STUDENT WARNING: This course syllabus is from a previous semester archive and serves only as a preparatory reference. Please use this syllabus as a reference only until the professor opens the classroom and you have access to the updated course syllabus. Please do NOT purchase any books or start any work based on this syllabus; this syllabus may NOT be the one that your individual instructor uses for a course that has not yet started. If you need to verify course textbooks, please refer to the online course description through your student portal. This syllabus is proprietary material of APUS.

American Public University System

The Ultimate Advantage is an Educated Mind

Education
EDUC 671
Integrating Elementary Mathematics and Science
Credit Hours = 3
Length of Course = 8 weeks
Prerequisite:

Instructor Information

Instructor: APUS Instructor

Course Description

This course is intended to allow the certified teacher to examine the objectives, methods, instructional emphasis, and integration of elementary school mathematics and science. Practicing teachers are given the opportunity to examine research related to elementary school mathematics and science instruction with an emphasis on innovative programs. The course also includes an analysis of teaching mathematics and science to elementary school children with emphasis on current educational trends, curricular materials, and techniques. The use of instructional technology and resources as an enhancement to understanding the teaching of math and science will also be explored. (Prerequisite: This course may be taken concurrently with EDUC 503/EDUC 640, EDUC 513/EDUC 652; or EDUC 524/EDUC 531/EDUC 637 program segments)

Course Scope

This course focuses on giving the teacher candidate skills to interpret children’s math and science experiences and guide their development of math and science concepts. Best teaching practices will be investigated, observed, and applied. Objectives, methods, and content in elementary school math and science instruction will be explored, and candidates will create curricular materials for classroom use. A field experience within an elementary school classroom is required.

Candidates will explore opportunities and experiences that facilitate continued professional development beyond course work in math and science as an avenue of life-long learning. The modeling of inquiry teaching and fieldwork experience gives candidates opportunities to observe and experience appropriate
ways to facilitate the construction of knowledge in a variety of settings and populations within the context of benchmarks and standards.

### Course Objectives

This course will be centered on the attainment of the course objectives listed below. These objectives are understood to be reflective of the following standards: National Science Teachers Association (NSTA), National Council for Teachers of Mathematics (NCTM), and the National Board for Professional Teaching Standards. As a result of participation in this course, students will be able to:

- Develop an understanding of the national education standards for mathematics and science (NCTM 6,8)(NSTA 1a,6a,6b)(NBPTS 2,4)
- Identify ways math and science standards impact teaching and learning (NCTM 6,8)(NSTA 1a,6a,6b)(NBPTS 2,4)
- Examine the use of standards within their own classroom (NCTM 6,8)(NSTA 1a,6a,6b)(NBPTS 2,4)
- Develop an understanding of recent trends in mathematics and science education (NCTM 1,6,7,8)(NSTA 1b,2a,4a,6a,6b,6c)(NBPTS 1,3,4)
- Assess the value of teaching using an inquiry approach (NCTM 1,6,7,8)(NSTA 1b,2a,3a,5a)(NBPTS 1,2,3,4)
- Identify the basic processes involved in inquiry based learning (NCTM 2,4)(NSTA 1b,2a,3a,5a)(NBPTS 2,3,4)
- Develop an understanding of the impact of misconceptions in the classroom (NCTM 4,5,6)(NSTA 1b,2a,4a,5a,6c)(NBPTS 3,4)
- Examine ways to identify misconceptions in the classroom (NCTM 5,6)(NSTA 2a,4a,5a,6c)(NBPTS 3,4)
- Identify possible means of misconceptions and increased awareness for diverse students (NCTM 4,5,6)(NSTA 2b,4a,5a,6c)(NBPTS 1,3,4)
- Define how technology can be used to enhance curriculum (NCTM 3,6,8)(NSTA 1b,4a,5b,6a)(NBPTS 2,4)
- Critically examine various technological websites for integration into the curriculum (NCTM 3,6,8)(NSTA 1b,4a,5b,6a)(NBPTS 2,4)
- Critically examine software for integration into the curriculum (NCTM 3,6,8)(NSTA 1b,4a,5b,6a)(NBPTS 2,4)
- Understand the need for systematic approaches to teaching (NCTM 2,4,7,8)(NSTA 1b,2a,2b,6e)(NBPTS 1,2,3,4)
- Explain age related difficulties that may arise with math and science concepts (NCTM 2,4,7,8)(NSTA 2b,5a,2a,6c)(NBPTS 1,2,3,4)
- Identify characteristics of effective teaching in the areas of science and mathematics (NCTM 5,6)(NSTA 1b,2b,6c)(NBPTS 1,2,3,4)
- Describe the methods for ascertaining prior knowledge (NCTM 5,6)(NSTA 2a,5a,6c)(NBPTS 2,3,4)
- Evaluate strategies for developing effective questioning (NCTM 5,6)(NSTA 2b,5a)(NBPTS 2,3,4,5)
- Explain the role of questioning in teaching math and science (NCTM 5,6)(NSTA 1b,2b,3a,3b,5a)(NBPTS 2,3,4,5)
- Explain the various needs students may exhibit in the inclusive classroom (NCTM 4,6)(NSTA2b,5a,6c)(NBPTS 1,2,3,4)
- Evaluate lesson plan and classroom modifications that may be required to accommodate all learners (NCTM 1,4,6)(NSTA 2b,5a,6c)(NBPTS 1,2,3,4)
- Create lesson plans with accommodations/modifications (NCTM 1,4,6)(NSTA 2b,3a,3b,5a,6c)(NBPTS 1,2,3,5)
- Explain the purposes of assessment (NCTM 1,3,5,6,7,8)(NSTA 1b,5a)(NBPTS 3)
- Describe appropriate ways to accommodate learners in assessments (NCTM 1,4,6)(NSTA 2b,5a,6c)(NBPTS 1,2,3,4)
- Create lesson plans containing quality assessments (NCTM 1,3,5,6,7,8) (NSTA 2b,3a,3b,5a)(NBPTS 1,3)

**Course Delivery Method**

This course, delivered via distance learning, will enable students to complete academic work in a flexible manner, completely online. Course materials and access to an online learning management system will be made available to each student. Online assignments are due by Sunday evening of the week as noted and include Discussion Board items, and assignments (submitted for review by the Faculty Member). Assigned faculty will support the students throughout this eight-week course.

