate in full-time student teaching. It is intended that this will be the same placement as the spring junior year. This change has implications for each of the five new standards. It will also extend our candidates’ opportunities to work collaboratively with public school faculty and enable them to gain a richer understanding of the vision, organization, and planning necessary for both their student teaching experience and their careers.</td>
</tr>
</tbody>
</table>
B. How public school partners were involved in the re-visioning of the program and how they will be involved in the delivery and evaluation of the program. (1-2 pages maximum)

During the Spring and Fall of 2008, the College of Education convened several focus groups for discussion of the following two questions: “What should teachers in North Carolina know and be able to do in 2012 and beyond?” and “How can a pre-service teacher education program help them to develop that set of knowledge, skills, and dispositions?” From these discussion with 1) the University Council on Teacher Education (includes faculty and administrators across campus, teachers and administrators from the public schools of Wake, Johnston, and other counties, as well as community representatives like Carolyn McKinney) 2) a UNC-Tomorrow focus group of faculty and community stakeholders, 3) a focus group of Community Members and Practitioners (intentionally weighted toward representatives of African-American, Hispanic, and Native American Community Agencies, the Governor’s Office, and Social Service Agencies in Wake County), and 4) at the Spring Faculty Retreat of College of Education. Analysis of the content of each of the focus group discussions yielded six themes. These themes were developed into six parameters which have served as guides to the re-visioning process for each of the teacher education programs at NC State. The six parameters include: Assessment, Collaboration, Diversity, Field Experiences, Globalization, and Technology.

The assessment parameter will be met with a new core course on Assessment to include formative and summative assessment content and the use of vendor-based assessment products such as Blue Diamond and ClassScape. The Collaboration parameter will be met through instruction on Professional Learning Communities in core courses and the application of those principles in PD sessions and an assessment PLC attached to the assessment course. The Diversity parameter will be met through a revised course with new emphasis on diversity, the assessment course, field experiences in which students are placed and supervised in targeted diverse settings, and PD sessions and PLC sessions on teaching to diversity. The field experience parameter will be met through a series of intentionally varied virtual and actual field experiences that will progressively prepare candidates for the complexities and regularities of schools and classrooms. The globalization parameter will be met through a variety of means including enhanced opportunities and encouragement for study abroad as well as virtual means of contact with global cultures. The technology parameter will be met through technology integration into classes, the implementation of a 1:1 computing environment in classes, PD opportunities, a technology legacy project for student teaching, and teaching settings during field experiences.

In addition to the unit’s efforts to involve public school partners in the evaluation and re-visioning process the mathematics education program has included partners in the evaluation, planning, and implementation by convening two meeting of practicing middle and high school teachers. During these meetings the following question was posed: “What knowledge, skills, and dispositions do beginning teachers need to be prepared to teach mathematics in the 21st Century?” One faculty member facilitated the discussion by recording ideas presented by teachers on the board while another faculty member recorded ideas on a computer. The recorded ideas were analyzed and the following themes were identified: Beginning mathematics teachers need to (1) know deeply the middle and high school mathematics content that they will be teaching (algebra, geometry, number and operations, data analysis, statistics, probability, discrete mathematics) by developing “mathematical knowledge for teaching” (2) be able to use a variety of different instructional strategies and materials, including technology (3) know how to pose good questions (4) facilitate classroom discourse (5) differentiate instruction and make accommodations to meet the needs of all students (6) use different types of assessments (7) develop strong classroom management skills (8) know how to plan lessons that include a logical sequence of activities and smooth transitions (9) be flexible, caring, and believe that all students are capable of learning. Several teachers suggested more extended field experiences that build upon each other beginning with observing students and teachers, tutoring individual students, teaching a small group of students, teaching a whole class of students a lesson developed by someone else, developing a lesson and teaching a whole class of students. A year-long student teaching experience was also strongly supported.

Finally, public school partners will be involved in the delivery of our program as our professional learning community sessions for students will be led by a cadre of classroom teachers. There will be several places in the new core courses in the pedagogy sequence in which the classroom teacher cadre participate significantly. The first is that they will lead PLCs as after-school sessions attached to the Assessment course. The teachers will have actual classroom data sets “scrubbed” of identifying information to use in leading preservice candidates in sessions to analyze the data and plan new instruction to produce positive
gains in student achievement. The second is that candidates will be required to participate in a minimum of six professional development sessions before they can apply for licenses. These sessions are non-credit. They will allow coverage of topics that are current and timely, but beyond the scope of courses. One example might be a session in SIOP to deal with ELL and inclusion teaching tactics. The Classroom Teacher Cadre can deliver these PD sessions and be paid an honorarium since they will be held after school hours.
C. The electronic evidences the institution will use to demonstrate candidates meet the standards. The template to be used for this section of the proposal is detailed in the following pages. It is to include:

