George Mason University
FAST TRAIN Program
EDUC 513: TEACHING ELEMENTARY MATHEMATICS IN INTERNATIONAL SCHOOLS
(3 credits)
Summer 2012

Instructor	Corinne Magee	Class Meets	8:30-3:20, July 18th- July 27th
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I. Course Description

This course is an introduction to methods for teaching developmentally appropriate topics in numbers and operations, algebra, geometry, measurement, and data analysis and probability to students in international schools. Students focus on mathematical thinking in an activity-based, workshop-oriented experience. Students work with manipulatives and technology to explore mathematics, solve problems, and learn ways to teach mathematics content to elementary children. This course is approved for the sequence of courses in the George Mason University IB certificate program. Field experience is required.

II. Student Outcomes

This course will enable students to:

A. Know what constitutes the essential topics in K – 6 mathematics in international schools.
B. Identify and use selected manipulatives and technology such as Linking Cubes, Attribute Blocks, Geoboards, Base-10 Blocks, Fraction Circles, Tangrams, calculators, and computers to teach appropriate mathematics content topics in K - 6.
C. Implement standards-based lessons using a variety of instructional strategies and techniques (cooperative and peer group learning, activity centers, laboratories and workshops, teacher-directed presentations, etc.) to teach diverse learners.
D. Identify and use alternative methods for assessing students' work in mathematics in K - 6.
E. Solve problems in the mathematical content areas of number and number theory, geometry, algebra, probability, and statistics appropriate for adaptation to K - 6.
F. Know and explain what is a standards-based mathematics curriculum, what are the key elements of the National Council of Teachers of Mathematics Principles and Standards for School Mathematics, and what are the key elements of the Virginia Standards of Learning for Mathematics.

III. Relationship to Program Goals and Professional Organizations

Student Outcomes Referenced to Selected National Standards

Course Student Outcomes (above)	NCTM Principles and Standards	ISTE NETS	INTASC
A	S1, S2, S3, S4, S5	SI	P1, P7
B	S10	SII	P1, P2, P6
C	P1, P2, P3, P4, P6	SII	P1, P2, P3, P4
D	P5	SIV	P3, P8
E	S1, S2, S3, S5, S6	SI	P4, P6
F	S1-10, P1-6	SI	P1, P7, P9

Key:
NCTM Principles and Standards = National Council of Teachers of Mathematics Principles and Standards for School Mathematics (2000), where P = principles and S = standards.
ISTE NETS = International Society for Technology in Education National Education Technology Standards 2000, where S = standard number
INTASC = Standards for Licensing Beginning Teachers, where P = principles

College of Education and Human Development Core Values

In the context of an enduring college-level and university-level commitment to teaching, research and service, the College of Education and Human Development also holds the following Core Values: Collaboration, Ethical Leadership, Innovation, Research-Based Practice and Social Justice.

The following CEHD Core Values are in alignment with the program assessment of the Math Content Assessments and the Student Mathematics Interview and Action Plan:

- Research Based Practice
- Innovation

Visit http://cehd.gmu.edu/values/ for complete descriptions and examples of each value.

Primary Years Programme Areas and Domains Relevant to Teaching K-6 Mathematics in International Schools

Course	Curriculum	Teach/Learn	Assessment	Professional
Teaching Elementary Mathematics in International Schools	A	E, F, G, H	I, J, M	N, O

Area of inquiry 1: Curriculum processes

A: International education and the role and philosophy of the IBO programmes

What is international education and how does the IBO's mission and PYP philosophy promote it?

A consideration of aims and development of international education, the values and mission of the IBO and the beliefs and values of the PYP programme including the:

- PYP perspective on internationalism
- the centrality of the learner profile
- criteria for assessing international mindedness in the school environment.

Area of inquiry 2: Teaching and learning

E. Learning theories, strategies and styles

What is constructivist learning and how is this exemplified in PYP practice?

- the centrality of structured, purposeful inquiry and the engagement of students actively in their own learning.
- the role of the planner in supporting the planning and development of authentic PYP transdisciplinary learning.
- the value and role of collaboration and reflection in the development of authentic PYP transdisciplinary learning.
- criteria for the planning and evaluation of the effectiveness of authentic PYP transdisciplinary learning.

F. Teaching methodologies and the support of learning

What learning activities and teaching strategies support PYP learning outcomes?

- The centrality of using a range and balance of teaching strategies that incorporate student inquiry as an integral part of the learning process and demonstrate appropriate teaching strategies to develop meaningful and relevant inquiry.

