

LONG SIGNATURE SHEET

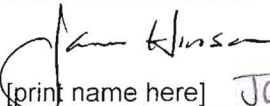





Proposal Number: REEL- 08-20-10b

Proposal Title: Establishment of a Graduate Certificate Program in Elementary School (Grades K-5) Mathematics

Originating Department: Reading and Elementary Education

TYPE OF PROPOSAL: UNDERGRADUATE _____ GRADUATE X _____ UNDERGRADUATE & GRADUATE _____
 (Separate proposals sent to UCCC and Grad. Council)

DATE RECEIVED	DATE CONSIDERED	DATE FORWARDED	ACTION	SIGNATURES
12/6/10	12/6/10	12/6/10	Approved	DEPARTMENT CHAIR  (print name here) <u>Jan Hinson</u>
12/6/10	12/6/10	1/14/11	Approved	COLLEGE CURRICULUM COMMITTEE CHAIR  Print name: <u>Jeanneine Jones</u>
NA	NA	NA	Approved	COLLEGE FACULTY CHAIR <u>NA</u> Print name:
11-14-11	2-3-11	2-3-11	Approved	COLLEGE DEAN  Print name here if signing on behalf of Dean: <u>Mary Lynne Collier</u>
			Approved	UNDERGRADUATE COURSE & CURRICULUM COMMITTEE CHAIR (for undergraduate courses)
2/4/11	3/1/11	3/18/11	Approved	GRADUATE COUNCIL CHAIR (for graduate courses) 
			Approved	FACULTY GOVERNANCE SECRETARY (noting Faculty Council approval on Consent Calendar)
				FACULTY EXECUTIVE COMMITTEE (if decision is appealed)

COPY MADE
 Grad School
 3/18/11 ap

Revised 10/20/10 OAA/cag

University of North Carolina at Charlotte

REEL 08-20-10

Revised: Graduate

Course and Curriculum Proposal from: Department of Reading and Elementary Education

Long Form Course and Curriculum Proposal:

*Establishment of a Graduate Certificate Program in Elementary School (Grades K-5)
Mathematics*

A. SUMMARY. The Department of Reading and Elementary Education proposes to add an 18-hour Graduate Certificate in Elementary School (Grades K-5) Mathematics. These courses are all part of the statewide North Carolina 18-hour add-on license for classroom teachers, mathematics coaches and others interested in developing their content and pedagogical knowledge related to elementary school mathematics. The program of study includes:

- a. ELED 6311: Number Systems & Operations: K-5 Mathematical Tasks
- b. ELED 6312: Geometry & Spatial Visualization: K-5 Assessment
- c. ELED 6313: Algebraic Reasoning: K-5 Discourse & Questioning
- d. ELED 6314: Rational Numbers & Operations: K-5 Learning Trajectories
- e. ELED 6315: Data Analysis and Measurement: K-5 Classroom Interactions
- f. ELED 6316: Mathematical Modeling: K-5 Leadership

B. PROPOSED CATALOG COPY.

Program Description: The Elementary School Mathematics Graduate Certificate Program is an 18-hour program that meets all of the requirements for the North Carolina Elementary School Mathematics Add-On License.

Admission Requirements: Individuals applying to the Graduate Certificate Program must hold a bachelor's degree from an accredited university and a valid teaching license in Elementary Education (Grades K-6) or Middle Grades Education, with a Mathematics license (Grades 6-8).

ELED 6311: Number Systems & Operations: K-5 Mathematical Tasks. (3). Analysis and construction of effective mathematical tasks in teaching number systems and operations at the K-5 level; attention is also given to the expansion of content knowledge. (*Fall, Spring, Summer*).

ELED 6312: Geometry & Spatial Visualization: K-5 Assessment. (3). Formative and summative assessment strategies of students' geometric thinking in elementary grades; Concept development of 2- and 3-dimensional Geometry. Attention also given to diagnosis of student errors. Course Prerequisites: Completion of ELED 6311 (*Fall, Spring, Summer*).

ELED 6313: Algebraic Reasoning: K-5 Discourse & Questioning. (3). Focus on the early algebra concepts of functional thinking and generalized arithmetic in relationship to pedagogical practices centered on questioning in the mathematics classroom. Course Prerequisites: Completion of ELED 6311 (*Fall, Spring, Summer*).

ELED 6314: Rational Numbers & Operations: K-5 Learning Trajectories. (3). Focus on rational number concepts through learning trajectories at the K-5 level; attention also given to problem solving and content knowledge. Course Prerequisites: Completion of ELED 6311 (*Fall, Spring, Summer*).

ELED 6315: Data Analysis and Measurement: K-5 Classroom Interactions. (3). Focus on statistical literacy of elementary teachers and the teaching of data analysis and measurement to K-5 students; attention is also given to learning methods which facilitate appropriate classroom interactions. Course Prerequisites: Completion of ELED 6311 (*Fall, Spring, Summer*).

ELED 6316: Mathematical Modeling: K-5 Leadership. (3). Generating mathematical representations and making explicit connections between concepts. Pedagogy designed to equip elementary teachers to become mathematics teacher-leaders in school settings; Focus given to topics integrated within mathematical strands. Course Prerequisites: Completion of ELED 6311, 6312, 6313, 6314, and 6315 (*Fall, Spring, Summer*).

C. JUSTIFICATION.

1. The Need for the Graduate Certificate

- a. On July 9, 2009, the North Carolina State Board of Education approved the establishment of an Elementary Mathematics Add-On License with a program of study, including six courses totaling 18 graduate credit hours, focused on the mathematical knowledge needed for successfully teaching mathematics at the elementary level. This program has been designed and is going through the course approval process at seven universities in the North Carolina system, as part of a coordinated effort between the University of North Carolina General Administration (UNCGA) and the North Carolina Department of Public Instruction (NCDPI). Courses have been designed by both Arts & Science and College of Education faculty from around the state. The coursework helps teachers build the necessary understanding of mathematics, the process of learning mathematics and children's mathematical thinking in order to be strong mathematics teachers. To ensure consistency of program, any university approved

by the UNC System to offer the program-of-study will need to include all six courses and maintain the fidelity of the course outlines.

- b. There has been a nationwide effort to deepen the knowledge and skills related to teaching mathematics in the elementary school grades. The Association for Mathematics Teacher Educators has recently published standards for Elementary Mathematics Specialists (see: http://amte.net/sites/all/themes/amte/resources/EMSSStandards_Final_Mar2010.pdf)
 - f). This program of study has been designed to address those standards.
 - c. The North Carolina Board of Education has released new Professional Teaching Standards for Advanced Licensure. This program has been designed to address those standards.
 - d. While this statewide program will be offered at 7 different institutions across North Carolina, UNC Charlotte is one of only three schools in the western part of the state (besides Appalachian State University and UNC Greensboro) who is offering the program. Due to the population of teachers in the Charlotte area, numerous public school districts, including Charlotte-Mecklenburg Schools, Cabarrus County Schools, and Union County Schools have expressed demand for this program.
 - e. These courses include course materials and topics that are equivalent with an advanced degree in Elementary Education with a focus on mathematics teaching and learning. The course numbers (6000 level) reflect that.
2. IMPACT.
- a. The program of study in this proposal will serve those that are interested in continuing their education and deepening their knowledge in content and pedagogy related to elementary school mathematics.
 - b. This program will not have an impact on other existing courses or curricula.
 - a. The courses will be able to be taught in the Fall, Spring, or Summer semesters. The courses will be offered using a cohort model, with 1 course being offered each semester until all 6 courses have been offered.
 - b. The content or frequency of offering of other courses will not be affected.
 - c. The enrollment for each course will be capped at 30 students. Expected enrollment is between 20-30 students per course.
 - d. Enrollment in other courses will not be affected. The population taking these courses is licensed teachers who would only be attending UNC Charlotte to complete the add-on licensure program.
 - e. These courses have not been offered at UNC Charlotte before.
 - f. Other areas of catalog will not be affected.