1. A brief description of the evidence and the descriptors of the element of the standards it addresses. (Section I of the template)
2. A matrix showing where each descriptor of the elements of each standard is included in the key evidences. (Section II of the template)
3. A detailed description of the evidence, how it specifically addresses the descriptors of the element for which it is cited, and how it is evaluated by the institution. (Section III of the template)
## SECTION I: Key Evidences

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Name</th>
<th>Description</th>
<th>Elements Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Content Knowledge</strong>: Evidence that demonstrates breadth of content knowledge in the specialty area.</td>
<td>Transcript or Praxis II scores</td>
<td>3b.1</td>
</tr>
<tr>
<td>2</td>
<td><strong>Content Knowledge</strong>: Evidence that demonstrates candidate depth of understanding and application of content knowledge in the specialty area.</td>
<td>Thinking Deeply about Mathematics: A Focus on Algebra</td>
<td>3b.1</td>
</tr>
<tr>
<td>3</td>
<td><strong>Pedagogical and Professional Knowledge Skills and Dispositions</strong>: Evidence that demonstrates effective design of classroom instruction based on research-verified practice.</td>
<td>Unit Plan</td>
<td>1a.2, 2a.3, 2d.1, 3a.1, 3c.1, 3c.2, 3d.1, 4a.1, 4a.2, 4b.1, 4c.1, 4d.1, 4e.1, 4f.1, 5c.1</td>
</tr>
<tr>
<td>4</td>
<td><strong>Pedagogical and Professional Knowledge Skills and Dispositions</strong>: Evidence that demonstrates knowledge, skills, and dispositions in practice.</td>
<td>LEA/IHE Certification of Teaching Capacity</td>
<td>1a.1, 1a.3, 1a.4, 1d.1, 1e.1, 2a.1, 2b.1, 2b.2, 2c.1, 2d.1, 2d.2, 3a.2, 3b.2, 3d.1, 4c.1, 4d.1, 4e.1, 4f.1, 4g.1, 4g.2, 4h.1, 4h.2, 5a.1</td>
</tr>
<tr>
<td>5</td>
<td><strong>Positive Impact on Student Learning</strong>: Evidence that demonstrates impact on student learning.</td>
<td>Assessing Mathematical Thinking and Reasoning Project</td>
<td>1a.1, 4b.1, 4h.1, 4h.2, 5a.1</td>
</tr>
<tr>
<td>6</td>
<td><strong>Leadership and Collaboration</strong>: Evidence that demonstrates leadership and collaboration.</td>
<td>Leadership &amp; Collaboration</td>
<td>1b.1, 1b.2, 1b.3, 1c.1, 1c.2, 2e.1, 5b.1</td>
</tr>
</tbody>
</table>
## SECTION II: Relationship of the Evidence to the Standards

<table>
<thead>
<tr>
<th>North Carolina Teacher Standard</th>
<th>Key Evidence(s) from Section I Demonstrating the Descriptors of the Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. TEACHERS DEMONSTRATE LEADERSHIP</strong></td>
<td></td>
</tr>
<tr>
<td>a. Teachers lead in their classrooms.</td>
<td></td>
</tr>
<tr>
<td>1. Evaluates the progress of students toward high school graduation using a variety of assessment data measuring goals of the North Carolina Standard Course of Study.</td>
<td>☐ #1 ☐ #2 ☐ #3 ✗ #4 ✗ #5 ☐ #6 ☐ #7 ☐ #8</td>
</tr>
<tr>
<td>2. Draws on appropriate data to develop classroom and instructional plans.</td>
<td>☐ #1 ☐ #2 ✗ #3 ☐ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8</td>
</tr>
<tr>
<td>3. Maintains a safe and orderly classroom that facilitates student learning.</td>
<td>☐ #1 ☐ #2 ☐ #3 ✗ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8</td>
</tr>
<tr>
<td>4. Uses positive management of student behavior, effective communication for defusing and deescalating disruptive or dangerous behavior, and safe and appropriate seclusion and restraint.</td>
<td>☐ #1 ☐ #2 ☐ #3 ✗ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8</td>
</tr>
<tr>
<td>b. Teachers demonstrate leadership in the school.</td>
<td></td>
</tr>
<tr>
<td>1. Engages in collaborative and collegial professional learning activities.</td>
<td>☐ #1 ☐ #2 ☐ #3 ☐ #4 ☐ #5 ✗ #6 ☐ #7 ☐ #8</td>
</tr>
<tr>
<td>2. Identifies the characteristics or critical elements of a school improvement plan.</td>
<td>☐ #1 ☐ #2 ☐ #3 ☐ #4 ☐ #5 ✗ #6 ☐ #7 ☐ #8</td>
</tr>
<tr>
<td>3. Displays the ability to use appropriate data to identify areas of need that should be addressed in a school improvement plan.</td>
<td>☐ #1 ☐ #2 ☐ #3 ☐ #4 ☐ #5 ✗ #6 ☐ #7 ☐ #8</td>
</tr>
<tr>
<td>c. Teachers lead the teaching profession.</td>
<td></td>
</tr>
<tr>
<td>1. Participates in professional development and growth activities.</td>
<td>☐ #1 ☐ #2 ☐ #3 ☐ #4 ☐ #5 ✗ #6 ☐ #7 ☐ #8</td>
</tr>
</tbody>
</table>
### 2. Begins to develop professional relationships and networks.