G. Differentiated teaching strategies

How does the PYP enable the learning needs of all students to be supported?

An appreciation of how differing teaching strategies impact and address the needs of students:

- with different levels of competency, types of ability, learning styles and learning difficulties
- for whom the language of instruction is not the mother tongue.

H. Selection and evaluation of teaching and learning materials

What learning resources support PYP practice and how are they selected?

Criteria for the selection and evaluation of appropriate teaching and learning resources to:

- support the achievement of PYP learning outcomes
- represent multiple perspectives and diverse cultures that exist in school and global communities
- meet the needs of students operating in languages other than their own
- meet the needs of students with special learning needs.

Area of inquiry 3: Assessment and learning

I. The principles of assessment

What is the role of assessment in PYP practice?

J. Developing assessment strategies

How are assessment strategies designed and implemented to support PYP practice?

- strategies enable effective assessment of broad and specific PYP learning outcomes.
- strategies enable evidence from a variety of contexts to be gathered using a range of techniques according to the nature of what is being assessed.

M. Effective feedback

How is student-learning progress effectively communicated to students and parents?

The design and implementation of alternative procedures for:

- recording authentic student achievement
- providing feedback to students and parents about learning progress and outcomes.

Area of Inquiry 4: Professional Learning

N. The principles and processes of reflective practice

What is reflective practice and how it supports programme implementation and enhance PYP practice?

- the process of reflective practice and its role in improving teaching and learning in the PYP context.
- current standards and practices pertaining to the implementation of PYP programme.
- current innovations and ideas in the area of international education and other educational contexts and how these can apply to enhancing the implementation of the PYP.
- PYP authorization and evaluation processes.
- PYP curriculum review process.

O. Collaborative working: planning, implementation and evaluation

What is the role of collaborative working practice in supporting the PYP learning outcomes?

The PYP programme requirements regarding the desirability of effective collaborative planning, instructional design and evaluation in that they:

- address assessment issues throughout the planning process
- address all of the essential elements (concepts, skills, knowledge, attitudes and action)
- emphasize the connections between transdisciplinary and subject disciplinary teaching and learning
- recognize a variety of levels of language competency
- accommodate a range of individual learning needs and styles

IV. Texts

Required:

Reys, Lindquist, Lambdin, & Smith. (2012). *Helping Children Learn Mathematics*, 10th edition, New York: John Wiley & Sons, Inc.

Recommended:

Ashlock. (2010). *Error Patterns in Computation: Using Error Patterns to Improve Instruction*, 10th edition, Upper Saddle River, NJ: Pearson.

V. Course Requirements and Assignments

Assignments are intended to further your understanding of mathematics and what it means to teach and learn mathematics in light of current reforms in mathematics education. Assignments are due by midnight on the day which they are due. Electronic submissions are acceptable and must meet the midnight deadline as well. All assignments are to be turned in to your instructor on time. **LATE ASSIGNMENTS**: Late work will not be accepted for full credit. If the student makes prior arrangements with the instructor, assignments turned in late will receive a 10% deduction from the grade per late day or any fraction thereof (including weekends and holidays).

Exams (40%)

The errors pattern exam will focus on your ability to identify children's errors in computation for the purpose of improving mathematics instruction. The content exam will consist primarily of computation and problem-solving questions that focus on mathematics content and pedagogy throughout elementary grades.

July 26, July 29

Field Experience (10%)

Field experience documents (signed logs of hours and signed teacher recommendation) will be part of your final grade. Grades are held until all documents are sent to your instructor; failure to complete your field work will make you ineligible to register for your next class. See field experience information sheets for more information.

Due: March 15, 2012

Lesson Plans (20%)

- You are required to design and write three lesson plans. One of the lesson plans must be presented in class to fellow students. The format for designing your lesson plan will be provided.
- Plan lessons with a problem solving approach. Focus on the integration of mathematical tools (manipulatives, calculators, computers) and representations (concrete, visual, symbolic) to provide children with an interactive, conceptually based mathematics experience.