D. CONSULTATION WITH THE LIBRARY AND OTHER DEPARTMENTS OR UNITS.

1. General Education requirements
 - a. This program does not relate to General Education requirements.

2. Library consultation (attached)
3. Consultation with other departments or units
 - a. This proposed change does not affect other departments.
 - b. Not applicable
 - c. Faculty within the Department of Reading and Elementary Education unanimously elected to approve this proposal on August 20, 2010.
 - d. The Department of Mathematics and Statistics has been consulted since these courses are Education courses focused on teaching mathematics. See attached letter. These conversations resulted in them supporting that these courses should be housed in the College of Education under an ELED prefix, since the focus is on deepening teachers' knowledge and skills as it relates to elementary school mathematics.

ATTACHMENTS.

1. Consultation with Department of Mathematics and Statistics
2. Consultation on Library Holdings
3. Letter from Dr. Janice Hinson, Chair of the Department of Reading and Elementary Education

Course Outline

New or Revised Graduate Courses

COURSE NUMBER: ELED 6311

CREDIT HOURS: 3

COURSE TITLE: Number Systems and Operations: K-5 Mathematical Tasks

PROPOSED CATALOG COPY

ELED 6311: Number Systems and Operations: K-5 Mathematical Tasks. (3). Analysis and construction of effective mathematical tasks in teaching number systems and operations at the K-5 level; attention is also given to the expansion of content knowledge. (Fall, Spring, Summer).

COURSE PREREQUISITES: None

COURSE RATIONALE

This is the first of 6 courses in the 18-hour North Carolina K-5 Mathematics add-on license. Analysis and construction of effective mathematical tasks in teaching number systems and operations at the K-5 level; attention is also given to the expansion of content knowledge. Course is based on Standards from the North Carolina Professional Teaching Standards (NCPTS) and the Mathematics Specialist Standards from the Association of Mathematics Teacher Education (AMTE).

COURSE OBJECTIVES

Upon completion of this course, the successful student will be able to:

1. Understand models and interpretations of operations with whole numbers (i.e., the set of natural number and zero),
 - Having a large repertoire of interpretations of addition, subtraction, multiplication, and division and ways they can be applied,
 - Understanding relationships among operations.
2. Develop a strong sense of place value in the base-ten number system, including:
 - Understanding how place value permits efficient representation of numbers,
 - Recognizing the value of each place as ten times as large as the value of the next place to the right and the implications of this for ordering numbers and for estimation and approximation,
 - Recognizing the relative magnitude of numbers.
3. Understand multi-digit calculations, including standard algorithms, “mental math,” and non-standard methods commonly created by students, including:

- Recognizing how the base-ten (place value) structure of number is implicated in all multi-digit computations,
 - Recognizing the properties of commutativity, associativity, and distributivity as useful tools for organizing thinking about computation,
 - Developing flexibility in mental computation and estimation.
4. Understand and explain fundamental ideas of number theory as they apply to elementary grades mathematics, including:
 - Making conjectures about odd and even numbers
 - Making conjectures about divisibility rules for 2, 3, 4, 5, 6, 8, 9, and 10, providing justifications that prove or disprove the conjectures based on understanding the place value structure of our number system.
 5. Understand models and interpretations fractions, including:
 - Recognizing the multiple meanings for a fraction to represent a variety of mathematical situations (part-whole, set, division, ratio, or measurement),
 - Comparing relative sizes of fractions,
 - Exploring equivalence as a concept characteristic of work with whole numbers and with fractions.
 6. Understand the structure of the real number system, including:
 - Understanding the number line as a representation of the whole numbers and fractions,
 - Distinguishing between the additive and multiplicative principles,
 - Understanding and using field properties.
 7. Understand and use the *Mathematics Task Framework*, including
 - Distinguishing high cognitive and low cognitive demand tasks;
 - Using to framework to guide sorting and categorizing tasks
 - Connecting the use of tasks with the success of implementation (i.e., learning)
 8. Select, modify and design mathematically rich tasks to meet the developmental needs of their students,
 - Justifying how their selection of tasks aligns to students' developmental levels
 9. Consider the role of the teacher in structuring and scaffolding student learning through the use of instructional tasks, including
 - Engaging in a lesson planning protocol designed to support this role (TTLP)
 10. Identify and use methods of evaluation to aid in analysis/selection of
 - Different types of instructional tasks including tasks posed in context or through games;
 - Different purposes for instructional tasks including tasks used to introduce and/or develop concepts or to build fluency
 11. Consider the use of a two design principles to help in task creation or adaptation:
 - 'Dimensions-of-possible-variation'
 - Reversibility, flexibility, and generalizability

Overview of the Semester (1 topic per module)

1. Introduction to Mathematical Tasks
2. Base 10 and Base 4: Place Value
3. Place Value in K-2 Grades
4. Analyzing Tasks, Creating a Lesson from Mathematically Rich Tasks
5. Place Value: How to use tasks to develop conceptual understanding

6. Cognitively Guided Instruction: Developmentally-Appropriate Tasks
7. Trajectory of place value, addition, and subtraction
8. Connecting multiplication and division strategies from place value
9. Designing tasks for the four operations
10. Modifying and selecting tasks for the four operations
11. Essential Understandings of Number Sense in the K-5 Standard Course of Study/Common Core
12. Developmentally-Appropriate Instruction for Fractions
13. Creating Tasks to Develop Fraction Understanding
14. Developing Tasks that Address Multiple Content Strands
15. Final Project

ILLUSTRATIVE COURSE ASSIGNMENTS:

All written items should include a professional standard of spelling, grammar and punctuation. Cohesion of thought, clarity of expression, depth of reading, analysis of issues and relevance of discussion will need to be evident. Use of appropriate referencing style, use of headings and subtitles if necessary and reference list will be standard requirements for each assignment.

1. Assignment #1 – Task Analysis. Using curricula materials, you will use the Task Framework to analyze five mathematical tasks. For each task, you will align it to appropriate state standards, provide a critique of how well it meets the objective, the cognitive demand of the tasks, and provide suggestions for improving the task.
2. Assignment #2- Task Creation. You will identify three state standards in the Number Sense strand and design cognitively demanding tasks that align to each of those standards. For each task, you will describe how you would implement in your classroom to meet a variety of students' developmental levels.
3. Assignment #3- Place Value Research Paper. You will research, examine and analyze how students develop one aspect of understanding related to either place value or number sense.
4. Assignment #4- Final Project: Task Sequence for Developing Number Sense. Selecting one concept related to number sense, you will design a sequence of ten mathematical tasks that are developmentally appropriate and aligned to state standards. You will provide a rationale about how the tasks build upon one another and help move students towards a deeper understanding of number sense.

Course Requirements and Evaluation:

Grading: Final grade for the semester will be based on a series of written assignments, projects, test, and portfolio as shown below. Specific guidelines and grading criteria will be given over the course of the semester for each assignment. Your final grade will be determined as follows:

Assignment #1 – Task Analysis	20%
Assignment #2 – Task Creation	20%
Assignment #3 – Place Value Research Paper	30%
Assignment #4 – Final Project	30%
GRADING SCALE A: 93-100, B: 85-92, C: 77-85, Unacceptable: Below 77	

COURSE BIBLIOGRAPHY

Membership NCTM – journal choice should be *Teaching Children Mathematics*

See: <http://www.nctm.org/membership/>

Additional required readings will be made available at the Blackboard class website

Chapin, S. H. & Johnson, A. (2006) *Math Matters: Understanding the math you teach, Grades K-8 (Second Edition)*. Sausalito, CA: Math Solutions. ISBN: 978-0-941355-71-1

Research articles based upon selection of topic

COURSE EXPECTATIONS

Regular attendance: Unexcused absences are highly discouraged. More than 1 unexcused absence will negatively influence your grade. You are responsible for meeting all obligations on time and being thoroughly prepared. If you are ill and need to miss class, you are advised to find colleagues who may update you on information you may have missed during your absence.

