

**GEORGE MASON UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT
GRADUATE SCHOOL OF EDUCATION
FAST TRAIN**

EDUC 513 6F5: Teaching Elementary Mathematics in International Settings
3 Credits, Summer 2014
Wednesdays/4:30p.m.-7:10 p.m. Arlington Campus: Founders Hall 322

PROFESSOR(S):

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COURSE DESCRIPTION:

A. Prerequisites/Corequisites

Admission to FAST TRAIN or Permission of Instructor.

B. University Catalog Course Description

Addresses interrelationship of instruction, curriculum, and assessment in international schools. Includes review of research and effective practice.

C. Expanded 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.

LEARNER OUTCOMES or OBJECTIVES:

This course is designed to enable students to:

1. Know what constitute the essential topics in mathematics of the modern K-6 international classroom.
2. 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 grades K-6.

3. Identify and use various instructional strategies and techniques (cooperative and peer group learning, activity centers, laboratories and workshops, teacher-directed presentations, etc.) to implement standards-based lessons of mathematical content topics appropriate for the students in grades K-6, including those from non-mainstreamed populations.

4. Identify and use alternative methods for assessing students' work in mathematics in grades K-6.

5. Solve problems in the mathematical content areas of logic, number theory, geometry, algebra, probability, and statistics appropriate for adaptation to grades K-6.

6. Know and explain the learning progression in relation to the standards-based mathematics curriculum, the key elements of the National Council of Teachers of Mathematics Principles and Standards for School Mathematics, and the key elements of the Virginia Standards of Learning for Mathematics.

PROFESSIONAL STANDARDS (National Council of Teachers of Mathematics, International Society for Technology in Education National Education Technology Standards, INTASC):

Course Student Outcomes (above)	NCTM Principles and Standards	ISTE NETS	INTASC
1	S1, S2, S3, S4, S5	SI	P1, P7
2	S10	SII	P1, P2, P6
3	P1, P2, P3, P4, P6	SII	P1, P2, P3, P4
4	P5	SIV	P3, P8
5	S1, S2, S3, S5, S6	SI	P4, P6
6	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

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

REQUIRED TEXTS:

Van De Walle, J., Karp, K. S., & Bay-Williams, J. M. (2012). *Elementary and Middle School Mathematics: Teaching Developmentally*. (8th edition) New York: Allyn & Bacon.

COURSE ASSIGNMENTS AND EXAMINATIONS:

The assignments across the semester are intended to further your understandings of what it means to teach, learn, and assess mathematics in light of current reforms in mathematics education. All assignments are to be turned in to your instructor on time. **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).

1. EXAMS (30%)

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.

2. 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.

3. TWO PROBLEM-BASED LESSON STUDY PLAN SUMMARIES (20%)

You are required to plan, teach, and complete a formal summary for two mathematics lessons during your field placement. The first lesson may be taught in a small group setting, while the

second lesson must include the entire class. Try to avoid the *overuse* of worksheets. Integrate the use of mathematics tools (manipulatives, calculators, computers) and representations (concrete, pictorial, symbolic) to provide children with an interactive, conceptually-based mathematics experience. The lesson plan summaries are a three-phase process: (1) Design the lesson plan, (2) Teach the lesson in your classroom, and (3) Collect and report evidence of student learning from the lesson in a reflection.

4. PARTICIPATION & ATTENDANCE (10%)

- a. PARTICIPATION: Active participation in all activities is expected. Rich, meaningful, problem-based tasks will be assigned in each session. Students are expected to complete these problems and incorporate their thinking about strategies used to solve the problems in class discussion. Work on problem sets will be shared in class and on occasion may be collected and evaluated. For identified class sessions, students will bring to class examples of high-level cognitive demand tasks and low-level cognitive demand tasks. The tasks will be utilized in the specified class sessions to assist students with identifying and modifying higher-level tasks that can be implemented in the elementary classroom for many purposes.
- b. ATTENDANCE: It is the student's responsibility to attend all class sessions. Students are held accountable for all information from each class session whether they are present or not. Please report reasons for any absences to the instructor in writing. It is also your responsibility to be on time for each class session. Please report your reasons for any tardiness to the instructor in writing.

5. STUDENT MATHEMATICS INTERVIEW & ACTION PLAN (30%)

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.

EVALUATION SCHEMA: Determination of the Final Grade

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.