  Due: July 29, 2011

Participation and Attendance (10%)

- **Participation**: You will share ideas on student error patterns, required course readings, and technology during class sessions. You will participate in class activities such as problem solving and concept mapping during class time. These assignments require your active engagement in class sessions; therefore, there is no opportunity to "make-up" these assignments.
- **Attendance Policy:** FAST TRAIN students are expected to attend *all* class periods of courses for which they register. In-class participation is important not only to the individual student, but to the class as whole. Class participation is a factor in grading; instructors may use absence, tardiness, or early departure as de facto evidence of nonparticipation and as a result

lower the grade as stated in the course syllabus (Mason Catalog). Each unexcused absence will result in a 12.5 point (out of 100) deduction from the student's participation grade Two points will be deducted from the student's participation grade for each hour he/she is late, up to a total of 12.5 points.

Student Assessment Interview (20%)

Teacher Anthology and PBA's:

The Teacher Candidate Anthology (TCA) is designed to be a collection of performance-based tasks that are valid samples of candidate work throughout the program. It documents the individual's knowledge, skills, dispositions and ability to teach. Further it documents the candidate's ability to positively influence PK-6 student learning. Its purpose is to assess the attainment of the Interstate New Teacher Assessment and Support Consortium (INTASC) standards and to provide an avenue for growth and reflection.

All FAST TRAIN licensure courses have a required Performance Based Assessment (PBA). The required PBA for this course is a student assessment interview. In order to plan effective instruction, you will need to know how to assess children's knowledge of mathematical concepts. One way to assess children's thinking is a diagnostic interview. This assignment has two parts: (1) Design a plan for the interview, assessing a specific mathematics topic using concrete, pictorial and abstract representations, (2) Conduct the interview with a child and write a report describing the outcome of the interview. Your PBA must be submitted to TASK STREAM, where it will be reviewed and graded, in order to receive credit. **Due March 15, 2010**

Additionally, students are required to submit both a mid-point anthology reflective paper after completing three licensure courses and a final reflective after completing the final licensure courses. Both the mid-point and final anthology will be posted to Task Stream for scoring. Future registrations will be effected if this requirement is not met by the due dates indicated in the guidelines. Please see the FAST TRAIN website: http://gse.gmu.edu/fasttrain/programs_of_study/elementary/ for more guidelines about the anthology requirement.

VI. Evaluation Schema

Determination of the Final Grade:

Graduate Grading Scale

A+	100%
A	94-99%
A-	90-93%
B+	85-89%
B	80-84% (no B- grades)
C	70-79% (does not meet licensure requirements or Level I award recommendation)
F	Below 70% (does not meet requirements of Graduate School of Education)

The mathematics education courses in FAST TRAIN's Elementary Education Program integrate pedagogy and mathematics content appropriate for the elementary school grades. To earn a grade of A in the course, you must demonstrate excellence in *both* the pedagogical knowledge and the content knowledge of the mathematics appropriate at your level of teaching. Thus, the grading in the course is structured to help fairly evaluate student excellence in both areas. Exam work focuses primarily on ascertaining student excellence in handling mathematics content appropriate for the elementary grades. Pedagogical knowledge is ascertained primarily through readings, assignments and participation in the course. Therefore, if you demonstrate excellence in both pedagogical knowledge and content knowledge, you will receive an acceptable grade for performance in graduate education.

In Progress (IP): All students will receive an IP or "In Progress" at the conclusion of this course. Students will be required to turn in the required Fieldwork Log, Fieldwork Evaluation Form, and the Student Assessment Interview to the instructor according to the FAST TRAIN Fieldwork Timeline posted here: http://fasttrain.gmu.edu/current-students/field-req/ The deadline for posting the PBA to TaskStream and for completing the required fieldwork document in this course is March 15, 2012. Failure to submit this work to the instructor by this deadline will result in an F for the course.

Incomplete (IN): This grade may be given to students who are in good standing, but who may be unable to complete scheduled course work for a cause beyond reasonable control. The student must then complete all the requirements by the end of the ninth week of the next semester, not including summer term, and the instructor must turn in the final grade by the end of the 10th week. Unless an explicit written extension is filed with the Registrar's Office by the faculty deadline, the grade of IN is changed by the registrar to an F. (Mason Catalog) Faculty may grant an incomplete with a contract developed by the student with a reasonable time to complete the course at the discretion of the faculty member. The faculty member does not need to allow up to the following semester for the student to complete the course. A copy of the contract will be kept on file in the FAST TRAIN office.

VII. UNIVERSITY POLICIES

GSE Student Expectations

- Students must adhere to the guidelines of the George Mason University Honor Code [See http://academicintegrity.gmu.edu/honorcode/].
- Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu/].
- Students must follow the university policy for Responsible Use of Computing [See http://universitypolicy.gmu.edu/1301gen.html].
- Students are responsible for the content of university communications sent to their George Mason University email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students solely through their Mason email account.
- Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- Students are expected to exhibit professional behaviors and dispositions at all times.

