**Rev 2012-13**

I. Educ 363: Teacher Laboratory – Elementary Methods Math Component

II. 1.5 Credit Hours

III. Course Description:

The Teacher Laboratory emphasizes preparation for the teaching of mathematics, science, social studies and music along with general methods, technology competency and orientation to teaching. The student is involved with others in the process of continual development of attitudes, knowledge and skills needed by classroom teachers as they plan, present and evaluate their lessons and class management. Development of attitudes conducive to projection of a professional image is also an important part of the laboratory experiences. The course consists of in-class sessions and some self-paced learning. It is designed to assist prospective teachers in making the transfer from the role of student to the role of teaching professional. The course requires a 40 hour per week commitment.

IV. Place of Course in the Curriculum: This course is a math methods component which enhances the student teaching experience.

V. Goals and Objectives:

Goals – The mathematics component of Teacher Lab has several purposes. First, it acquaints the teacher candidate with methods that are peculiar to the teaching of arithmetic/mathematics. Second, it provides practice for the teacher candidate in using materials that aid students in mathematics understanding. Finally, it brings the teacher candidate in contact with those organizations, institutional theories, and trends in mathematics which are currently producing change in mathematics education.

Objectives – Upon completion of this course, the teacher candidate will be able to:

1. Identify the major professional organizations in mathematics and list the contributions and spheres of influence of each. Included in these are: (T5, LD3, LD7)
    i. The National Council of Teachers of Mathematics
    ii. The Nebraska Association of Teachers of Mathematics

2. Explain the current reforms in mathematics education and the contributions of the National Council for Teachers of Mathematics, the National Research Council, and the Common Core Standards.

3. Explain in detail the current theories on how students learn mathematics, such as those espoused by Piaget and Dienes, and list

activities that can be used in teaching students, taking these theories into account. These should include: (T6, T8, T9, LD3, LD4, LD8, LR2, LR4, LR7)

i. Sequencing
ii. Patterning
iii. Exploring for relationships
iv. Going from concrete to abstract

4. Write a thorough lesson plan which includes conceptual, and when applicable, procedural knowledge for the mathematical topic at hand. This lesson should also include different levels of questions, modification for gearing up and gearing down the lesson, and assessment.

5. Use several different methods to teach addition, subtraction, multiplication and division of whole numbers, decimals, and integers, with special adaptations for children with different abilities. These should include: (T2-T6, T8, T9, LD1-LD4, LD8, LR2, LR4, LR7)

i. Partial sums
ii. The nines complement in subtraction
iii. The lattice method for multiplication
iv. Repeated multiplication and subtractions for division
v. Casting out nines for checking

6. Analyze component skills needed to successfully use current algorithms for addition, subtraction, multiplication, and division. (T1, T2, T3, T5, T6, T8, T9, LD1, LD3, LR&)

7. Identify the different meanings of addition and subtraction. These should include:

i. Join/Separate
ii. Part-part-whole
iii. Comparison

8. Identify the different meanings of multiplication and division. These should include:

i. Repeated addition/subtraction
ii. Partition
iii. Comparison
iv. Combinations

9. Estimate answers. These should include: (T2, T3, T5, T6, LD2, LR4, LR6, LR7)

    i. Rounding numbers
    ii. Metric and English measures

10. Identify necessary problem solving skills and list activities that can be used in teaching students problem solving skills with special adaptations for children with different abilities. These should include: (T1-T6, T8, T9, LD2, LD3, LD4, LD6, LD8, LR4, LR6, LR7, Rule 20/005.10)
    i. Reading maps, graphs and charts
    ii. Looking for patterns
    iii. Selecting relevant facts
    iv. Drawing pictures
    v. Examining "open ended" questions
    vi. Knowing "undoing" operations
    vii. Bar models
    viii. Polya's four steps to problem solving

11. Locate the Nebraska state and Common Core the scope and sequence of the math content presented in each of the elementary grade levels as contained in most textbook series. (T6, T8, LD3, LR5, LR7)

12. Use various modes of visualizing math instruction. These should include: (T2, T4,T8,LR7)
    i. Powerpoint presentations
    ii. Overhead presentations

13. Identify and use a number of common mathematics audio-visual aids. These should include: (T2,T4, T6, T8, LD8, LR7)

    i. Mira
    ii. Geoboard
    iii. Cuisinaire rods
    iv. Calculator

14. List sources of elementary math activities and use these in their student teaching. These should include: (T2,T4,T5,T8,LD1,LD3,LD4,LR7)
    i. "The Arithmetic Teacher"
    ii. "Science and Arithmetic"
    iii. Textbook resource materials

15. Include reading and writing as an integral part of the mathematics curriculum.

16. Demonstrate knowledge and understanding of the concepts, skills, and processes of reading , writing, science, social studies, and math as defined in the Nebraska Content Standards for first, fourth, eighth, and twelfth grades. (T2, LD1, LD2, LR7)