Readings and Class participation: Due to the interactive and participatory nature of the class, attendance is expected by everyone. To participate fully, students are expected to complete the reading(s) and any class assignments in advance of the class for which the reading(s) is (are) scheduled. You are also responsible for the material covered in the reading assignments, whether it is discussed in class or not. Generally, class sessions are utilized to extend the content of the readings

COLLEGE OF EDUCATION CONCEPTUAL FRAMEWORK

Students at UNC-Charlotte use their knowledge base to become excellent professionals to teach specific content, skills and concepts including those that support literacy development of all learners across subject areas. They use best practices when making decisions about instructional strategies that support students reading and writing as they design instruction for students at the primary and secondary level. They engage in critical analysis and reflective thinking about how they implement lessons that support students' reading and writing in content areas. They are to be responsive teachers concerning instructional challenges in ways that demonstrate their respect for human differences and diverse learners. They work collaboratively with peers and clinical teachers to provide instruction that is based on their knowledge of developmental, cultural, individual, and age appropriate methods for supporting the literacy learning of students across grade levels and are expected to show leadership within their schools, classrooms and communities.

Academic Integrity: All UNCC students have the responsibility to be familiar with and to observe requirements of the UNCC Code of Student Academic Integrity (refer to the Graduate Catalogue). This code forbids cheating, fabrication or falsification of information, multiple submission of academic work, plagiarism, abuse of academic materials (such as library books on reserve), and complicity in academic dishonesty (helping others violate the code).

Plagiarism: All students are required to abide by the Code of Student Academic Integrity available on-line at <http://www.legal.uncc.edu/policies/ps-105.html>. If you violate the UNCC Code of Student Academic Integrity, formal actions will be taken. * Any violations will result in a zero for the assignment and a "U" for the course. Graduate students who receive a U will be suspending from their programs.

SPECIFIC POLICIES THAT APPLY TO THE COURSE

- Attendance Policy: Attendance is required for all class meetings.
- Student Behavior Policy: Cell phones are to be silenced for class. Laptop computers are only to be used for course-related activity.
- Inclement Weather Policy: In the case of inclement weather please visit <http://www.uncc.edu> or other local media outlets for cancellations.
- UNC Charlotte Code of Student Academic Integrity. <http://www.legal.uncc.edu/policies/ps-105.html>
- College of Education Diversity Commitment. http://education.uncc.edu/coe/diversity_statement.htm

NOTE: If both graduate and undergraduate versions of this course are to be offered, submit proposals to both the Undergraduate Course and Curriculum Committee and to the Graduate Council.

FACULTY RESPONSIBLE FOR DEVELOPING THIS COURSE OUTLINE

Drew Polly

APPROVAL BY THE APPROPRIATE COLLEGE OF EDUCATION CURRICULUM COMMITTEE:

Approved on _____ by the College Undergraduate Curriculum Committee

Date

Chair: _____

Approved on _____ by the College Graduate Curriculum Committee

Date

Chair: _____

Course Outline

New or Revised Graduate Courses

COURSE NUMBER: ELED 6312

CREDIT HOURS: 3

COURSE TITLE: Geometry & Spatial Visualization: K-5 Assessment

PROPOSED CATALOG COPY

1. *ELED 6312: Geometry & Spatial Visualization: K-5 Assessment.* (3). Formative and summative assessment strategies of students' geometric thinking in elementary grades; Concept development of 2- and 3-dimensional Geometry. Attention also given to diagnosis of student errors. (*Fall, Spring, Summer*).

COURSE PREREQUISITES: Completion of ELED 6311

COURSE RATIONALE

This is one of the 6 courses in the North Carolina K-5 Mathematics add-on license. In this course teachers will deepen their knowledge of geometry while exploring the high leverage teaching practice of assessment. Geometry topics will include: properties of two and three-dimensional shapes, congruence, similarity, geometric transformations, spatial relationships, and visualization. A focus will be placed on analyzing student thinking using the van Hiele Levels of Geometric Thinking and SOLO taxonomy. The use of clinical interviews to gather in-depth information about students' geometric thinking will be introduced to teachers and will be a key feature of one of the major projects for the course. Teachers will also learn how to diagnose and correct common student errors by analyzing student work samples and video clips of students solving geometric tasks. Formative assessment strategies that include designing and modifying tasks that build on and respond to student thinking as well as traditional and non-traditional summative assessment techniques will be applied in context of the learning and teaching of geometry and number concepts. Course is based on Standards from the North Carolina Professional Teaching Standards (NCPTS) and the Mathematics Specialist Standards from the Association of Mathematics Teacher Education (AMTE).

COURSE OBJECTIVES and STUDENT LEARNING OUTCOMES

Upon the successful completion of the course, the students will be able to do the following:

1. Determine and use appropriate assessment strategies that will measure student learning and understanding (AMTE 2a, 2c; NCPTS 1, 3).
2. Demonstrate content knowledge of geometry, specifically shapes and properties, location, transformations and spatial relationships/visualization (AMTE 1a, NCPTS 1, 3)
3. Demonstrate advanced knowledge of mathematics pedagogy related to geometry in elementary school grades (AMTE 2b, NCPTS 3).
4. Use appropriate technology to support student learning related to geometry (AMTE 2b, NCPTS 3).
5. Demonstrate the ability to help students connect the content that they are studying to their existing mathematical knowledge, to other disciplines, and to the “real” world (AMTE 2b, NCPTS 3).

Overview of the Semester (1 module per topic)

1. Introduction to geometry, VanHiele Levels of Development
2. Analyzing Student Work
3. Triangles
4. Quadrilaterals/Circles
5. Diagnosing Students’ Computational Errors
6. Transformations, Symmetry
7. Student Interviews about Counting
8. Tessellations, Patterns in Geometry
9. Nets of various 3-Dimensional Shapes
10. Categorizing 3-Dimensional Shapes
11. Area, Perimeter
12. Volume of 3-Dimensional Shapes
13. Geometry/algebra connections
14. Student Interviews about Addition and Subtraction
15. Using Data to Drive Instruction

ILLUSTRATIVE COURSE ASSIGNMENTS:

All written items should include a professional standard of spelling, grammar and punctuation. Cohesion of thought, clarity of expression, depth of reading, analysis of issues and relevance of discussion will need to be evident. Use of appropriate referencing style, use of headings and subtitles if necessary and reference list will be standard requirements for each assignment.

1. *Assignment #1: IQs* (Included in participation grade). Each student is expected to read and respond to the assigned readings with at least two ideas (I) that you learned about teaching and learning mathematics and at least two questions (Q) that you will share with the class to help guide the class discussion of the reading. We will use the IQs as we discuss the assigned readings in class. For selected classes you may be asked to bring in a favorite math activity to share and to bring copies for the class. (OBJ. 2, 3, 4)

2. *Assignment #2: Analysis/Creation* (15%) You will translate North Carolina Standard Course of Study goals and objectives into appropriate assessment activities for evaluating student learning. (OBJ. 1, 2, 3, 5)

3. *Assignment #3: Diagnostic Interviews* (15%) You will conduct three student interviews: a student using geometry tasks, early number sense (counting), and addition and subtraction. For each, you will report that student's understanding, using research to support your judgments and statements. (OBJ. 1, 2, 3, 5)

4. *Assignment #4: Content Analysis of Student Responses* (15%) You will analyze assessments to inform and improve student learning. (OBJ. 1, 2, 3, 4, 5)

5. *Assignment #5: Developing Mathematical Understanding* (20%) You will complete problem sets that focus on geometry content knowledge. (OBJ. 2)

Course Requirements and Evaluation:

Grading: Your final grade for the semester will be based on a series of written assignments, reflections, class attendance, and participation. Specific guidelines and grading criteria will be given over the course of the semester for each assignment. I reserve the right to reduce the grade on late assignments. Your final grade will be determined as follows:

Preparedness, Participation, & Attendance (Assignment #1 - IQs)	10%
Assignment #2 – Test Analysis/Creation	20%
Assignment #3 – Clinical Interview	30%
Assignment #4– Content Analysis	20%

Assignment #5 – Developing Mathematical Understanding	20%
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Grading Scale

A 93-100,

B 85-92

C 77-84

U Below 77

COURSE BIBLIOGRAPHY

Clarke, D. (1997). *Constructive assessment in mathematics: Practical steps for classroom teachers*. Berkeley, CA: Key Curriculum Press.