- **d. Teachers advocate for schools and students.**
  1. Implements and adheres to policies and practices positively affecting students’ learning.
  
  - Key Evidence(s) from Section I Demonstrating the Descriptors of the Elements:
    - #1 #2 #3 #4 #5 #6 #7 #8

- **e. Teachers demonstrate high ethical standards**
  1. Upholds the *Code of Ethics for North Carolina Educators* and the *Standards for Professional Conduct.*
  
  - Key Evidence(s) from Section I Demonstrating the Descriptors of the Elements:
    - #1 #2 #3 #4 #5 #6 #7 #8

### 2. TEACHERS ESTABLISH A RESPECTFUL ENVIRONMENT FOR A DIVERSE POPULATION OF STUDENTS

- **a. Teachers provide an environment in which each child has a positive, nurturing relationship with caring adults.**
  1. Maintains a positive and nurturing learning environment.
  
  - Key Evidence(s) from Section I Demonstrating the Descriptors of the Elements:
    - #1 #2 #3 #4 #5 #6 #7 #8

- **b. Teachers embrace diversity in the school community and in the world.**
  1. Appropriately uses materials or lessons that counteract stereotypes and acknowledges the contributions of all cultures.
  
  2. Incorporates different points of view in instruction.
  
  3. Understands the influence of diversity and plans instruction accordingly.
  
  - Key Evidence(s) from Section I Demonstrating the Descriptors of the Elements:
    - #1 #2 #3 #4 #5 #6 #7 #8

- **c. Teachers treat students as individuals.**
  1. Maintains a learning environment that conveys high expectations of every student.
  
  - Key Evidence(s) from Section I Demonstrating the Descriptors of the Elements:
    - #1 #2 #3 #4 #5 #6 #7 #8

- **d. Teachers adapt their teaching for the benefit of students with special needs.**
  1. Cooperates with specialists and uses resources to support the special learning needs of all students.
  
  - Key Evidence(s) from Section I Demonstrating the Descriptors of the Elements:
    - #1 #2 #3 #4 #5 #6 #7 #8
<table>
<thead>
<tr>
<th>NORTH CAROLINA TEACHER STANDARD</th>
<th>KEY EVIDENCE(S) FROM SECTION I DEMONSTRATING THE DESCRIPTORS OF THE ELEMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Uses research-verified strategies to provide effective learning activities for students with special needs.</td>
<td>☐ #1 ☐ #2 ☒ #3 ☒ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8</td>
</tr>
<tr>
<td></td>
<td>☐ #1 ☐ #2 ☐ #3 ☒ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8</td>
</tr>
</tbody>
</table>

| e. Teachers work collaboratively with the families and significant adults in the lives of their students. | 1. Communicates and collaborates with the home and community for the benefit of students. | ☐ #1 ☐ #2 ☐ #3 ☒ #4 ☐ #5 ☒ #6 ☐ #7 ☐ #8 |

### 3. TEACHERS KNOW THE CONTENT THEY TEACH

| a. Teachers align their instruction with the North Carolina Standard Course of Study. | 1. Develops and applies lessons based on the North Carolina Standard Course of Study. | ☐ #1 ☐ #2 ☒ #3 ☒ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8 |
|                                                                                        | 2. Integrates effective literacy instruction throughout the curriculum and across content areas to enhance students’ learning. | ☐ #1 ☐ #2 ☐ #3 ☒ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8 |

| b. Teachers know the content appropriate to their teaching specialty. | 1. Demonstrates and appropriate level of content knowledge in the teaching specialty. | ☐ #1 ☒ #2 ☐ #3 ☒ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8 |
|                                                                         | 2. Encourages students to investigate the content area to expand their knowledge and satisfy their natural curiosity. | ☐ #1 ☐ #2 ☐ #3 ☒ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8 |

