EDU519: Instructional Methods for Elementary Mathematics

Syllabus

Course Description

This course will provide candidates the opportunity to explore research-based strategies for teaching elementary mathematics (grades kindergarten through six) in alignment with national and state content standards, findings from the National Mathematics Advisory Panel, and standards established by the Association for Childhood Education International (ACEI). Best practices in assessing K-6 student learning will also be explored. By using the national, state and ACEI standards as a key resource, there is a strong focus on the essential topics of elementary mathematics, including numbers and operations, algebra, geometry, measurement, and data analysis. This course combines elementary mathematics content with elementary mathematics methods in a coordinated way through the completion of a Teacher Work Sample.

In the course project, Mathematics Teacher Work Sample: Supporting Student Learning, candidates will develop and implement a Teacher Work Sample. Candidates choose an important math skill or concept, implement a valid and reliable pre-test, analyze the results, design and implement a mathematics lesson, evaluate K-6 student learning,

implement a post test, analyze the results, and reflect on the experience with his/her sponsor, thereby being individually accountable for improving his/her instructional skills.

This course includes a field-based experience, that is, required activities that take place in a K-6 classroom. Candidates must secure a sponsor (e.g., a licensed K-6 teacher, school principal, other licensed K-12 educator, etc.) and complete activities with K-6 students onsite in a school-based classroom.

Course Learning Objectives

Upon successful completion of this course, each student/candidate will:

- Design and implement a mathematics teacher work sample that includes standards alignment, assessment, and lesson development.
- Collaborate with a sponsor to complete the school-based teacher work sample.
- Demonstrate knowledge of national and state mathematics standards and incorporate standards into classroom instruction.
- Select, create and use formal and informal assessments, administer assessments, and use results to design learning objectives and identify teaching strategies and instructional materials.
- Demonstrate an understanding of formal and informal assessment types identify the advantages, disadvantages, limitations, and developmental appropriateness of each type.
- Use technology to efficiently collect, report, and use assessment data.
- Use formal and informal assessment data to monitor learning and strengthen instruction.
- Collaborate with colleagues and conduct research about instructional materials, teaching strategies, and technological resources to develop students' critical thinking, problem solving, and performance skills.
- Demonstrate knowledge of the principals, techniques, limitations, advantages of strategies to improve the cognitive processes associated with various kinds of learning.
- Facilitate student use of a variety of strategies to solve problems and monitor and reflect on problem-solving methods.
- Facilitate student ability to recognize the importance of reasoning and investigation related to mathematical conjectures and proofs.

- Facilitate student ability to use mathematical language to communicate concepts orally and in writing.
- Facilitate student ability to make connections among mathematical ideas and to real-life contexts outside of mathematics.
- Create a lesson that includes student use of mental mathematics, manipulative materials, and technology tools.
- Facilitate the development of student understanding, use, and communication of number systems and number sense, geometry, measurement, statistics and probability, and functions and use of variables.

Required Materials

Texts

Burns, M. (2007). *About teaching mathematics: A K-8 resource.* Sausalito, CA: Math Solutions Publications.

American Psychological Association. (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: Author.

NOTE: The APA Publication Manual is a required resource that you will use throughout your degree program. It is listed as a required text in all JIU courses. You only need to purchase it once.

Jones e-global library® Readings

This course includes readings from electronic textbooks and/or journal articles available through the Jones *e*-global library®. These resources are available free of charge and you will access them from the Readings page in each module.

Web-based Readings

This course includes required online readings. You will access them from links within each module where they are assigned. A complete list of required online readings is included on the Readings page in each module.

JIU Technology Requirements

JIU Browser Checker - An easy way to check your browser and plug-ins is to use the JIU Browser Checker, a web-based application that automatically checks to determine whether your browser and plugins meet the requirements for JIU courses.