Chapin, S. H., & Johnson, A. (2006). *Math Matters* (2nd ed.). Sausalito, CA: Math Solutions Publications.

Assessment Standards for School Mathematics: <http://standards.nctm.org/Previous/AssStds/index.htm>

North Carolina Standard Course of Study, Common Core National Standards

Other readings made available through electronic Reserves

COURSE EXPECTATIONS

Regular attendance: Unexcused absences are highly discouraged. More than 1 unexcused absence will negatively influence your grade. You are responsible for meeting all obligations on time and being thoroughly prepared. If you are ill and need to miss class, you are advised to find colleagues who may update you on information you may have missed during your absence.

Readings and Class participation: Due to the interactive and participatory nature of the class, attendance is expected by everyone. To participate fully, students are expected to complete the reading(s) and any class assignments in advance of the class for which the reading(s) is (are) scheduled. You are also responsible for the material covered in the reading assignments, whether it is discussed in class or not. Generally, class sessions are utilized to extend the content of the readings

Clinical Hours: This course will require extensive (15 hours) of work in the public schools or public setting where children are present. This requirement must be fulfilled and documented to get full credit in the course. This experience provides the context for exploring, developing and critically reflecting upon your perceptions of teaching, learning and the institution of schooling.

COLLEGE OF EDUCATION CONCEPTUAL FRAMEWORK

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- UNC Charlotte Code of Student Academic Integrity. <http://www.legal.uncc.edu/policies/ps-105.html>
- College of Education Diversity Commitment. http://education.uncc.edu/coe/diversity_statement.htm

NOTE: If both graduate and undergraduate versions of this course are to be offered, submit proposals to both the Undergraduate Course and Curriculum Committee and to the Graduate Council.

FACULTY RESPONSIBLE FOR DEVELOPING THIS COURSE OUTLINE

Drew Polly, Reading and Elementary Education

APPROVAL BY THE APPROPRIATE COLLEGE OF EDUCATION CURRICULUM COMMITTEE:

Approved on _____ by the College Undergraduate Curriculum Committee
Date
Chair: _____

Approved on _____ by the College Graduate Curriculum Committee
Date
Chair: _____

Course Outline

New or Revised Graduate Courses

COURSE NUMBER: ELED 6313

CREDIT HOURS: 3

COURSE TITLE: Algebraic Reasoning: K-5 Discourse & Questioning

PROPOSED CATALOG COPY

ELED 6313: Algebraic Reasoning: K-5 Discourse & Questioning. (3). Focus on the early algebra concepts of functional thinking and generalized arithmetic in relationship to pedagogical practices centered on questioning in the mathematics classroom. (Fall, Spring, Summer).

COURSE PREREQUISITES: Completion of ELED 6311

COURSE RATIONALE

This course is one of six courses in the statewide add-on endorsement in K-6 Mathematics. In this course teachers will deepen their knowledge of algebraic reasoning while also examining how to establish and maintain mathematics classrooms that promote discourse about mathematical ideas. Course is based on Standards from the North Carolina Professional Teaching Standards (NCPTS) and the Mathematics Specialist Standards from the Association of Mathematics Teacher Education (AMTE).

COURSE OBJECTIVES and STUDENT LEARNING OUTCOMES

Upon completion of this course, the successful student will be able to:

1. Implement a variety of developmentally appropriate instructional strategies to assist elementary children in constructing algebraic ideas (AMTE 2; NCPTS 4)
2. Demonstrate content knowledge in K-8 algebraic thinking based upon national standards (i.e. NCSCS – North Carolina Standard Course of Study, NCTM – National Council of Teachers of Mathematics) (AMTE 1a; NCPTS 3)
3. Demonstrate an understanding of patterns, relations, and functions from a variety of perspectives (AMTE 1a; NCPTS 3)
4. Represent mathematical situations and structures using algebraic symbols (AMTE 1a; NCPTS 3)

5. Demonstrate an understanding of how to facilitate discourse to elicit algebraic reasoning in elementary classrooms (AMTE 1b; NCPTS 2)
6. Demonstrate an understanding of the assessment of algebraic reasoning in elementary classrooms through questioning and listening to students, analyzing students' written work, documenting patterns of students' thinking and planning appropriate student/teacher interactions (AMTE 1b; NCPTS 2)
7. Develop a plan to support teachers' use of higher-order questions (AMTE 3; NCPTS 1)

Overview of the Semester (1 module per topic)

Week 1 – Building a discussion based mathematics community

Week 2 – Algebra as generalized arithmetic/encouraging students to make and test mathematical conjectures

Week 3 – Generalizations and arithmetic properties including number systems

Week 4 – Making a known quantity unknown/varying a known quantity

Week 5 – The equal sign/finding missing numbers

Week 6 – Thinking algebraically with the hundred chart

Week 7 – Patterns from K through 6th Grade- What is developmentally appropriate?

Week 8 – Algebra as functional thinking through discourse and questioning

Week 9 – Developing representational tools

Week 10 – Keeping the independent variable explicit

Week 11 – Transitioning from recursive patterns to functional relationships

Week 12 – Moving from words to symbols/ Transforming arithmetic tasks into opportunities for algebraic thinking

Week 13 – Graphing Algebraic Relationships

Week 14 – Graphing Algebraic Relationships

Week 15- Final Project

ILLUSTRATIVE COURSE ASSIGNMENTS:

Weekly Reading Assignments (*SLO 1, 2 etc*)

Each week you are expected to post comments about a reading or problems I have assigned. These comments are graded on a 3-point rubric as follows:

- 3 – Response addresses the prompt with references to the readings for the week, and when appropriate, earlier readings. Opinions, observations, and/or past experiences are thoughtfully related to the readings throughout the response.
- 2 – Response addresses the prompt with references to the readings for the week. Connections between the readings and opinions, observations, and/or past experiences are present.
- 1 – Response submitted either does not address the prompt or does not refer to the readings.
- 0 – No response is submitted.

Class Participation/Attendance (*SLO 1, 2 etc*)

This course is an opportunity for you to become part of a community of learners who are committed to learning about teaching and learning through reading, writing, discussing, and collaborating. Your overall involvement in the course includes the following:

- *Intellectual risk taking*: demonstrated willingness to offer and pursue ideas and suggestions that go beyond the ordinary
- *Making connections*: demonstrated ability to connect the theoretical and the practical, to relate specific ideas to larger themes
- *Thinking clearly on paper*: demonstrated proficiency in expressing ideas, organizing information, and communicating in writing
- *Contributing to the community*: demonstrated willingness to share information and ideas with the group and to support others in their efforts to build understanding
- *Commitment to developing listening and speaking skills*: demonstrated effort to develop effective speaking skills and active listening and responding skills
- *Commitment to exploring new ways to think about teaching and learning mathematics*: demonstrated willingness to being open to trying out new ways of teaching mathematics and to allowing children opportunities to make sense of mathematics.

Midcourse Exams (*SLO 1-8*)

There will be 2 exams given that cover K-8 algebraic content, the first exam will cover algebra as generalized arithmetic and the second will cover algebra as functional thinking. Each exam will be a blend of multiple choice and open response.

Questioning & Discourse Assessment (*SLO 1-8*)

After our first FTF meeting on May 7 and before the school year comes to an end at your respective places of work, you are to spend time interacting with a small group of children (Grades K-5). Complete five student activities from your textbooks. The assessment of the activity is to be focused on discourse and questioning in developing algebraic reasoning. Prior to

each session you are to complete a planning grid. At the completion of each session, you are to record your experiences from the session. Examine each student's understanding by completing the chart, "Analyzing Students' Written Work". Write notes on the questions you asked, the discourse tools you used, and the impact they had on student understanding. Bring both the planning grids and notes to class in July so that you can share ideas with others and raise questions about what you noticed. You will submit a written reflection of the student assessments to be included in your final portfolio.