Campus Resources

- The George Mason University Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach programs) to enhance students' personal experience and academic performance [See http://caps.gmu.edu/].
- The George Mason University Writing Center staff provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing [See http://writingcenter.gmu.edu/].

Technology in Class: Students will not be permitted to use cell phones during class. Please silence cell phones (not vibrate) while class is in session. Students may not use laptops unless specifically directed by instructor to do so during class.

GMU E-mail & Web Policy: Mason uses electronic mail (www.gmu.edu/email) to provide official information to students. Examples include notices from the library, notices about academic standing, financial aid information, class materials, assignments, questions, and instructor feedback. Students are responsible for the content of university communication sent to their Mason e-mail account and are required to activate that account and check it regularly (Mason Catalog).

Course Withdrawal with Deal Approval: For graduate and non-degree students, withdrawal after the last day for dropping a course requires approval by the student's academic dean, and is permitted only for nonacademic reasons that prevent course completion. (Mason Catalog). Students must contact an academic advisor in FAST TRAIN to withdraw after the deadline. There is no guarantee that such withdrawals will be permitted.

VIII. Course Schedule

This course schedule is subject to change at the discretion of the instructor. Any changes will be announced in class.

SUMMER 2011 CALENDAR
CLASS SCHEDULE

Date	Topic/Learning Experience	Readings & Assignments (Due)
Wednesday, July 18	Course Overview & Requirements Defining Standards-Based Mathematics Mathematical Processes and Problem Solving Planning for Instruction	Review sample lesson plans posted on Blackboard.
Thursday, July 19	Number Sense, Counting, and Place Value Assessing Student Mathematical Thinking Meanings of Operations	Read Reys Chapters 1-5 Work on lesson plan 1
Friday, July 20	Basic Facts and Whole Number Operations Standard and Invented Algorithms Student Error Patterns	Read Chapters 7-9 in Reys Submit lesson plan 1 for review
Monday, July 23	Fractions, Decimals, and Percents Student Error Patterns Differentiation	Read Reys Chapters 10-12 Work on lesson plan 2
Tuesday, July 24	Geometry and Measurement Student Assessment Interviews **Error Patterns Exam**	Read Reys chapters 13, 15, 16 Submit lesson plan 2 for review
Wednesday, July 25	Data Analysis, Statistics, and Probability Algebraic Thinking Integrating Technology in the Mathematics Curriculum	Read Reys chapters 14, 17 Work on Lesson Plan 3
Thursday, July 26	Research Topics in Mathematics Education: Mathematics Knowledge for Teaching Collaborative Planning	Read article Work on Lesson Plan 3
Friday, July 27	Student Presentations **Final Exam**	**Lesson Plans 1, 2, and 3 due today.**

Student Mathematics Interview & Action Plan Scoring Rubric

Criteria	Score			
	4 – Exceeds Standard	3 – Meets Standard	2 – Approaching Standard (Not Met)	1 – Needs Improvement (Not Met)
Design Interview Plan – Applying Knowledge ACEI Standard 3.1 – Integrating and Applying Knowledge	Interview plan uses extensive knowledge of the student, including performance in other academic, social, and behavioral areas, to design appropriate and relevant interview strategies. (Cite references)	Interview plan uses knowledge from some diverse areas to design appropriate interview strategies. Minimal references are cited.	Interview Plan uses minimal knowledge of the student to design specific interview strategies.	Interview Plan uses no knowledge of the student and creates only generic interview strategies.
Design Interview Plan – Developmental Appropriate ACEI Standard 1.0 – Development, Learning & Motivation	Interview plan demonstrates extensive knowledge and theories of child development to design appropriate interview questions. Theories are clearly integrated in interview strategy.	Interview plan uses some knowledge and theories of child development to design interview questions and strategies	Interview plan make little reference to child development to design interview questions	Interview plan contains no references to child development to design interview questions
Conduct Interview – Content Knowledge ACEI Standard 2.3 – Content Mathematics	Interviewer clearly and accurately describes two specific and age appropriate mathematical concepts to be evaluated in the interview.	Interviewer describes one appropriate mathematical concept to be evaluated in the interview	Interviewer describes mathematical concept in vague or general terms	Interviewer fails to accurately describe mathematical concept being evaluated
Conduct Interview – Differentiation ACEI Standard 3.2 – Adaptation to Diverse Students	Interviewer uses at least three different forms of representation (pictorial, concrete, and abstract) with different examples of each form to assess child's understanding of mathematic concept. Questions provide extensions for different levels of student performance and are clearly aligned with concept.	Interviewer uses a variety of tasks and questions for each of the three forms of representation to assess child's understanding of mathematic concept. Tasks and questions are aligned with concept.	The tasks and questions designed for the interview are only somewhat aligned with the mathematics concept being assessed. Three forms of representation are use.	The tasks and questions designed for the interview are not clearly aligned with the mathematics concept being assessed.
Conduct Interview – Critical Thinking ACEI Standard 3.3 – Development of Critical Thinking	Questions require student to engage in critical thinking and communicate about and through mathematics concepts. Questions help students work through their understanding of the concept during the interview.	Questions require critical thinking on mathematics concepts during the interview.	Questions only require minimal critical thinking during the interview.	Questions do not allow for engagement or critical thinking during the interview.