	Minimum:	**Recommended:**
Operating System	• Windows XP or Mac OSX	
RAM	• 256 MB of RAM	• 1 GB of RAM or above
Storage		• 4 GB or better
Monitor	• 15" VGA • High color (16 bit) • 1024 X 768 Resolution	• 17" SVGA Monitor • True color (24 bit) • 1024 X 768 resolution or

		higher
Internet Connection	• 56K Modem	• Broadband
Browser **(only 1 needed)***	• Internet Explorer 6.0 or newer (PC) • Firefox (PC and Mac) • Safari (Mac)	
Software	• Microsoft Office 2000 or newer	
Plugins	• Ebrary Reader • Adobe Acrobat Reader • Macromedia Flash Player	
Peripherals	• CD-ROM • Sound Card • Printer	

Browser Settings	• Cookies must be allowed in your browser	

***Note:** The registration portal at my.jiu.edu may not function properly if you are using a non-supported browser. Recommended browsers include Internet Explorer 6 and Safari 1.2. All other JIU websites including the My Courses/Dashboard pages and JIU courses support most modern browsers. Recommended browsers include Internet Explorer, Firefox and Safari.

Help Desk

For the following issues, you should first contact Technical Support:

- Server issues (site not available, server is slow)
- Course access (login problems, course not available)
- Technical problems (forum malfunctioning, any course delivery software function not working properly)

Contact Information:

- Toll-Free from U.S. and Canada: 1.888.560.4951
- International Calls: +1.416.494.6622
- Online Help

Diversity Policy

JIU professors seek and value the active participation of all students. Professors value diversity in students' ideas, viewpoints, perspectives, values, religious beliefs, backgrounds, race, gender, age, sexual orientation, human capacity, ethnicity, etc. Importantly, JIU professors respect students' diverse talents and ways of learning and provide

flexibility by offering students multiple pathways to success. Professors encourage students to choose deliverables—in pursuit of learning objectives—that are personally and professionally meaningful.

Disability Services

Any student who feels s/he may need an accommodation based on the impact of a disability should visit the website for the Office of Disabilities Services at JIU. Here, you will find information regarding our policy and the procedure for requesting an accommodation.

Course Engagement Policy

JIU student participation in online discussions and projects are part of JIU teaching and learning models. Substantive and frequent interaction helps students to solidify and extend learning. All students are required to actively participate in and contribute to course discussions.

JIU will confirm course engagement as of the "census date." The census date is the third Sunday of a course, up to 11:59 p.m. Mountain Time. Course Engagement is determined by active participation through the course and professor's evaluation of the student's level of engagement in the course.

Students who are not actively engaged in a course by the census date will be dropped from the course and will receive a grade of NDR with a 100% tuition refund for that course. The course will not count as an attempted course.

Please review the course engagement policy in the JIU Student Handbook for details.

Academic Honor Statement

All JIU students are expected to adhere to the JIU Academic Honor Statement, which states:

In accordance with the JIU "Academic Code of Conduct" (found in the Student Handbook), I am solely responsible for all of my assignments (unless the assignment specifically allowed me to work with others). I have not plagiarized (represented the work of another as my own), nor have I violated copyright or other applicable U.S. laws. JIU holds

that the respect for ideas and intellectual property rights is a critical value in academic communities. As a member of this community, I share responsibility in ensuring that the authentic expression of ideas is observed.

Total Professional Advantage 2.0®

JIU's institutional learning objectives require all JIU students to "design a personal and professional development strategy to formulate a pathway leading to future success."

To that end, JIU has created a customized career development portal and program: Total Professional Advantage® 2.0 (TPA® 2.0).

TPA 2.0 provides an array of free career development resources, including an electronic portfolio, access to a professional career advisor, and interactive workshops. All students produce three "deliverables": a résumé, a career goal statement, and a professional development plan. These deliverables are submitted at the end of your academic program in your capstone course.

We strongly encourage you to engage in TPA 2.0 *early* in your academic program. Access TPA 2.0 via the link near the top of your "My Courses" page.

Course Structure

This course consists of the eight modules outlined below:

Module 1: Current Math Standards and Reports

This module will introduce *standards* as a way to ground your thinking about teaching mathematics in the elementary classroom. You will read the basic documents that guide school mathematics today: the National Council of Teachers of Mathematics (NCTM) Principles and Standards, The Final Report of the National Mathematics Advisory Panel, the Common Core State Standards for Mathematics, and the Colorado Academic Standards. Through these readings, you'll find that mathematics is more than arithmetic; and in your first Forum discussion, you'll explain why.