<p>| c. Teachers recognize the interconnectedness of content areas/discipline. | 1. Demonstrates knowledge of links between grade/subject and the North Carolina Standard Course of Study by relating content to other disciplines. | ☐ #1 ☐ #2 ☒ #3 ☒ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8 |
|                                                                         | 2. Relates global awareness to the subject. | ☐ #1 ☐ #2 ☒ #3 ☒ #4 ☐ #5 ☐ #6 ☐ #7 ☐ #8 |</p>
<table>
<thead>
<tr>
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</thead>
</table>
| d. Teachers make instruction relevant to students.  
  1. Integrates 21st century skills and content in instruction. | ☐#1 ☐#2 ☒#3 ☒#4 ☐#5 ☐#6 ☒#7 ☒#8 |
| 4. TEACHERS FACILITATE LEARNING FOR THEIR STUDENTS | |
| a. Teachers know the ways in which learning takes place, and they know the appropriate levels of intellectual, physical, social, and emotional development of their students.  
  1. Identifies developmental levels of individual students and plans instruction accordingly. | ☐#1 ☐#2 ☒#3 ☒#4 ☐#5 ☐#6 ☒#7 ☒#8 |
| 2. Assess and uses resources needed to address strengths and weaknesses of students. | ☐#1 ☐#2 ☒#3 ☒#4 ☐#5 ☐#6 ☒#7 ☒#8 |
| b. Teachers plan instruction appropriate for their students.  
  1. Collaborates with colleagues to monitor student performance and make instruction responsive to cultural differences and individual learning needs. | ☐#1 ☐#2 ☒#3 ☒#4 ☐#5 ☐#6 ☒#7 ☒#8 |
| c. Teachers use a variety of instructional methods.  
  1. Uses a variety of appropriate methods and materials to meet the needs of all students. | ☐#1 ☐#2 ☒#3 ☒#4 ☐#5 ☐#6 ☒#7 ☒#8 |
| d. Teachers integrate and utilize technology in their instruction.  
  1. Integrates technology with instruction to maximize students’ learning. | ☐#1 ☐#2 ☒#3 ☒#4 ☐#5 ☐#6 ☒#7 ☒#8 |
| e. Teachers help students develop critical-thinking and problem-solving skills.  
  1. Integrates specific instruction that helps students develop the ability to apply processes and strategies for critical thinking and problem solving. | ☐#1 ☐#2 ☒#3 ☒#4 ☐#5 ☐#6 ☒#7 ☒#8 |
| f. Teachers help students to work in teams and develop leadership qualities.  
  1. Organizes student learning teams for the purpose of developing cooperation, collaboration, and | ☐#1 ☐#2 ☒#3 ☒#4 ☐#5 ☐#6 ☒#7 ☒#8 |
### North Carolina Teacher Standard

<table>
<thead>
<tr>
<th>Student Leadership</th>
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#### Key Evidence(s) from Section I

**g. Teachers communicate effectively.**
1. Uses a variety of methods to communicate effectively with all students.
2. Consistently encourages and supports students to articulate thoughts and ideas clearly and effectively.

**h. Teachers use a variety of methods to assess what each student has learned.**
1. Uses multiple indicators, both formative and summative, to monitor and evaluate students’ progress and to inform instruction.
2. Provides evidence that students attain 21st century knowledge, skills and dispositions.

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### 5. Teachers Reflect on Their Practice

#### a. Teachers analyze student learning.
1. Uses data to provide ideas about what can be done to improve students’ learning.

#### b. Teachers link professional growth to their professional goals.
1. Participates in recommended activities for professional learning and development.

#### c. Teachers function effectively in a complex, dynamic environment.
1. Uses a variety of research-verified approaches to improve teaching and learning.
**Evidence #1 (State Prescribed)**

**Content Knowledge:** Evidence that demonstrates breadth of general content knowledge of mathematics.

**Evidence(s):** Transcript

**Descriptors:** 3b.1

Candidates will complete a minimum of 24 hours with a grade of C or better in the following courses:

<table>
<thead>
<tr>
<th>Degree program</th>
<th>Mathematics Education – Middle Grades [recommended for 6-9 license in Mathematics]</th>
<th>Mathematics Education – Middle Grades with Science Minor [recommended for 6-9 license in Mathematics and Science]</th>
</tr>
</thead>
</table>
| **Content Courses in Mathematics** | MA 141: Calculus I  
MA 241: Calculus II  
MA 205: Matrix Algebra  
Discrete Mathematics course  
Number/Operations/Algebra course  
225: Foundations of Advanced Mathematics  
ST 311: Intro to Statistics I  
MA 308 or 408: College Geometry  
MA 433: History of Mathematics  
MA 410: Number Theory  
MA elective [35 credit hours] | MA 141: Calculus I  
MA 241: Calculus II  
MA 205: Matrix Algebra  
Discrete Mathematics course  
Number/Operations/Algebra course  
225: Foundations of Advanced Mathematics  
ST 311: Intro to Statistics I  
MA 308 or 408: College Geometry  
MA 410: Number Theory  
[29 credit hours] |