GRADING POLICY

At George Mason University course work is measured in terms of quantity and quality. A credit normally represents one hour per week of lecture or recitation or not fewer than two hours per week of laboratory work throughout a semester. The number of credits is a measure of quantity. The grade is a measure of quality. The university-wide system for grading graduate courses is as follows:

Grade	GRADING	Grade Points	Interpretation
A+	=100	4.00	Represents mastery of the subject through effort beyond basic requirements
A	94-99	4.00	
A-	90-93	3.67	
B+	85-89	3.33	Reflects an understanding of and the ability to apply theories and principles at a basic level
B	80-84	3.00	
C*	70-79	2.00	Denotes an unacceptable level of understanding and application of the basic elements of the course
F*	<69	0.00	

Note: "C" is not satisfactory for a licensure course

"F" does not meet requirements of the Graduate School of Education

TASKSTREAM REQUIREMENTS

Every student registered for any FAST TRAIN course with a required performance-based assessment is required to submit this assessment, Student Assessment Interview to TaskStream (regardless of whether a course is an elective, a onetime course or part of an undergraduate minor). Evaluation of the performance-based assessment by the course instructor will also be completed in

TaskStream. Failure to submit the assessment to TaskStream will result in the course instructor reporting the course grade as Incomplete (IN). Unless the IN grade is changed upon completion of the required TaskStream submission, the IN will convert to an F nine weeks into the following semester.

GMU POLICIES AND RESOURCES FOR STUDENTS

- a. Students must adhere to the guidelines of the George Mason University Honor Code (See <http://oai.gmu.edu/the-mason-honor-code/>).
- b. Students must follow the university policy for Responsible Use of Computing (See <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>).
- c. 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.
- d. 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/>).
- e. 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/>).
- f. Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- g. 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/>).

PROFESSIONAL DISPOSITIONS

Students are expected to exhibit professional behaviors and dispositions at all times.

CORE VALUES COMMITMENT

The College of Education & Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles: <http://cehd.gmu.edu/values/>.

For additional information on the College of Education and Human Development, Graduate School of Education, please visit our website <http://gse.gmu.edu/>.

PROPOSED CLASS SCHEDULE:

Date	Topic/Learning Experiences	Readings & Assignments Due In Class
April 23 rd	How Do Children Learn Mathematics? NCTM's Principles & Standards The Process Standards In Class Discussion: Chapters 1 & 2	Math Autobiography
April 30 th	What is Problem Solving? Selecting Worthwhile Tasks Planning for Mathematics Instruction	<i>Chapter 3: Teaching through Problem Solving</i> <i>Chapter 4: Planning In the Problem-Based Classroom</i> <i>*Chapter 6: Equity (embedded in each class)</i>
May 7 th	Assessment: Conducting a Diagnostic Interview Number Sense, Counting, Patterns & Place Value	<i>Chapter 5: Assessment</i> <i>Chapter 8: Early Number Concepts</i>
May 14 th	Helping Children Master the Basic Facts Developing Strategies for Whole-Number Place-Value Concepts	<i>Chapter 9: Developing Meaning of Operations</i> <i>Chapter 10: Basic Facts</i> <i>Chapter 11: Place Value</i> Checkpoint: Student Assessment TASK IDEAS Due
May 21 st	Developing Strategies for Whole Number Computation	<i>Chapter 12: Whole Number Computation</i> Bring High/Low Level Tasks Lesson Plan Summary #1 Due
May 28 th	Computational Estimation Communication: Promoting Math Talk	<i>Chapter 13: Computational Estimation</i> Individual Student Assessment PLAN Due Bring High/Low Level Tasks
June 4 th	Algebraic Thinking	<i>Chapter 14: Algebraic Thinking</i> Bring High/Low Level Tasks
June 11 th	Fractions	<i>Chapter 15: Fractions</i> Bring High/Low Level Tasks

June 18 th	Fraction Concepts and Computation Multiple Representations In-Class Discussion of Lesson Plan #1	<i>Chapter 16: Fractions Operations</i> Lesson Plan Summary #2 Due Bring High/Low Level Tasks
June 25 th	Rational Number Concepts Proportional Reasoning	<i>Chapter 17: Decimals & Percent</i> <i>Chapter 18: Proportional Reasoning</i> Bring High/Low Level Tasks
July 2 nd	Measurement	<i>Chapter 19: Measurement</i> Error Pattern Exam Bring High/Low Level Tasks
July 9 th	No In-Class Meeting	Independent Work/Collaboration Time
July 16 th	Geometry Integers In-Class Discussion of Lesson Plan #2	<i>Chapter 20: Geometry</i> <i>Chapter 23: Integers</i> Bring High/Low Level Tasks
July 23 rd	Data Analysis Probability Experiments	<i>Chapter 21: Data Analysis</i> <i>Chapter 22: Probability</i> Bring High/Low Level Tasks
July 30 th	Individual Student Assessment Final REPORT DUE Panel Discussion	Content Exam Individual Student Assessment REPORT Due (Taskstream) Field Experience Logs Due (Taskstream)