Module 2: The Standards and Beyond

In this module, you will take a deeper look at the Common Core State Standards Initiative and Colorado mathematics standards. You will read about the rationale and strategies for incorporating manipulatives, writing in mathematics and teaching mathematics vocabulary. The Colorado Academic Standards provide examples for real-world applications in the "Relevance and Application" section. You will also align the mathematics topics you selected for your lesson to either the Common Core State Standards or Colorado standards; and identify how you will include problem solving, writing, real-world applications, and manipulatives and technology.

Module 3: Pre-Assessment I

In this module, you will be introduced to the concepts of formal and informal assessments, and compare their purposes and forms. You will also get acquainted with professionally developed assessments: National Assessment of Educational Progress (NAEP), AimsWeb, Northwest Evaluation Association (NWEA) Assessments and Scantron Achievement Series Assessments.

Module 4: Pre-Assessment II

In this module, you will pre-assess your students using the instrument you selected or created in Module 3. After you assess, you will collect, analyze, summarize and display your pre-assessment data. You will also reflect on the pre-assessment instrument, administration, scoring process and results.

Module 5: Creating Lesson Plans

In this module, you will create a lesson plan for the mathematics skills and concepts you selected in Module 2 and pre-assessed in Module 4. The lesson plan must embrace all learners and incorporate problem solving, critical thinking, mathematical vocabulary and symbols, and include resources such as technology and manipulatives. We'll spend some time exploring the diversity you can expect to find in your classroom and discuss the different resources available to you to help you reach all learners and incorporate all facets of mathematics.

Module 6: Problem Solving Strategies and Lesson Implementation

In this module, you will implement the lesson plan you developed in Module 5, carefully documenting and reflecting on the process using the JIU post-lesson observation form immediately after you teach the lesson.

Module 7: Assessing Mathematical Understanding (Post-Assessment)

In this module, you will assess your students using the instrument you used in Module 3 (or a parallel form of the instrument). After you assess, you will collect, analyze, summarize and display your post-assessment data, and

compare it to your pre-assessment data. This module is also about connections — connections between "school math" and the real world and connections between the different branches of the elementary mathematics curriculum. You'll be making these connections by creating enrichments for your lesson. You'll also learn about the power of mental math and some of the more fundamental techniques.

Module 8: Wrapping it Up

In this module, you will pull your entire project together, using previous suggestions from your instructor, your classmates and new knowledge gained throughout the course. In addition, you will experiment with technology tools for assessment, explore the World Wide Web for teaching resources and reflect on what it means to be a lifelong learner in the education profession.

Assignments Overview

Two types of assignments will be submitted to the instructor for grading:

Forum Discussions

Students engage in ongoing professional discussions with peers in the program about their professional reading, professional development and professional projects. A successful discussion includes the following distinguishing features. The student:

- Clearly demonstrates introspection and synthesis of ideas
- Clearly demonstrates relevance to readings and class discussions
- Clearly demonstrates a deep understanding of course content
- Clearly and persuasively expresses opinions
- Uses professional language
- Uses proper grammar and punctuation
- Adheres to JIU Rules of Netiquette
- Posts often throughout the week period

- Engages participants in dialogue
- Clearly offers insightful comments or questions that build on comments from peers
- Advances the discussion in a meaningful and significant way Responds to all questions
- Is graceful, polite and professional when disagreeing with a peer
- Clearly demonstrates mature critical thinking
- Clearly makes arguments that are relevant, focused, logical and well-supported
- Cites relevant resources (readings, module content and personal experience) with appropriate detail
- Clearly provides concrete examples from own experience to support opinions

Project Elements

These course project components will be compiled throughout the course to create the final course project: *Mathematics Teacher Work Sample: Supporting Student Learning*.