| **Methods Courses in Mathematics** | EMS 203: Introduction to Mathematics Education  
EMS 480: Teaching Mathematics with Technology  
EMS 474: Teaching Mathematics Topics in Middle Grades  
EMS 470: Methods and Materials for Teaching Mathematics [12 credit hours] | EMS 203: Introduction to Mathematics Education  
EMS 480: Teaching Mathematics with Technology  
EMS 474: Teaching Mathematics Topics in Middle Grades  
EMS 470: Methods and Materials for Teaching Mathematics [12 credit hours] |

| **Content Courses in Science** | CH 101/102: Chemistry -4  
BIO 105/106 Biology -4  
PY 131 Conceptual Physics -4  
Science Elective -3 [15 credit hours] | CH 101/102: Chemistry -4  
BIO 105/106 Biology -4  
PY 131 Conceptual Physics -4  
MEA 130 Weather and Climate -3  
PY 124 Astronomy -3  
MEA 101 Geology –3 [21 credit hours] |

| **Methods Courses in Science** | EMS 375: Methods of Teaching Science I [3 credit hours] | EMS 375: Methods of Teaching Science I [3 credit hours] |
Evidence #2

**Content Knowledge:** Evidence that demonstrates candidate depth of understanding and application of content knowledge in mathematics.

**Evidence(s):** Thinking Deeply about Mathematics

**Descriptors:** 3b.1

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**Name of Evidence:** Thinking Deeply about Mathematics: A Focus on Algebra

- Candidates will solve a set of mathematics problems that focus on Algebra. These problems are non-routine in that they may have more than one solution or more than one solution-strategy. The problems also require students to reexamine their own understandings of Algebra and think deeply about central concepts and processes. Problems require students to consider connections among different mathematical ideas, and they require candidates to use a variety of different representations and tools.

- The evidence addresses the descriptors through the criteria as follows:

  I. **Problem-solving report** (Descriptors here) – For each problem you will need to describe:

    - The “starts and stops” that occurred as you solved the problem
    - Possible “blind alleys” you pursued that you realized would not lead to a solution
    - A correct solution to the problem that you found
    - The processes you used to determine your solution is correct

  II. **Reflection** (Descriptors here) – For each problem you will reflect on your own mathematical thinking

    - Describe the mathematical ideas that you drew upon as you worked through the problem
    - Explain how you selected and used particular representations or tools and whether they were helpful to you as you solved the problem
    - Describe new understandings you developed about Algebra or new ways of thinking about ideas you previously learned as a result of solving the problem

**Sample problems:**

Joe, Mary, and Helen play a game. Whoever loses pays the other two whatever it would take to double what money they currently have. There are three rounds to this game. In round 1, Joe loses, in round 2 Mary loses. In round 3, Helen loses. After all three rounds, the three players all have $24. How much money did each player start with? Work this problem in two ways, at least one of which uses symbolic algebra.

A bricklayer is building a large base for a sign. She uses 6 blocks for the top layer and each layer below requires 8 more blocks than the layer above it. Each next number in the pattern is the total number of blocks for the sign.

A. Find the first four numbers in the pattern.
B. What is the number in the 100th step of the pattern
C. Find a recursive and explicit formula for the nth step in the pattern where n is the number of layers in the base.
Evidence #3

Pedagogical and Professional Knowledge Skills and Dispositions: Evidence that demonstrates effective design of classroom instruction based on research-verified practice.

Evidence(s): Unit Plan

Descriptors: 1a.2, 2b.3, 2d.1, 3a.1, 3c.1, 3c.2, 3d.1, 4a.1, 4a.2, 4b.1, 4c.1, 4d.1, 4e.1, 4f.1, 5c.1

Name of Evidence: **Unit Plan**

- Students will create a teaching unit that could be implemented during student teaching. The unit plan will contain information about the instructional context, at least three lesson plans, and a reflection. Lesson plans will include performance objectives from the NC Standard Course of Study (NCSCOS) and should include the relative Core Standards for the discipline. The unit plan should demonstrate a variety of instructional strategies that reflect an understanding of current pedagogy for core subjects, relevance for 21st century learners, inclusion of information, media, and technology, and which are developmentally appropriate for the age group taught.

- The evidence addresses the descriptors through the criteria as follows:

  **I. Introduction** (3a.1, 3a.2, 3b.1, 3c.1, 4b.1, 4c.1) - In this section you need to describe the context of the unit plan. This should be written in such a way that readers can “see” your class. Be sure to include the following:

  A. Instructional Context --

  o The course title and unit covered for this project
  o The number, ages, and grades of students in the class
  o The relevant characteristics of the class that influenced your planning for this instructional sequence
  o The relevant characteristics of the students with exceptional needs and abilities that influenced your planning for this instructional sequence; who was consulted regarding these students

  B. Planning

  o An overview of the topic of study and its position in the NC Standard Course of Study and the manner in which it meets the Core Standards for your discipline. *Principles and Standards for School Mathematics, 2000*
  o An overview of how the unit incorporates Learning and Innovation and 21st Century skills.
  o A description of all collaboration and resources used to plan the unit, broad learning outcomes and objectives for the unit, and any prerequisite knowledge students should have prior to the unit.