Course Requirements and Evaluation:

Grading: Your final grade for the semester will be based on a series of written assignments, reflections, class attendance, and participation. Specific guidelines and grading criteria will be given over the course of the semester for each assignment. I reserve the right to reduce the grade on late assignments. Your final grade will be determined as follows:

1. Weekly Homework Assignments	15%
2. Class Participation/Attendance	10%
3. Midcourse Exams (2)	20%
4. Questioning & Discourse Assessment	25%
5. Final Assessment (content exam/course portfolio)	30%

Grading Scale

A	93-100
B	85-92
C	77-84
U	Below 77

COURSE BIBLIOGRAPHY

Textbooks:

Blanton, M. L. (2008). *Algebra and the elementary classroom*. Heinemann: Portsmouth, NH.

Carpenter T. P., Franke, M. L., & Levi, L. (2003). *Thinking mathematically: Integrating arithmetic & algebra in the elementary school*. Heinemann: Portsmouth, NH.

Students choose ONE of these two books based on the grade level you teach:

FOR K-2: Sheffield, L. J., Cavanagh, M., Dacey, L., Findell, C. R., Greenes, C. E., & Small, M. (2002). *Navigating through Algebra in Prekindergarten – Grade 2*. Reston, VA: National Council of Teachers of Mathematics. ISBN: 0-87535-520-0

FOR 3-5: Chapin, S., Koziol, A., MacPherson, & Rezba, C. (2002). *Navigating through Algebra in Grades 3 – 5*. Reston, VA: National Council of Teachers of Mathematics.

ISBN: 0-87535-521-9

North Carolina Standard Course of Study

Other readings made available through electronic Reserves

COURSE EXPECTATIONS

Regular attendance: Unexcused absences are highly discouraged. More than 1 unexcused absence will negatively influence your grade. You are responsible for meeting all obligations on time and being thoroughly prepared. If you are ill and need to miss class, you are advised to find colleagues who may update you on information you may have missed during your absence.

Readings and Class participation: Due to the interactive and participatory nature of the class, attendance is expected by everyone. To participate fully, students are expected to complete the reading(s) and any class assignments in advance of the class for which the reading(s) is (are) scheduled. You are also responsible for the material covered in the reading assignments, whether it is discussed in class or not. Generally, class sessions are utilized to extend the content of the readings

COLLEGE OF EDUCATION CONCEPTUAL FRAMEWORK

Students at UNC-Charlotte use their knowledge base to become excellent professionals to teach specific content, skills and concepts including those that support literacy development of all learners across subject areas. They use best practices when making decisions about instructional strategies that support students reading and writing as they design instruction for students at the primary and secondary level. They engage in critical analysis and reflective thinking about how they implement lessons that support students' reading and writing in content areas. They are to be responsive teachers concerning instructional challenges in ways that demonstrate their respect for human differences and diverse learners. They work collaboratively with peers and clinical teachers to provide instruction that is based on their knowledge of developmental, cultural, individual, and age appropriate methods for supporting the literacy learning of students across grade levels and are expected to show leadership within their schools, classrooms and communities.

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SPECIFIC POLICIES THAT APPLY TO THE COURSE

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- UNC Charlotte Code of Student Academic Integrity. <http://www.legal.uncc.edu/policies/ps-105.html>
- College of Education Diversity Commitment. http://education.uncc.edu/coe/diversity_statement.htm

NOTE: If both graduate and undergraduate versions of this course are to be offered, submit proposals to both the Undergraduate Course and Curriculum Committee and to the Graduate Council.

FACULTY RESPONSIBLE FOR DEVELOPING THIS COURSE OUTLINE

Drew Polly, Reading and Elementary Education
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APPROVAL BY THE APPROPRIATE COLLEGE OF EDUCATION CURRICULUM COMMITTEE:
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Approved on _____ by the College Undergraduate Curriculum Committee

Date

Chair: _____

Approved on _____ by the College Graduate Curriculum Committee

Date

Chair: _____

Course Outline

New or Revised Graduate Courses

COURSE NUMBER: ELED 6314

CREDIT HOURS: 3

COURSE TITLE: Rational Numbers & Operations: K-5 Learning Trajectories

PROPOSED CATALOG COPY

ELED 6314: Rational Numbers & Operations: K-5 Learning Trajectories. (3). Focus on rational number concepts through learning trajectories at the K-5 level; attention also given to problem solving and content knowledge. (*Fall, Spring, Summer*).

COURSE PREREQUISITES: Completion of ELED 6311

COURSE RATIONALE

This course is one of six courses in the statewide Add-on endorsement in K-6 Mathematics. In this course teachers will deepen their knowledge of rational numbers (fractions, decimals and percents) while also examining the research and theory behind learning trajectories about mathematical concepts. Course is based on Standards from the North Carolina Professional Teaching Standards (NCPTS) and the Mathematics Specialist Standards from the Association of Mathematics Teacher Education (AMTE).

COURSE OBJECTIVES and STUDENT LEARNING OUTCOMES

Upon completion of this course, the successful student will be able to:

1. Use learning trajectories to promote the teaching and learning of rational number concepts (AMTE 1, 2; NCPTS 2, 4).
2. Identify how equi-partitioning, composing, and decomposing numbers facilitates students' understanding of rational number concepts (AMTE 1, 2; NCPTS 4).
3. Order rational numbers and describe the process for making comparison decisions (AMTE 1a; NCPTS 3).

4. Demonstrate an understanding of models and interpretations of fractions, including decimals and percents (AMTE 1a; NCPTS 3).
5. Relate fractions, decimals, and percents and articulating the inter-relationship between multiple representations and uses of rational numbers (AMTE 1a; NCPTS 3).
6. Describe conceptual models for algorithms for rational numbers including fractions, decimals, percents, and ratios.
7. Compare additive versus multiplicative reasoning (within vs. between, and integer vs. non-integer); Distinguish between additive and multiplicative thinking and analyze state standards for both types (AMTE 1a, 2; NCPTS 3, 4).
8. Use symbols and graphs to explore solutions to problems involving proportions.
9. Develop rational number tasks that align to state standards and provide a rationale for their developmental appropriateness (AMTE 2, NCPTS 2, 4).

Overview of the Semester (1 module per topic)

- 1) Learning Trajectories for Rational Number
- 2) Equipartitioning/Splitting (Part 1)
- 3) Equipartitioning/Splitting (Part 2)
- 4) Fraction as a Number: Different Representations
- 5) Fraction as a Number: Decimals
- 6) Fraction as a Number: Percents
- 7) Division
- 8) Multiplication
- 9) Ratio
- 10) Proportional Reasoning
- 11) Similarity and Scaling
- 12) Area
- 13) Volume
- 14) Designing Developmentally-Appropriate Rational Number Tasks
- 15) Learning Trajectory for Rational Number Development

ILLUSTRATIVE COURSE ASSIGNMENTS:

Assignment 1: Initial Thinking about Learning Trajectories using “Teaching Math in the Primary Grades the Learning Trajectories Approach” article and your current classroom curriculum as a guide. (SLO 1)

Assignment 2: Write short stories about understanding of fraction operations. (SLO 1, 2, 3)

Assignment 3: Abbreviated lesson study using Fosnot mini-lessons. (SLO 1, 2, 3, 4, 5)

Assignment 4: Analyzing student thinking (algorithms) using NCTM Navigations and/or NAEP student work. (SLO 1, 6-12)

Assignment 5: Final Course Assignment: Written: Select or create and implement a hypothetical learning trajectory including: learning goals, a plan for instructional activities, hypotheses of the learning process, and assessment of students' knowledge.
Discussion: Reflection on implementation of hypothetical learning trajectory (SLO 1-12)

Course Requirements and Evaluation:

Grading: Your final grade for the semester will be based on a series of written assignments, reflections, class attendance, and participation. Specific guidelines and grading criteria will be given over the course of the semester for each assignment. I reserve the right to reduce the grade on late assignments. Your final grade will be determined as follows:

Online Discussions (15%): This course is a seminar-style course, meaning your online contributions are a significant part of our class. The online writings activities serve as important springboards for class discussions and individual learning. You are expected to post your online postings within the specified deadlines. Responses to online prompts and your classmates' ideas should be thoughtful and detailed and will be evaluated with a rubric.