VI. Content and Methodology:

Content

1. Professional Organizations – The major professional organizations in mathematics and their publications are examined in some detail. Special emphasis is placed on the NCTM magazines: Teaching Children Mathematics; The NCTM Yearbook; and The Research in Mathematics Education Journal. (T5, LD3, LD7)
2. NCTM Standards – The whole session is spent examining former NCTM guidelines, then the new NCTM standards. Special emphasis is placed on the areas of mathematics that are undergoing changes because of these standards. (T6,T8, LD3, LR5, LR7)
3. How Students Learn Math – The contributions of Jean Piaget, Zoltan Dienes, and others to the learning of mathematical concepts are explored. A video demonstrating a constructivist math classroom (Kamii) is viewed and discussed. (T6, T8, T9, LD3)
4. The Curriculum – The teacher candidate examines elementary math texts and other materials produced by publishers. Emphasis is placed on scope and sequence; flexibility of material for the slow and rapid learner and adjustment to different cultures, attractiveness and durability of texts; compatibility of material to mathematics learning theory; review and enrichment activities. (T1-9, LD1-3,LR7, LR5)
5. The teacher candidate reviews addition, subtraction, multiplication and division of integers using a variety of methods of checking and solving including adaptations for the physically handicapped and slower student.
6. Methods for adding, subtracting, multiplying, dividing, converting, reducing and ordering rational numbers and decimals including adaptations for students of different degrees of ability are introduced and reviewed. (T1-9, LD1-3, LR4,7)
7. Activities that help the elementary student develop problem solving skills, including deductive and inductive reasoning are introduced and discussed. A number of these are actually

tried in the class by the teacher candidates so that they can get a "feel" for these activities. (T1-6, 8,9, LD 1-4, 8, LR 4,6,7)

8. Activity materials unique to mathematics in the elementary school are introduced and tried by the teacher candidates. (T2, 4,6,8;LD8:LR7)
9. Proper care of math materials, including calculators, blackboards, etc., are explained. Writing on the board, drawing geometric figures and perspective using construction tools are explained and practiced. (T2,4,8;LR7:LR8)
10. Evaluation of student progress using teacher made and standardized tests, homework, study sessions, etc., are discussed. Includes discipline problems peculiar to math classes. (T1-3, 5,6,8,9;LD 1-3, LR 2,7)

Methodology (T1, T2, T5, LD2, LD3, LD9, LR2)

1. Modeling
2. Demonstration
3. Lecturing
4. Video
5. Simulation
6. Examination and review of sample materials
7. Manipulation of learning aids
8. Practice of each skill to be taught
9. Analysis and evaluation activities
10. Clinical analysis of lessons planned and taught by candidates
11. Small group activities

VII. Student Roles:

1. Teacher candidates will find and describe in writing eight examples of activities contained in the texts that they feel are good and tell why, taking into account such factors as Piaget's conservation theory. (T6,8:LD3)
2. The student will write a thorough and detailed lesson plan which includes conceptual, and when applicable, procedural knowledge for the mathematical topic at hand. This lesson should also include an anticipatory set, different levels of questions, modification for gearing up and gearing down the lesson, and appropriate assessment.
3. Student is required to compile a worksheet demonstrating his mastery of methods of checking and solving addition, subtraction, multiplication and division of integers and adaptations for handicapped or slower students. (T1-9;LD1-3;8, LR4,7,6;LD2,3,6,8)

4. The teacher candidate completes a worksheet demonstrating his mastery of methods for adding, subtracting, multiplying, dividing, converging, reducing and ordering rational numbers and decimals and adaptations for various degrees of ability. (T1-9, LD 1-3, 8;LR4)
5. The teacher candidate completes a number of activities during class to demonstrate understanding of the meanings of addition, subtraction, multiplication and division.
6. The teacher candidate reviews current elementary texts and shares with the class those which were found to be of value. (T6,8,9;LD3, Rule 20/005.10)
7. Teacher candidates work in groups examining math activities catalogs, determining how they would spend a given amount of money on aids for their classrooms, then justifying their selections in the light of what they know about current theory and trends in the mathematics learning. (T2, 6,8;LD8;LR7)
8. Each teacher candidate finds a math activity online or in some magazine such as "Teaching Children Mathematics," constructs this activity and shares it with the class, also providing handout descriptions to other members of the class. (T2,4,5,8;LD 1,3,4;LR7, Rule 20/005.10)

VIII. Evaluation:
Grades are based on active engagement and professionalism expectations.

IX. Bibliography:

The National Council of Teachers of Mathematics. The Arithmetic Teacher. Research in Mathematics Education. Year Books. Curriculum and Evaluation Standards. The Mathematics Teacher. Washington, D.C.

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Reys, R. E., Lindquist, M.,Lambdin, D.V. & Smith, N.L. *Teaching Children Mathematics.*(9th ed.). Wiley.

Riedesel, C. Alan. Teaching Elementary School Mathematics. 5th ed. 1990.

Van de Walle, J. Elementary and Middle School Mathematics: Teaching Developmentally. NY: Allyn & Bacon, 2004.

Various elementary mathematics textbook publishing companies.