  C. Mathematical Connections

  A concept map of the mathematical topics in the unit that depicts how the ideas are related to and build upon one another.

**II. Three Lesson Plans** (3a.1, 3a.2, 3c.1, 3d.1, 4a.1, 4b.1, 4c.1, 4h.1, 4h.2) - In this section you will describe each of the three lessons in your plan. Include the title of each lesson on the lesson plan. The collective lesson plans must demonstrate the following:

- Measureable learning objectives
• Provisions for learners with special needs and evidence of consideration of a diverse student population
• Learning activities that allow students to use higher order thinking skills and creativity.
• Activities that allow for cooperative learning/collaboration
• Learning activities that allow for exploration of/through Information, Media and Technology skills
• A variety of lesson types (open-ended exploration, application and synthesis, direct instruction, guided discovery, etc.)

All lesson plans must be written with enough detail that another teacher could take your lesson plan and teach directly from it. For example, problems to be used with students must be worked out with correct answers and questions that you plan to ask during the lesson should be included.

III. Reflection (2a.1, 2b.1, 2b.2, 2b.3, 2c.1, 2d.1, 2d.2, 3a.1, 3a.2, 3b.1, 3b.2, 3c.1, 3c.2, 3d.1, 4a.1, 4b.1, 4c.1, 4d.1, 4e.1, 4f.1, 4g.1, 4g.2) - In this section you will reflect on your experiences of this unit plan as a whole. If you teach this plan, you can reflect after it is taught. Include the following:

• How do your lesson plans measure performance objectives from the NC SCOS and relate to the Core Standards?
• How does the unit relate to your students? Consider age group, developmental characteristics and linguistic levels.
• What student characteristics did you consider during your planning? Refer to learning styles, multiple intelligences, needs of exceptional students, diversity, gender, and emotional/physical/social development of your students
• How did you address students with special needs without calling attention to their needs?
• Explain how the cooperative learning activity helps students build skills in teamwork, cooperation and leadership, and how it can foster a positive classroom atmosphere.
• How did you include student use of higher order thinking skills and creativity?
• How will you manage student behavior during the lesson?

What formative assessments were conducted during the lesson to determine the extent to which students learned the material taught?

If the unit or lessons from the unit were taught, did students respond in ways that were unexpected? What modifications to the unit would you make? Why?
**Evidence #4 (State Prescribed)**

**Pedagogical and Professional Knowledge Skills and Dispositions:** Evidence that demonstrates knowledge, skills, and dispositions in practice.

**Evidence(s):** LEA/IHE Certification of Teaching Capacity

**Descriptors:** 1a.1, 1a.3, 1a.4, 1d.1, 1e.1, 2a.1, 2b.1, 2b.2, 2c.1, 2d.1, 2d.2, 3a.2, 3b.2, 3d.1, 4c.1, 4d.1, 4e.1, 4f.1, 4g.1, 4g.2, 4h.1, 4h.2, 5a.1

The LEA/IHE Certification of Teaching Capacity will be administered during the student teaching semester as part of a more extensive evaluation process at NC State University. Candidates must score at the “Met” level on all items in order to be recommended for licensure.
Evidence #5

Positive Impact on Student Learning: Evidence that demonstrates impact on student learning.

Evidence(s): Assessing Learning

Descriptors: 1a.1, 4b.1, 4h.1, 4h.2, 5a.1

Name of Evidence: Assessing learning

- Demonstrate your ability to plan, implement, and assess instruction. You will select two student responses for two different instructional prompts/activities. These should provide insight to students’ conceptual understanding of a topic within the context of instruction. You will also submit a written commentary that provides a context for instructional choices and describes, analyzes, and reflects upon your teaching of this sequence. The instructional activities should reflect the NC Standard Course of Study Objectives, the Core Standards for your discipline, and a variety of instructional strategies that demonstrate your understanding of current pedagogy, diversity, inclusion of information, media and technology, relevance for 21st century learners, and which are developmentally appropriate for the age group taught.