In-class Activities (15%): Since this course seminar-style course, in-class contributions are a significant part of our class. These activities will focus on problem solving and reflection and will be collected periodically throughout the semester.

Written Assignments (55%): These assignments are described above.

Final Exam (15%)

Grading Scale

A 93-100

B 85-92

C 77-84

U Below 77

COURSE BIBLIOGRAPHY

Fosnot, K. T. & Dolk, M. (2002). *Young Mathematicians at Work: Constructing Fractions, Decimals, and Percents*. Boston: Heinemann.

Chapin, S. H., & Johnson, A. (2006). *Math Matters* (2nd ed.). Sausalito, CA: Math Solutions Publications.

Class Web Supplements:

National Library of Virtual Manipulatives: <http://nlvm.usu.edu/en/NAV/index.html>

Cramer, K., Wyberg, T., & Leavitt, S. (2009). *Rational Number Project: Fraction Operations and Initial Decimal Ideas*. [Available at <http://www.cehd.umn.edu/rationalnumberproject/RNP2/RNP2.pdf>.]

North Carolina Standard Course of Study

Other readings made available through electronic Reserves

COURSE EXPECTATIONS

Regular attendance: Unexcused absences are highly discouraged. More than 1 unexcused absence will negatively influence your grade. You are responsible for meeting all obligations on time and being thoroughly prepared. If you are ill and need to miss class, you are advised to find colleagues who may update you on information you may have missed during your absence.

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COLLEGE OF EDUCATION CONCEPTUAL FRAMEWORK

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strategies that support students reading and writing as they design instruction for students at the primary and secondary level. They engage in critical analysis and reflective thinking about how they implement lessons that support students' reading and writing in content areas. They are to be responsive teachers concerning instructional challenges in ways that demonstrate their respect for human differences and diverse learners. They work collaboratively with peers and clinical teachers to provide instruction that is based on their knowledge of developmental, cultural, individual, and age appropriate methods for supporting the literacy learning of students across grade levels and are expected to show leadership within their schools, classrooms and communities.

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http://education.uncc.edu/coe/diversity_statement.htm

NOTE: If both graduate and undergraduate versions of this course are to be offered, submit proposals to both the Undergraduate Course and Curriculum Committee and to the Graduate Council.

FACULTY RESPONSIBLE FOR DEVELOPING THIS COURSE OUTLINE

Drew Polly, Reading and Elementary Education

APPROVAL BY THE APPROPRIATE COLLEGE OF EDUCATION CURRICULUM COMMITTEE:

Approved on _____ by the College Undergraduate Curriculum Committee
Date
Chair: _____

Approved on _____ by the College Graduate Curriculum Committee
Date
Chair: _____

Course Outline

New or Revised Graduate Courses

COURSE NUMBER: ELED 6315

CREDIT HOURS: 3

COURSE TITLE: Data Analysis and Measurement: K-5 Classroom Interactions

PROPOSED CATALOG COPY

ELED 6315: Data Analysis and Measurement: K-5 Classroom Interactions. (3). Focus on statistical literacy of elementary teachers and the teaching of data analysis and measurement to K-5 students; attention is also given to learning methods which facilitate appropriate classroom interactions. (*Fall, Spring, Summer*).

COURSE PREREQUISITES: Completion of ELED 6311

COURSE RATIONALE

This course is one of six courses in the statewide Add-on endorsement in K-6 Mathematics. In this course teachers will deepen their knowledge of data analysis and measurement, and learn developmentally-appropriate ways to develop their students' conceptual understanding of these topics. Further, students will analyze classroom environments and consider how to establish rich classroom interactions between students about mathematical ideas. Course is based on Standards from the North Carolina Professional Teaching Standards (NCPTS) and the Mathematics Specialist Standards from the Association of Mathematics Teacher Education (AMTE).

COURSE OBJECTIVES and STUDENT LEARNING OUTCOMES

Upon completion of this course, the successful student will be able to:

1. Demonstrate an understanding of the process of statistical investigation by using the PCAI Method. Posing a question, collecting the data, analyzing the data, and interpreting the results (AMTE 1a, 2; NCPTS 2, 3).
2. Examine how the PCAI Model can be applied across K-6 in developmentally-appropriate ways (AMTE 2; NCPTS 4).
3. Analyze how classroom environments can be set up to support discussion and interactions about statistical investigations (AMTE 2; NCPTS 4).

4. Distinguish different types of data, including categorical and numerical and how each should be appropriately represented (AMTE 1a; NCPTS 3).
5. Demonstrate knowledge of key statistical concepts needed to analyze each type of data, including representations, measures of center, and measures of variability (AMTE 1a; NCPTS 3)
6. Recognize the shape and important features of various distributions of data, including the normal distribution (AMTE 1a; NCPTS 3).
7. Analyze simple probability experiments by representing the possible outcomes (sample space), predicting the probability of these outcomes, and testing predictions (AMTE 1a; NCPTS 3).
8. Make explicit connections between probability concepts and state standards, while creating developmentally-appropriate activities for various grade levels (AMTE 2; NCPTS 4).
9. Investigate the common misconceptions held by students (and adults) about probability and data analysis (AMTE 2; NCPTS 4).
10. Use the process of measurement as applied to the collection of data (AMTE 1a; NCPTS 3).
11. Demonstrate understanding of key concepts related to units of measure, precision of measurements, and relationships between various units of measure (AMTE 1a; NCPTS 3).
12. Develop developmentally-appropriate lessons and supporting material to support students' understanding of measurement concepts (AMTE 2, NCPTS 1, 2, 4).
13. Apply systems of measurement using standard and metric systems, including converting between systems using benchmarks (AMTE 1a; NCPTS 3).
14. Apply appropriate techniques, tools, and formulas to determine measurements explaining why these techniques, tools, and formulas determine the measurements desired
15. Analyze classroom environments in terms of classroom interactions (language, doing mathematics, classroom culture) (AMTE 2; NCPTS 2, 4).
16. Create a plan to support their and others' establishment of a mathematically rich classroom (AMTE 2; NCPTS 1, 2, 4).

Overview of the Semester (1 module per topic)

- 16) PCAI Model
- 17) Types of Data, Collecting Data
- 18) Analyzing Data
- 19) Interpreting Data
- 20) Probability
- 21) Misconceptions about Data, Statistical Literacy
- 22) Measurement Processes
- 23) Measurement and Data Connection
- 24) Systems of Measurement
- 25) Analyzing Measurement Data
- 26) Distributions and Inference

- 27) Setting up a Mathematically Rich Classroom
- 28) Language and Vocabulary in Mathematics
- 29) Integrating Literature into Mathematics
- 30) Designing Developmentally-Appropriate Instruction

ILLUSTRATIVE COURSE ASSIGNMENTS:

Task Analysis, Development, Implementation, and Reflection (TADIR) Projects: You will be introduced to three different mathematical tasks/problems which will require you to a) explore mathematical content in depth and engage in mathematical reasoning and problem solving, b) modify the task for use in your grade level and c) teach the mathematical content of the task and implement various pedagogical strategies designed to enhance interaction in the classroom, and d) reflect on students' mathematical learning and the effectiveness of the strategies used. Each of the tasks will be introduced at an advanced level. You will be responsible for revising the task for your grade level and implementing the task in the classroom. Student samples will be used to reflect on student learning and the role that new pedagogical strategies and content depth played in mathematical understanding. You will be graded on your participation in the problem solving process, your modification of the task/lesson planning, and your reflections.