It should be carefully noted and considered by the student in preparing assignments that a critical factor in grading assignments is *reference to readings*. In preparing papers, students should cite readings in order to support the premise of the assignment, and to show the instructor that the readings have been done and understood.

TurnItIn.com

The academic leaders at Jones International University recognize that some students experience challenges when working to properly cite sources within their papers and projects.

To ensure that every student gives proper credit to a work's original author and to prevent plagiarism, JIU has contracted with TurnItIn.com® to provide students and professors with access to its "Originality Checking" software. From this point forward, students may submit assignments for every course to TurnItIn for a quality check, and then correct errors prior to submitting assignments to their professors. Students are especially encouraged to use TurnItIn prior to submitting their final projects and papers in every course.

Please note:

- TurnItIn does not check the correctness of a student's citations. The TurnItIn report only indicates that a section of text is found in another source. It is each student's responsibility to make certain s/he has properly cited others' works.
- Every student must follow APA guidelines when citing sources. Students who are unsure about APA formatting should use the numerous free resources available to them in the Resources section in JIU's courses.
- Your instructor will provide details on how to access TurnItIn.com.

Course at a Glance

Module 1: Current Math Standards and Reports

Required Readings

Burns, M. (2007). *About teaching mathematics: A K-8 resource, 3rd ed*. Sausalito, CA: Math Solutions Publications. [Text]

pp. 3-6, Part 2: Instructional Activities for the Content Standards

U.S. Department of Education. (2008). The final report of the national mathematics advisory panel. [Web]

Executive Summary, pp. xi-xxvii

Common Core Standards Initiative. (2010). Common core state standards in mathematics. [Web]

pp. 3-4

Colorado Department of Education. (2010). Colorado academic standards: Mathematics. [Web]

pp. 2-3

Assignments

- Assignment 1.1: Your Sponsor 10
- Assignment 1.2: Forum Discussion: What is Mathematics? 40
- Assignment 1.3: Course Project: Demographics 20

Module 2: The Standards and Beyond

Required Readings

Burns, M. (2007). *About teaching mathematics: A K-8 resource, 3rd ed*. Sausalito, CA: Math Solutions Publications. [Text]

pp. 16-23, 33-35, 38-41, 42-44, 372-374

U.S. Department of Education. (2008). The final report of the national mathematics advisory panel. [Web]

Chapter 7, pp. 49-51

Common Core Standards Initiative. (2010). Common core state standards in mathematics. [Web]

p. 5, and the standards related to the skills and concepts for your project

Colorado Department of Education. (2010). Colorado academic standards: Mathematics. [Web]

pp. 11-13 (the page numbers at the bottom of the page in the document), and the standards related to the skills and concepts for your project

National Council of Teachers of Mathematics. (2005). Computation, calculators, and common sense. [Web]

National Council of Teachers of Mathematics. (2008). The role of technology in the teaching and learning of mathematics. [Web]

Assignments

- Assignment 2.1: Forum Discussion: Compare and Contrast Features of Common Core and State Standards 40
- Assignment 2.2: Course Project: Align Math Concepts and/or Skills with Standards 50

Module 3: Pre-Assessment I

Required Readings

U.S. Department of Education. (2008). The final report of the National Mathematics Advisory Panel. [Web]

Chapter 7, pp. 46-49; Chapter 9, pp. 57-61

AimsWeb Mathematics Assessments. (2010). AIMSweb Mathematics Concepts and Applications (M-CAP) assessment for grades 2-8. [Web]

AimsWeb Mathematics Assessments. (2010). Mathematics-CMB: Math computation/math facts. [Web]

National Assessment of Educational Progress. (NAEP). [Web]

Explore Grade 4 Results and Test Items

Northwest Evaluation Association Assessments. MAP Basics Overview. [Web]

Scantron Achievement Series Assessments [Web]

Explore Home Page

Assignments

- Assignment 3.1: Forum Discussion: Features of High-Quality Assessments Reflection 40
- Assignment 3.2: Course Project: Pre-Assessment Plan 50