- Assessing Mathematical Thinking and Reasoning Project

- The evidence addresses the descriptors through the criteria as follows:

  I. Introduction (2a.1, 2b.1, 2b.2, 2b.3, 2c.1, 2d.1, 2d.2, 3a.1, 3a.2, 3b.1, 3b.2, 3c.1, 3c.2, 3d.1, 4a.1, 4b.1, 4c.1, 4d.1, 4e.1, 4f.1, 4g.1, 4g.2) - In this section you need to describe the context of your instructional sequence and activities. This should be written in such a way that the readers can “see” your class. Be sure to include the following:

    A. Instructional Context
      - The course title and unit covered for this evidence
      - The number, ages, and grades of the students in the class
      - The relevant characteristics of the class that influenced your planning
      - The relevant characteristics of the students with exceptional needs and abilities that influenced your planning; who was consulted regarding these students

    B. Planning
      - An overview of the topic of study and its position in the NC Standard Course of Study and the manner in which it meets the Core Standards for your discipline.
      - An overview of how the instructional activities incorporate Learning and Innovation and 21st Century skills.
      - A description of collaboration and resources used to plan, broad learning outcomes and objectives, and any prerequisite knowledge the students should have prior to the learning sequence.

  II. Instructional Sequence - You will need to select an instructional sequence from which you will choose student work in response to two instructional activities.

    A. The instructional sequence must be one in which students are engaged in thinking and reasoning mathematically and building understanding of a major idea in mathematics. The mathematical thinking and reasoning that you feature for this project should not be one in which students are only memorizing procedures or are otherwise involved in rote learning. If the unit concerns the learning of and use of procedures, the focus for the activities selected should relate to the reasoning behind the procedures and/or to identifying patterns to explain different approaches to problems the procedures help solve.

The instructional activities that you choose for this project must result in written documentation by individual students. You may choose instructional activities that take place during a portion of a class period, an entire class period, or multiple
class periods. What is important about this project is that you build the conceptual understanding of the mathematical idea and use what you learn from students’ responses to adjust instruction. To show how you develop understanding, you should feature two instructional activities that are clearly connected to the mathematical idea and connected to each other.

In this section you need to describe in detail the instructional sequence, your goals for your students, your planning process, and how the instructional activities you have chosen to assess a student’s conceptual understanding. Be sure to address each of the following questions:

- What was the mathematical idea covered in this instructional sequence?
- What were your learning goals for the entire instructional sequence? Be sure to justify why these goals are important for all students in your class.
- Describe the instructional sequence in detail. Be sure to include the major activities you and your students engaged in during the entire sequence (not just the two you plan to highlight in this project), and how the activities were sequenced and organized to build on students’ interests and/or prior knowledge.
- Note which activities you plan to feature in this project. How does each contribute to the students’ development of conceptual understanding of the mathematical idea? Specifically, describe the connections between each of the featured activities and the mathematical idea, as well as the connection between the two featured activities. What are specific examples of the ways the activities worked together to further your students’ thinking and reasoning about the important mathematical idea that your learning goals are based on? How do these two activities work together to allow you to assess a student’s conceptual understanding?
- What challenges are inherent in teaching this mathematical idea? What specific challenges are presented by this class as you teach this mathematical idea? How is your instruction designed to meet these challenges? Explain any modifications you made and the reasons for them.

III. Analysis of Student Work (1a.1, 1a.2, 2a.1, 2a.2, 2b.1, 2b.3, 4a.1, 4a.2, 4a.3, 4c.1, 4h.1, 4h.2, 5a.1) – Select two students whose responses give you an opportunity to discuss your practice. Choosing two students who represent different kinds of challenges may readily give you such an opportunity. Keep in mind that the focus of this evidence is on your teaching practice, not the level of your students’ performance. You should include one formative and one summative assessment. Include the following in your reflection:

A. Student selection – include a separate section for each student. In your response to the questions, refer explicitly to the two featured activities and the student’s responses to both activities to provide concrete examples to illustrate your points. Address the following questions:
   o Why did you choose this student? What particular instructional challenges does this student represent? What is important to know about this student to understand and interpret her/his responses? Describe the unique characteristics of this student as a learner and as a learner of mathematics?

B. Impact on Student Learning
   o What does this student’s work tell you about the achievement of your learning goals and his/her conceptual understanding of the material that you presented? You should show evidence that students learned the material and made progress and include examples of student work as support.
   o Describe in detail the feedback (both written and verbal) that you provided for this student and how you expect this feedback to foster the student’s growth as a learner of your subject
   o Why did you choose this student? What particular instructional challenges does this student represent? What is important to know about this student to understand and interpret her/his
responses? Describe the unique characteristics of this student as a learner and as a learner of mathematics?
  o What does this student’s work tell you about the achievement of your learning goals and his/her conceptual understanding of the material that you presented? Be sure to provide evidence from the student’s work for any claims that you make.
  o Describe in detail the feedback (both written and verbal) that you provided for this student and how you expect this feedback to foster the student’s growth as a learner of mathematics.