- a. TADIR Project #1 – Data Analysis
- b. TADIR Project #2 – Probability
- c. TADIR Project #3 – Measurement

Curriculum Development: You will develop a series of lessons to deepen students' conceptual understanding of data analysis, probability, or measurement. You will provide a rationale for the sequence of the lessons, and align each to state standards.

Exams: A midterm and final exam will be administered to assess the extent to which you have mastered the course objectives. Both exams will be a blend of multiple choice and open response and will be administered online; dates for the exams will be announced at the first class meeting.

Course Requirements and Evaluation:

Grading: Your final grade for the semester will be based on a series of written assignments, reflections, class attendance, and participation. Specific guidelines and grading criteria will be given over the course of the semester for each assignment. I reserve the right to reduce the grade on late assignments. Your final grade will be determined as follows:

TADIR Projects (3 at 20% each)

Curriculum Development (15%)

Mid Term (10%)

Final Exam (15%)

Grading Scale

A 93-100

B 85-92

C 77-84

U Below 77

COURSE BIBLIOGRAPHY

Chapin, S. H. & Johnson, A. (2006) *Math Matters: Understanding the math you teach, Grades K-8 (Second Edition)*. Sausalito, CA: Math Solutions. ISBN: 978-0-941355-71-1

Chapin, S., O'Connor, C., & Anderson, N. (2009). *Classroom Discussions: Using Math Talk to Help Students Learn, Grades, K-6 (Second Edition)*. Sausalito, CA: Math Solutions. ISBN: 978-1-935099-01-7.

Students choose ONE of these two books based on the grade level you teach:

FOR K-2: Sheffield, L. J., Cavanagh, M., Dacey, L., Findell, C. R., Greenes, C. E., & Small, M. (2002). *Navigating through Data Analysis and Probability in Prekindergarten – Grade 2*. Reston, VA: National Council of Teachers of Mathematics. ISBN: 0-87535-520-0

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North Carolina Standard Course of Study

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COURSE EXPECTATIONS

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- College of Education Diversity Commitment. http://education.uncc.edu/coe/diversity_statement.htm

NOTE: If both graduate and undergraduate versions of this course are to be offered, submit proposals to both the Undergraduate Course and Curriculum Committee and to the Graduate Council.

FACULTY RESPONSIBLE FOR DEVELOPING THIS COURSE OUTLINE

Drew Polly, Reading and Elementary Education

APPROVAL BY THE APPROPRIATE COLLEGE OF EDUCATION CURRICULUM

COMMITTEE:

Approved on _____ by the College Undergraduate Curriculum Committee

Chair: _____

Approved on _____ by the College Graduate Curriculum Committee

Chair: _____

Course Outline
New or Revised Graduate Courses

COURSE NUMBER: ELED 6316

CREDIT HOURS: 3

COURSE TITLE: Mathematical Modeling: K-5 Leadership

PROPOSED CATALOG COPY

2. *ELED 6316: Mathematical Modeling: K-5 Leadership*. (3). Generating mathematical representations and making explicit connections between concepts. Pedagogy designed to equip elementary teachers to become mathematics teacher-leaders in school settings; Focus given to topics integrated within mathematical strands. (*Fall, Spring, Summer*).

COURSE PREREQUISITES: Completion of the other 5 courses in the North Carolina K-6 Mathematics Add-on Endorsement Program.

COURSE RATIONALE

This course is the capstone course of the North Carolina 18-hour certificate in Elementary School Mathematics. The focus is on becoming a school-based leader in an elementary school related to mathematics instruction. Learners focus on generating mathematical representations and making explicit connections in the context of completing mathematical tasks. Course is based on Standards from the North Carolina Professional Teaching Standards (NCPTS) and the Mathematics Specialist Standards from the Association of Mathematics Teacher Education (AMTE).

COURSE OBJECTIVES and STUDENT LEARNING OUTCOMES

Upon completion of this course, the successful student will be able to:

Upon the successful completion of the course, the students will be able to do the following:

1. Generate multiple mathematical representations for a given task (AMTE 1a, 1b; NCPTS 3)
2. Make explicit connections between mathematical concepts within the context of mathematical tasks (AMTE 1a, 1b; NCPTS 3)
3. Solve mathematical tasks that integrate numerous mathematical concepts (AMTE 1a, 1b; NCPTS 3)
4. Examine and synthesize research trends in mathematics teaching and learning (AMTE 2; NCPTS 3)

5. Synthesize knowledge from previous courses to complete mathematical tasks (AMTE 1a, 1b; ; NCPTS 3)
6. Synthesize national and state mathematics standards to identify commonalities and differences (AMTE 3; NCPTS 1, 3, 5)
7. Critically examine mathematics curriculum related to the teaching of mathematical concepts (AMTE 1c; NCPTS 3)
8. Differentiate between types of assessment, citing issues, benefits and drawbacks of each (AMTE 1a, 2; ; NCPTS 3, 5)
9. Design professional development based on mathematical concepts and high-leverage pedagogies (AMTE 2; NCPTS 4)

Overview of the Semester

Unit I: Critical Issues in Mathematics

1. Foundations of Standards in Teaching Mathematics
2. Current Issues in Mathematics Teaching and Learning
3. State Issues in Mathematics Teaching and Learning
4. Leading Mathematics Teachers in an Era of High-Stakes Assessment

Unit II: Exploring the Role of Curriculum

5. Overview of Elementary Mathematics Curriculum
6. Mapping Mathematics Curriculum, Content, and Standards
7. Modifying Elementary Mathematics Curriculum
8. Alternative Assessments in Elementary Mathematics

Unit III: Effective Mathematics Teaching

9. Unpacking and Pacing the Instruction of Mathematics Content
10. Differentiating Mathematics Instruction
11. Teaching Mathematics to Diverse Learners

Unit IV: Supporting Teacher Change

12. Supporting Teacher Learning in Elementary Mathematics
13. Coaching and Mentoring Elementary Mathematics Teachers
14. Facilitating Mathematics Professional Development Workshops
15. Evaluating Teachers and Grant Writing

*Mathematical modeling will be examined in each module through the exploration, discussion and reflection of mathematical tasks.

ILLUSTRATIVE COURSE ASSIGNMENTS:

All written items should include a professional standard of spelling, grammar and punctuation. Cohesion of thought, clarity of expression, depth of reading, analysis of issues and relevance of discussion will need to be evident. Use of appropriate referencing style, use of headings and subtitles if necessary and reference list will be standard requirements for each assignment.

Assignment #1 – Critical Issues Paper (Unit 1). Given the foundation on critical issues provided in class, the student will choose an issue upon which to expand or choose a related issue upon which to investigate and report. Recommendations for the student’s educational context must be provided in the paper. (OBJ.: 4 and 6)

Assignment #2 – Analysis of Mathematics Curriculum (Unit 2). Using tasks frameworks introduced or reviewed in the course, the student will analyze a portion of a mathematics textbook for the cognitive demands of the tasks, how the text motivates and develops mathematics ideas, and to what extent the treatment of the mathematics has the potential to encourage and foster the use of multiple representations. Explicit attention is to be given to curriculum-embedded assessments. (OBJ.: 1, 2, 4, 7, and 8).