Module 4: Pre-Assessment II

Required Readings

Burns, M. (2007). *About teaching mathematics: A K-8 resource* (3rd ed.). Sausalito, CA: Math Solutions Publications.

pp. 7-9, 47, 383-384

Jehlen, A. (2001). Math wars. *NEA Today, 19*(8). [Jones e-global libraryÂ®: EBSCO]

Loveless, T. (2001). Great curriculum debate: How should we teach reading and math? [Jones e-global libraryÂ®: EBSCO]

pp. 31-39

Assignments

- Assignment 4.1: Forum Discussion: Reform vs Traditional Mathematics Curriculum 40
- Assignment 4.2: Course Project: Pre-Assessment Data Analysis 50

Module 5: Creating Lesson Plans

Required Readings

Burns, M. (2007). *About teaching mathematics: A K-8 resource, 3rd ed*. Sausalito, CA: Math Solutions Publications. [Text]

pp. 54-57, pp. 130-143.

Common Core Standards Initiative. (2010). Common Core State Standards in Mathematics. [Web]

Standards related to your project

Colorado Department of Education. (2010). Colorado Academic Standards: Mathematics. [Web]

Standards related to your project

National Council of Teachers of Mathematics. (2005). Computation, calculators, and common sense. [Web]

National Council of Teachers of Mathematics. (2005). Closing the achievement gap. [Web]

National Council of Teachers of Mathematics. (2008). The role of technology in the teaching and learning of mathematics. [Web]

National Council of Teachers of Mathematics. (2008). Teaching mathematics to English language learners. [Web]

Assignments

- Assignment 5.1: Forum Discussion: Conjecture and Proof Reflection 40
- Assignment 5.2: Course Project: Lesson Plan 50

Module 6: Problem Solving Strategies and Lesson Implementation

Required Readings

Burns, M. (2007). *About teaching mathematics: A K-8 resource, 3rd ed*. Sausalito, CA: Math Solutions Publications. v

pp. 13-23, 27-32

National Council of Teachers of Mathematics (n.d.). *Reflection improves instruction.* [Web]

Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement.* Alexandria, VA: ASCD. [Web]

Chapter 1: Applying the research on instruction: An idea whose time has come.

Assignments

- Assignment 6.1: Forum Discussion: Problem-Solving Strategies Reflection 40
- Assignment 6.2: Course Project: Lesson Reflection 50

Module 7: Assessing Mathematical Understanding (Post-Assessment)

Required Readings

Burns, M. (2007). *About teaching mathematics: A K-8 resource, 3rd ed*. Sausalito, CA: Math Solutions Publications. [Text]

pp. 7-9, 25

National Council of Teachers of Mathematics. (n.d.). *Principles and standards for school mathematics: Connections*. [Web]

Seeley, C. (2005, December). Do the math in your head. *NCTM News Bulletin*. [Web]

Assignments

- Assignment 7.1: Forum Discussion: Enriching My Lesson 40
- Assignment 7.2: Course Project: Post-Assessment Data Analysis 50

Module 8: Wrapping it Up

Required Readings

Burns, M. (2007). *About teaching mathematics: A K-8 resource, 3rd ed*. Sausalito, CA: Math Solutions Publications. [Text]

Part 5, Questions Teachers Ask

DuFour, R. (2004, May). What is a professional learning community? *Educational Leadership*. [Web]

Schmoker, M. (2003). First things first: Demystifying data analysis. *Educational Leadership, 60* (5). [Jones e-global library®: EBSCO)

pp. 22-24.

U.S. Department of Education. (2008). The final report of the national mathematics advisory panel. [Web]

Chapter 6: Teachers and Teacher Education

Assignments • Assignment 8.1: Data Collection, Reporting and Use • Assignment 8.2: Professional, Portfolio-Ready Mathematics Teacher Work Sample	40 350
Total Points Possible	1,000

Grading

Final grades for the course will be assigned based on the scale below:

Final Grade	Total Points Earned
A	900 - 1,000

B	800 - 899
C	700 - 799
U	Less than 700

EDU519: Instructional Methods for Elementary Mathematics

Resources

- **General**
- **Course-Specific**

Course-Specific Resources

To access web resources for a specific module, click on the module number below. To access the Glossary, click on Glossary below. Similarly, click on Bibliography to access the Bibliography for this course.