ASSESSMENT RUBRIC(S):

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

<p>Conduct Interview – Differentiation</p> <p>ACEI Standard 3.2 – Adaptation to Diverse Students</p>	<p>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.</p>	<p>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.</p>	<p>The tasks and questions designed for the interview are only somewhat aligned with the mathematics concept being assessed. Three forms of representation are use.</p>	<p>The tasks and questions designed for the interview are not clearly aligned with the mathematics concept being assessed.</p>
<p>Conduct Interview – Critical Thinking</p> <p>ACEI Standard 3.3 – Development of Critical Thinking</p>	<p>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.</p>	<p>Questions require critical thinking on mathematics concepts during the interview.</p>	<p>Questions only require minimal critical thinking during the interview.</p>	<p>Questions do not allow for engagement or critical thinking during the interview.</p>
<p>Conduct Interview – Engagement</p> <p>ACEI Standard 3.4 – Active Engagement in Learning</p>	<p>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).</p>	<p>Questions and tasks are designed to engage child in mathematical concepts with some success throughout the interview.</p>	<p>Questions and tasks are not designed to engage the student during the interview. Child is unenthusiastic or confused during the interview.</p>	<p>No transcript is provided to demonstrate student engagement during the interview</p>
<p>Create Action Plan– Assessment</p> <p>ACEI Standard 4.0 - Assessment</p>	<p>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.</p>	<p>Action plan includes an assessment of the child’s understanding with evidence from the interview to support this.</p>	<p>Action plan includes an assessment of the child’s understanding but includes little supporting evidence.</p>	<p>Action plan does not include an assessment or does not include evidence to support the assessment.</p>

<p>Create Action Plan – Collaboration</p> <p>ACEI Standard 5.2 - Collaboration</p>	<p>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</p>	<p>Action plan includes only one or two supplemental sources to support the assessment and action plan.</p>	<p>Action plan includes minimal evidence of outside sources or collaboration to support the assessment and action plan.</p>	<p>Action plan does not include any outside sources to support the assessment and action plan.</p>
<p>Create Action Plan – Instructional Plan</p> <p>ACEI Standard 3.1 – Integrating and Applying Knowledge for Instruction</p>	<p>Action plan clearly integrates all gathered information to create an instructional plan that works well with the curriculum and is developmentally appropriate.</p>	<p>Action plan integrates most of the gathered information to create an instruction plan that is developmentally appropriate.</p>	<p>Action plan does not clearly demonstrate integration of gathered information or is not developmentally appropriate.</p>	<p>Action plan does not demonstrate integration of gathered information. Plan shows lack of support.</p>
<p>Create Action Plan – Differentiation</p> <p>ACEI Standard 3.2- Adaptation to Diverse Students</p>	<p>Action plan identifies many specific examples of activities and tasks that would further enhance the child’s knowledge of the mathematical concept</p>	<p>Action plan identifies several specific examples of activities and tasks that enhance the child’s knowledge of the mathematical concept</p>	<p>Action plan only includes one or two examples of activities or tasks that could enhance the child’s knowledge of the mathematical concept</p>	<p>Action plan examples of activities or tasks that do not appear to enhance the child’s knowledge of the mathematical concept</p>
<p>Provide Reflection – Pilot Lesson Plan</p> <p>ACEI Standard 5.1 – Professional Growth, Reflection & Evaluation</p>	<p>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.</p>	<p>Reflection includes extensive evaluation of how one or more activities discussed in the action plan could be implemented</p>	<p>Reflection includes little discussion of how any activities discussed in the action plan could be implemented</p>	<p>Reflection includes no follow up to the action plan or evidence that these tasks have been evaluated.</p>
<p>Provide Reflection – Self Evaluation</p> <p>ACEI Standard 5.1 – Professional Growth, Reflection, & Evaluation</p>	<p>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.</p>	<p>Interviewer provides a self-evaluation and reflection of the interview process and makes connections between this activity and overall effective teaching practice.</p>	<p>Interviewer provides little reflection or self-evaluation or does not draw connection to overall effective practice.</p>	<p>Interviewer provides no reflection, self-evaluation, or connections to overall teaching practice.</p>