Impact on Student Learning

Write a reflection that includes the following:

1. Comment on your use of the target language for instruction. Include a completed Observation Form from your CT or US indicating your use of target language.
2. How did you create or simulate authentic contexts for speaking the target language?
3. How did you model respect for the differences among students to foster a positive climate that promotes second language learning for all students?
4. How did you handle error correction? Cite two activities in which you approached error correction in different ways and explain why.

IV. Reflection - In this section you will reflect on your experiences with this project as a whole and how what you learned from the student work analyses informs your subsequent instruction. Be sure to address the following:
  o What does the work of each of the two students suggest about next steps for your instruction? What is the evidence for that judgment?
  o After reviewing student responses to the activities, what would you do differently in the future (before, during or after)? What would you repeat?
  o How did you set up or modify the visual and physical aspects of the classroom to enhance student success? How did you provide equity and access to learning for all students?

• Evaluation: This evidence will be evaluated with a program rubric.
Evidence #6

Leadership and Collaboration: Evidence that demonstrates leadership and collaboration.

Evidence(s): School Improvement Plan Collaboration Project

Descriptors: 1b.1, 1b.2, 1b.3, 1c.1, 1c.2, 2e.1, 5b.1

Name of Evidence: Leadership & Collaboration

- **ELP 344 – Collaboration Project:** The College of Education (CED), as a part of its re-visioning, requires all candidates to complete 6 professional development activities over the course of their program. The CED collectively requires one specific activity for all candidates (while individual program may prescribe others) a symposium presentation of their Collaboration Project. This project demonstrates the Learning and Innovation Skills outlined in the 21st Century Skills Framework (Creativity and Innovation; Critical Thinking and Problem Solving; and Communication and Collaboration) and the candidates’ capacity to utilize professional development, identify the characteristics or critical elements of a school improvement plan, develop an initiative, use appropriate data, and collaborate with others in a collegial manner. Candidates who extend this project will have the ability to demonstrate how they seek additional professional development opportunities, extend professional networks, implement school improvement activities, and communicate with colleagues, families, and other stakeholders.

- **The evidence demonstrates the descriptors through the following:**
  Each candidate in a teacher education program will complete the Collaboration Project as the signature assignment in their ELP 344 (“School and Society”) course. Candidates will work in interdisciplinary teams (4-5 students) to develop a project to address one of the goals found in a School Improvement Plan (SIP). The College of Education (CED) will provide one or more guest speakers (principals or other) who are intimately involved with School Improvement Plans (SIP) at their school. The guest speakers may serve as consultants for one or more teams and are expected to instruct candidates on the development and deployment of a SIP. This instruction should include the development of specific goals, types of evidence expected to evaluate the goals, and assistance with evidence evaluation. Teams will be expected to develop an initiative to meet the goal (and if possible implement the project in a school). The initiative proposal should also include specific outcomes, the types of evidence to be collected, how the evidence will be evaluated and timelines. Teams will also develop a plan for informing colleagues, parents, and students describing the initiative and a sample report detailing the conclusions of the project with recommendations. To fulfill the evidence requirement each team will be expected to present their project at an annual (or semi-annual) undergraduate symposium sponsored by the CED. The symposium presentation will fulfill one of the candidates’ required six professional development activities.

- **Evaluation:** Successful completion of the project will result in the candidate meeting each of the ACCEPTABLE elements on the attached rubric. Candidates who wish to extend or implement the project can attach additional documentation to support their desire to be rated in the TARGET category. This documentation will include an actual report with the results of the implemented project, and a one-page paper describing their experiences working in PLC’s, participating in other professional development opportunities, and their participation in their professional organizations and how each of these experiences contributed to their overall goals.
Program: Mathematics Education (6-12)

Program Coordinator: Dr. Karen Hollebrands

D. The timeline for implementation.

### Program Map to 2012

<table>
<thead>
<tr>
<th>Semester/Year</th>
<th>Spring 2012</th>
<th>Fall 2011</th>
<th>Fall 2010</th>
<th>Fall 2009</th>
<th>Fall 2008</th>
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<tbody>
<tr>
<td></td>
<td>Seniors – Old Program</td>
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<td>Juniors – Old Program*</td>
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<tr>
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<td>Juniors – New Program</td>
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<td>Sophomores – New Program</td>
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<td>Students beginning in Old Program and completing in New Program will be required to take a non-credit Special Topics Seminar to complete Licensure Artifacts.</td>
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<td>Courses</td>
<td>ED 300/ED 310 Assessment</td>
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<td>EDP 304 – Redesign</td>
<td>ECI 102</td>
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<td>ELP 344 – Redesign</td>
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<td>Yr-Long Placement if Possible</td>
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*Student must complete program by Fall 2012 in order to be eligible for Old Program. Students beginning in Old Program and completing in New Program will be required to take a non-credit Special Topics Seminar to complete Licensure Artifacts.*