Module 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

To access web resources for a specific module, click on the module number below.

Module Specific Resources

Module 1

Resources for Math Teachers

Directory to the different resources NCTM has to offer

Educational Associations and Organizations

Links to a variety of professional organizations

Module 2

Colorado Academic Standards for Math

Colorado Academic Standards for Math

NCTM Electronic Examples Index

An index to the different e-examples available through the NCTM website

The Teacher's Place

Resources for teaching math at all levels

Procedural Knowledge

A definition and brief description of procedural knowledge in the math classroom

Conceptual Knowledge

A definition and brief description of conceptual knowledge in the math classroom

Module 3

Five "Key Strategies" for Effective Formative Assessment

This article discusses five key strategies to aid in formative assessment. It also discusses the use of backward design in instructional planning, which is gaining popularity in the educational community.

Wiggins, G. & McTighe, J. (2005). *Understanding by design*. Baltimore, MD: ASCD.

If you are interested in further research on backward design, this book is available as an e-book through Jones e-global library®.

Standards-Based Teaching and Test Preparation Are Not Mutually Exclusive

This article discusses the traditional and reformed curricula -- how they affect what students learn and how standards can be integrated.

The Math League

The Math League specializes in math contests, books and computer software designed to stimulate interest and confidence in mathematics for students from the fourth grade through high school.

Module 4

No additional resources

Module 5

No additional resources

Module 6

Math Out Loud! Heard the word? Talking and writing about math boosts understanding in a big way

Article on using communication techniques in a math classroom

Talking, Writing, and Reasoning: Making Thinking Visible with Math Journals

Another article regarding communication in the math classroom, including journal sample prompts

Reflecting on Learning Fractions without Understanding

Discusses different approaches to teaching fractions and the affect on conceptual and procedural understanding. It also has video segments of teachers interacting with their students included to clarify the information presented.

Module 7

ISTE National Educational Technology Standards

The International Society for Technology in Education has developed national standards that define what students should know and be able to do with technology. The following sites will provide you with more specific information:

- ISTE National Technology Standards for Students
- ISTE National Technology Standards for Teachers

Module 8

Computing Technology for Math Excellence

Contains a variety of math resources for integrating technology into teaching and learning mathematics in grades K-12

Education Index

Although a general education website, this link takes you directly to math-related resources.

Education ONLINE

USA Today's website includes relevant real-world resources.

Education World Math Center

Although a general education website, this link takes you directly to math-related resources.

Future of Math

This site is dedicated specifically to mathematics. It contains a variety of resources and a math blog.

Internet4Classrooms

This is a general education website created to help teachers use the Internet effectively.

Math Archives

Provides links to Internet sites and lesson plans covering a variety of topics. Some of the links are extinct. However, those that are not provide excellent resources.

Math Technology

Provides information about math resources for the visually impaired student

TeAch-nology

This is a general education website containing links to a variety of resources. Use keyword “math.”

General Course Resources

Ten Marks

This is a free site for educators that allows students to practice their math skills.

Integrating Content, Pedagogy, and Reflective Practice: Innovative New Distance Learning Courses and Programs for Mathematics Teachers

This article outlines courses and programs offered by universities that bring distance learning in an online format to math teachers.

IES Research - Achievement Effects of Four Early Elementary School Math Curricula

From the Institute of Education Sciences, findings for first and second graders

IES Practice Guide - Developing Effective Fractions Instruction for Kindergarten Through 8th Grade

Recommendations from the Institute of Education Sciences

IES Practice Guide - Assisting Students Struggling with Mathematics: Response to Intervention for Elementary and Middle Schools

Recommendations from the Institute of Education Sciences

The Final Report of the National Mathematics Advisory Panel

2008 report of the National Mathematics Advisory Panel

Center on Instruction

A list of resources for teaching mathematics

Response to Intervention in Math *by Paul Riccomini and Bradley S. Witzel*