University of Houston College of Education
COLLABORATION FOR LEARNING & LEADING

CUIN 7333: Developing Algebraic Thinking

Standard II: Patterns and Algebra: The Master Mathematics Teacher understands and applies knowledge of patterns, relations, functions, algebraic reasoning, analysis, and the vertical alignment of patterns and algebra to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]).

Standard VI: Instruction: The Master Mathematics Teacher applies knowledge of mathematical content, uses appropriate theories for learning mathematics, implements effective instructional approaches for teaching mathematics, including teaching students who are at-risk, and demonstrates effective classroom management techniques.

Standard VII: Creating and Promoting a Positive Learning Environment: The Master Mathematics Teacher demonstrates behavior that reflects high expectations for every student, promotes positive student attitudes towards mathematics, and provides equitable opportunities for all students to achieve at a high level.

Standard VIII: Assessment: The Master Mathematics Teacher selects, constructs, and administers appropriate assessments to guide, monitor, evaluate, and report student progress to students, administrators, and parents, and develops these skills in other teachers.

Standard IX: Mentoring and Leadership: The Master Mathematics Teacher facilitates appropriate standards-based mathematics instruction by communicating and collaborating with educational stake-holders; mentoring, coaching, exhibiting leadership, and consulting with colleagues; providing professional development opportunities for faculty; and making instructional decisions based on data and supported by evidence from research.

T.E.K.S. addressed: (4.6) & (4.7); (5.5) & (5.6); (6.3 – 6.5); (7.3 - 7.5); (8.3 – 8.5); (A.1 – A.11)

Course Description and Assessment Methodology for Course Objectives

CUIN 7333, Developing Algebraic Thinking, is designed for Curriculum and Instruction M.Ed and Ed.D students seeking an emphasis in mathematics education. It is designed to help gain expertise and leadership regarding how children develop algebraic concepts and the corresponding instructional and assessment practices that facilitate this development. It is also designed to expand students' understandings of variables, expressions, equations, inequalities, relations, and functions. Small-group algebra-related activities involving appropriate uses of technology, electronic discussions, student presentations, and analysis of practice-related artifacts are important instructional strategies that will be utilized in this course.

The Student of CUIN 7333 will	Key Course Assignments
Understand and use mathematical reasoning to identify, extend, and analyze patterns and understands the relationships among variables, expressions, equations, inequalities, relations, and functions, using technology as appropriate. Understands and uses linear and quadratic functions and relations to model and solve problems using a variety of methods, including technology Understand and use nonlinear functions and relations, including polynomial, absolute value, trigonometric, rational, radical, exponential, logarithmic, and piecewise-defined functions, to model and solve problems using a variety of methods, including technology. Understand and use the conceptual foundations of calculus related to topics in	Graded HW 3-5 Mathematics Assessments Midterm Exam Final Exam

middle school mathematics.	
Plan and design effective instruction and assessment based on knowledge of how all students, including students who are at-risk, learn and develop patterns and algebra concepts, skills, and procedures.	TEKS Alignment Lesson Plan Analysis Unit Exam Analysis Task-based Interview Video Analysis (Fall & Spring semesters only) Midterm Exam/Final Exam
Implement a variety of instruction and assessment techniques to guide, evaluate, and improve students' learning of patterns and algebra concepts, skills, and procedures.	
Understands different coaching models (cognitive, peer, content-focused, etc.)	Coaching Case Study

Mathematics Assessments (Competencies 6-10, 24 & 25): 3-5 mathematics assessments

Mathematics Education Assignments (Competencies 11 & 12)

TEKS Alignment: In collaborative teams, teachers examine and critique the K-12 TEKS regarding algebraic concepts in light of 1) recommendations by the National Council of Teachers of Mathematics *Principles and Standards*, 2) current research about how children develop algebraic concepts and 3) as it relates to the development of proportional reasoning concepts. In addition, where applicable, they participate in activities of examining TAKS items designed to measure said TEKS (e.g., Chauvot & Benson, 2008).

> Criteria to assess the TEKS Alignment Assignment: This assignment is evaluated on the extent to which the MMT candidates accurately identify strengths and weaknesses of the TEKS, provide rationales supported by relevant research, and to correctly identify proportional reasoning concepts.

Lesson Plan Analysis: MMT candidates will submit and exchange their own lesson plans from practice. They then collaboratively analyze submissions in light of course readings about how children learn the respective content.

> Criteria to assess the Lesson Plan Analysis Assignment: This assignment is evaluated on the extent to which the MMT candidates accurately identify strengths and weaknesses of the lesson plans and to which they provide rationales supported by relevant research.

Unit Exam Analysis: MMT candidates submit and exchange unit exams from practice. They examine and apply frameworks (e.g., Kastberg (2003)) for analyzing classroom assessments. They submit the analysis, the test and suggested revisions.

> Criteria to assess the Unit Exam Analysis Assignment: This assignment is evaluated on the extent to which the MMT candidates accurately classify the items and to which they provide appropriate revisions.

Task-Based Interview: Drawing from the TEKS Alignment Assignment (above), MMT candidates conduct and analyze an audio-taped task-based interview with a grade 4-8 child that relates to both development of proportional reasoning concepts and algebraic concepts. Equipment for this assignment is available in the College of Education CITE lab.

Criteria to assess the Task-Based Interview Assignment: This assignment is evaluated on the extent to which the MMT candidates support claims about the child's thinking with evidence from the interview and the extent to which the MMT connects the child's thinking to relevant literature.

Video Analysis: The MMT candidate captures 20-40 minutes of his or her instructional practices and analyzes his or her teaching in terms of criteria brought forward in the respective course. Equipment for this assignment is available in the College of Education CITE lab.

Criteria to assess the Video Analysis Assignment: This assignment is evaluated on the extent to which the MMT candidates address relevant criteria and support claims about the instruction with evidence from the video.

Coaching Case Study: In pairs, the MMT candidates submit a brief report summarizing different coaching models. Having created and reflected upon video of own practices (in an earlier assignment), the MMT participates in a peer-coaching experience, under the supervision of UH faculty. The MMT pairs conduct and audiotape pre-observation interviews, exchange video, "observe" one another (via video) and conduct a post-observation interview. Each candidate submits a log and a report, which includes an analysis of digitally audio-taped interviews.