Conduct Interview – Engagement ACEI Standard 3.4 – Active Engagement in Learning	Questions and tasks are designed to creatively engage the child in mathematical concepts. Child responds to tasks enthusiastically and demonstrates motivation throughout the interview (provide transcript).	Questions and tasks are designed to engage child in mathematical concepts with some success throughout the interview.	Questions and tasks are not designed to engage the student during the interview. Child is unenthusiastic or confused during the interview.	No transcript is provided to demonstrate student engagement during the interview
Create Action Plan– Assessment ACEI Standard 4.0 - Assessment	Action plan includes an accurate assessment of child's current level of understanding of the mathematical concept. Assessment is supported with ample evidence including a variety of work samples from the interview.	Action plan includes an assessment of the child's understanding with evidence from the interview to support this.	Action plan includes an assessment of the child's understanding but includes little supporting evidence.	Action plan does not include an assessment or does not include evidence to support the assessment.
Create Action Plan – Collaboration ACEI Standard 5.2 - Collaboration	Action plan uses multiple sources on math development including texts, interviews with colleagues, and references to outside agencies or materials to support the assessment and action plan	Action plan includes only one or two supplemental sources to support the assessment and action plan.	Action plan includes minimal evidence of outside sources or collaboration to support the assessment and action plan.	Action plan does not include any outside sources to support the assessment and action plan.
Create Action Plan – Instructional Plan ACEI Standard 3.1 – Integrating and Applying Knowledge for Instruction	Action plan clearly integrates all gathered information to create an instructional plan that works well with the curriculum and is developmentally appropriate.	Action plan integrates most of the gathered information to create an instruction plan that is developmentally appropriate.	Action plan does not clearly demonstrate integration of gathered information or is not developmentally appropriate.	Action plan does not demonstrate integration of gathered information. Plan shows lack of support.
Create Action Plan – Differentiation ACEI Standard 3.2- Adaptation to Diverse Students	Action plan identifies many specific examples of activities and tasks that would further enhance the child's knowledge of the mathematical concept	Action plan identifies several specific examples of activities and tasks that enhance the child's knowledge of the mathematical concept	Action plan only includes one or two examples of activities or tasks that could enhance the child's knowledge of the mathematical concept	Action plan examples of activities or tasks that do not appear to enhance the child's knowledge of the mathematical concept
Provide Reflection – Pilot Lesson Plan ACEI Standard 5.1 – Professional Growth, Reflection & Evaluation	Reflection includes a pilot of one or more activities and tasks discussed in the action plan. Action plan is implemented in class or in tutoring environment.	Reflection includes extensive evaluation of how one or more activities discussed in the action plan could be implemented	Reflection includes little discussion of how any activities discussed in the action plan could be implemented	Reflection includes no follow up to the action plan or evidence that these tasks have been evaluated.

Provide Reflection – Self Evaluation ACEI Standard 5.1 – Professional Growth, Reflection, & Evaluation	Interviewer provides detailed self-reflection and analysis of the interview process. Reflection suggests specific areas for improvement and makes deep connections between activity and overall effective teaching practice.	Interviewer provides a self-evaluation and reflection of the interview process and makes connections between this activity and overall effective teaching practice.	Interviewer provides little reflection or self-evaluation or does not draw connection to overall effective practice.	Interviewer provides no reflection, self-evaluation, or connections to overall teaching practice.