Assignment #3 – Pacing Guide (Unit 3). Pacing guide is to be developed by teams of teachers and is to be based on state and national curriculum standards, a current textbook, and recommendations from research. (OBJ.: 4, 6, and 7)

Assignment #4 – Mentoring Elementary Mathematics Teacher on Differentiation and Diversity (Unit 3). Based on best practices for professional development, and particularly models for coaching, the student will mentor an elementary mathematics teacher in using assessment data (informal and formal) to enhance student learning. Product will be a synthesis of key ideas on assessment and coaching used for the mentorship, field notes on the mentoring episodes, and a conclusion/reflection on the process. (OBJ.: 4, 8, and 9)

Assignment #5 – Proposal for a Grant to Support Mathematics Teaching (Unit 4). Student will write and submit a grant proposal designed to fill a need within her/his educational setting. Grant proposal must address either mathematics standards for learning or provide a professional development opportunity for teachers. (OBJ.: 6 or 9)

Assignment #6 – Professional Development Module (Unit 4). This is the culminating leadership activity for the course. Student will select, design, modify, etc. a sustained professional development activity and deliver a portion of it. Professional development must involve teachers or administrators and is to be research based, standards based, and have a strong mathematics focus (OBJ.: 2, 4, 6, and 9)

Assignment #7 – Portfolio of Mathematical Tasks Explored During the Semester. Mathematical tasks will be assigned, collected, and provided with feedback throughout the semester. The student will collect these tasks, ensure they are correct, provide the appropriate numbers of solutions and representations, and reflect on a subset of the tasks. (OBJ.: 1, 2, 3, and 5)

Assignment #8 – Mathematics Content Test. Comprehensive mathematics test assesses mathematical capability from each of the certificate courses. Emphasis will be on ability to solve

problems from all mathematical strands, using various problem-solving strategies, and multiple representations for modeling the mathematics. (OBJ.: 1, 2, 3, and 5)

Course Requirements and Evaluation:

Grading: Final grade for the semester will be based on a series of written assignments, projects, test, and portfolio as shown below. Specific guidelines and grading criteria will be given over the course of the semester for each assignment. Your final grade will be determined as follows:

Assignment #1 – Critical Issues Paper (Unit 1)	10%
Assignment #2 – Analysis of Mathematics Curriculum (Unit 2)	10%
Assignment #3 – Pacing Guide (Unit 3)	5%
Assignment #4 – Mentoring Elementary Mathematics Teacher on Differentiation and Diversity (Unit3)	15%
Assignment #5 – Proposal for a Grant to Support Mathematics Teaching (Unit 4)	5%
Assignment #6 – Professional Development Module (Unit 4)	15%
Assignment #7 – Portfolio of Mathematical Tasks Explored During the Semester	20%
Assignment #8 – Mathematics Content Test	20%
GRADING SCALE	
A: 93-100, B: 85-92, C: 77-85, Unacceptable: Below 77	

COURSE BIBLIOGRAPHY

- Carpenter, T., Fennema, E., & Franke, M. L. (1996). Cognitively guided instruction: A knowledge base for reform in primary mathematics instruction. *The Elementary School Journal*, 97(1), 3-20.
- Franke, M.L., Kazemi, E., & Battey, D. (2007). Understanding teaching and classroom practice in mathematics. In *F. Lester (Ed.) Second Handbook of Research on Mathematics Teaching and Learning*, (p. 225-256).
- Heck, D.J., Banilower, E.R., Weiss, I.R., & Rosenberg, S.L. (2008). Studying the effects of professional development: The case of the NSF's local systemic change through teacher enhancement initiative. *Journal for Research in Mathematics Education*, 39(2), 113-152.

Loucks-Horsley, S., Love, N., Stiles, K. E., Mundry, S. & Hewson, P. W. (2003). *Designing professional development for teachers of science and mathematics* (2nd ed.). Thousand Oaks, CA: Corwin Press. (selected chapters)

COURSE EXPECTATIONS

Regular attendance: Unexcused absences are highly discouraged. More than 1 unexcused absence will negatively influence your grade. You are responsible for meeting all obligations on time and being thoroughly prepared. If you are ill and need to miss class, you are advised to find colleagues who may update you on information you may have missed during your absence.

Readings and Class participation: Due to the interactive and participatory nature of the class, attendance is expected by everyone. To participate fully, students are expected to complete the reading(s) and any class assignments in advance of the class for which the reading(s) is (are) scheduled. You are also responsible for the material covered in the reading assignments, whether it is discussed in class or not. Generally, class sessions are utilized to extend the content of the readings

Clinical Hours: This course will require extensive (15 hours) of work in the public schools or public setting where children are present. This requirement must be fulfilled and documented to get full credit in the course. This experience provides the context for exploring, developing and critically reflecting upon your perceptions of teaching, learning and the institution of schooling.

COLLEGE OF EDUCATION CONCEPTUAL FRAMEWORK

Students at UNC-Charlotte use their knowledge base to become excellent professionals to teach specific content, skills and concepts including those that support literacy development of all learners across subject areas. They use best practices when making decisions about instructional strategies that support students reading and writing as they design instruction for students at the primary and secondary level. They engage in critical analysis and reflective thinking about how they implement lessons that support students' reading and writing in content areas. They are to be responsive teachers concerning instructional challenges in ways that demonstrate their respect for human differences and diverse learners. They work collaboratively with peers and clinical teachers to provide instruction that is based on their knowledge of developmental, cultural, individual, and age appropriate methods for supporting the literacy learning of students across grade levels and are expected to show leadership within their schools, classrooms and communities.

Academic Integrity: All UNCC students have the responsibility to be familiar with and to observe requirements of the UNCC Code of Student Academic Integrity (refer to the Graduate Catalogue). This code forbids cheating, fabrication or falsification of information, multiple

submission of academic work, plagiarism, abuse of academic materials (such as library books on reserve), and complicity in academic dishonesty (helping others violate the code).

Plagiarism: All students are required to abide by the Code of Student Academic Integrity available on-line at <http://www.legal.uncc.edu/policies/ps-105.html>. If you violate the UNCC Code of Student Academic Integrity, formal actions will be taken. * Any violations will result in a zero for the assignment and a “U” for the course. Graduate students who receive a U will be suspending from their programs.

SPECIFIC POLICIES THAT APPLY TO THE COURSE

- Attendance Policy: Attendance is required for all class meetings.
- Student Behavior Policy: Cell phones are to be silenced for class. Laptop computers are only to be used for course-related activity.
- Inclement Weather Policy: In the case of inclement weather please visit <http://www.uncc.edu> or other local media outlets for cancellations.
- UNC Charlotte Code of Student Academic Integrity. <http://www.legal.uncc.edu/policies/ps-105.html>
- College of Education Diversity Commitment. http://education.uncc.edu/coe/diversity_statement.htm

NOTE: If both graduate and undergraduate versions of this course are to be offered, submit proposals to both the Undergraduate Course and Curriculum Committee and to the Graduate Council.

FACULTY RESPONSIBLE FOR DEVELOPING THIS COURSE OUTLINE

Drew Polly, Reading and Elementary Education
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<p>APPROVAL BY THE APPROPRIATE COLLEGE OF EDUCATION CURRICULUM COMMITTEE:</p>
--

<p>Approved on _____ by the College Undergraduate Curriculum Committee</p> <p style="text-align: center;">Chair: _____</p> <p>Approved on _____ by the College Graduate Curriculum Committee</p>
--

Chair: _____

To: Drew Polly, Dept. of Reading & Elementary Education
From: Judy Walker, Education/Curriculum Materials Librarian

Date: August 16, 2010

RE: Consultation on Library Holdings

Course/Program: Elementary School Mathematics K-6 Add-On License Program

Summary of Librarian's Evaluation of Holdings:

Evaluator: Judy Walker Date: August 16, 2010

Please Check One:

Holdings are superior _____

Holdings are adequate X

Holdings are adequate only if Dept. purchases additional items. _____

Holdings are inadequate _____

Comments:

There are ample resources to support the courses.



UNCCCHARLOTTE

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Department of Mathematics and Statistics
College of Arts & Sciences
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Fax: (704) 687-5415
email: math@math.uncc.edu

August 20, 2010

TO: Drew Polly, Assistant Professor, Dept. of Reading and Elementary Education, College of Education

FROM: Vic Cifarelli^{ALG}, Coordinator, Mathematics Education, Department of Mathematics & Statistics

RE: Elementary Mathematics Specialist Program (NC K-6 Math Add-On Credential)

We have examined the course proposals that you provided and have offered suggestions. The Department of Mathematics & Statistics is supportive of the effort. Please contact me if you require further information.

CC: A. Dow
K. Harris