**Course Materials**

**Required Course Textbook**

**Required Course Readings**
http://www.project2061.org/publications/sfaa/online/sfaatoc.htm &
http://www.project2061.org/publications/bsl/online/index.php

http://www.nap.edu/catalog/11102.html


http://www.nap.edu/openbook.php?isbn=0309069955


**Additional Resources**

In addition to the required course materials, the following websites are useful. Please note web site addresses are subject to change. Please abide by the university’s academic honesty policy when using Internet sources as well. Note Web site addresses are subject to change. If you notice that a link is down, conduct a search using the title to find if the site has moved.

American Association for the Advancement of Science

APA Style Guide

Concept Mapping

Council for Exceptional Children
[http://www.cec.sped.org](http://www.cec.sped.org)

Differentiated Instruction

GEMS: Great Explorations in Math and Science
http://lhsgems.org/gemspubs.html

National Association for Education of Young Children (NAEYC)  
http://www.naeyc.org/

National Board for Professional Teaching Standards  
http://www.nbpts.edu/

National Center for Improving Student Learning and Achievement in Mathematics and Science (NCISLA)  
http://www.wcer.wisc.edu/NCISLA/Publications/#bibliography

National Council for Teachers of Mathematics (NCTM)  
http://www.nctm.org/

National Council for Teachers of Mathematics (NCTM) Curriculum Focal Points and Standards  
http://www.nctm.org/standards/

National Educational Technology Standards (NETS)  
http://cnets.iste.org/

National Science Teachers Association (NSTA)  
http://www.nsta.org/

NCTM Principles and Standards for School Mathematics  
http://www.nctm.org

Project Zero  
http://www.pz.harvard.edu/

Science and Mathematics Education indicators  
http://www.ccsso.org/Projects/Science_and_Mathematics_Education_Indicators/

State Indicators of Science and Mathematics Education by State  

Technology Foundation Standards for All Students  
http://www.iste.org/inhouse/nets/cnets/students/index.html
Technology Foundation Standards for All Teachers  

U.S. Department of Education  
http://www.ed.gov
Evaluation Procedures

**Instructor announcements:** There will be an announcement at the beginning of each module highlighting learning objectives, giving additional guidance on the required weekly assignments, and providing a friendly reminder of key course milestones and due dates.

**Reading Assignments:** Every week you are assigned readings from the textbook and other sources. You are expected to keep up with the reading assignments which will directly relate to the discussion board questions and future assignments.

**Supplemental Readings:** As this is a graduate-level course, you are encouraged to search for additional reading/learning materials on each topic. Please share these within your discussion forum postings.

**Discussion Board Assignments & Exercises:** Interacting with your classmates is a critical part of your learning experience. It is my intent to have reflective and academic stimulating discussions in the classroom each week. In order to accomplish this there are two basic requirements of your participation. These requirements are:

1. To assist in getting discussions started early, please try to post your initial responses by Wednesday. The latest day you can post your initial responses for credit will be by the end of the week, Sunday evening.
2. To be sure you are clearly and completely answer a question, review the posting rubric. Late postings (after the due date) will be accepted but may result in a deduction in points on an individual basis. This must be cleared ahead of time to receive any credit for a late post.
3. The required number of comments to others each week is two (2). You can fulfill the requirements of responding to others by posting two substantive responses to ANY learner’s initial responses AND by the posted due date. These responses should be between 50 and 150 words. “I agree” or “great job” is not enough (please review the posting rubric). Tell why you agree or why you think the learner did a great job. Personalize your response with your experiences.

**Discussion Ground Rules**

1. Read posts with an attitude that you are open to rethinking your own beliefs and assumptions.
2. Acknowledge what the other person says and add to it in a substantive way.
3. Demonstrate professional courtesy and respect for one another.
4. Understand that "life" happens.
5. What is said here stays here.
6. What is learned here leaves here.
7. Have fun!
8. This rubric will be used in assessing the quality of your participation within our Blackboard online forum. It is possible for all participants to receive all points during each discussion. This requires thoughtful, interactive discussion, and an attitude which enhances the learning environment.

**Discussion Forum Posting Rubric**
<table>
<thead>
<tr>
<th>Rating Points</th>
<th>Participation in Discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Provides comments and new information in a regular and equitable manner. Interacts with a variety of participants</td>
</tr>
<tr>
<td>3</td>
<td>Provides comments and some new information in a fairly regular manner. Interacts with a few selected participants.</td>
</tr>
<tr>
<td>2</td>
<td>Sporadically provides comments and some new information. Interacts with only one or two participants.</td>
</tr>
<tr>
<td>1</td>
<td>Provides minimal comments and information to other participants.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rating Points</th>
<th>Content of Posting</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Revealed a solid understanding of the topic as evidenced by thoughtful responses and questions.</td>
</tr>
<tr>
<td>3</td>
<td>Revealed an adequate understanding of the topic as evidenced by posts indicating superficial knowledge.</td>
</tr>
<tr>
<td>2</td>
<td>Revealed a restricted understanding of the topic limited to information that could be derived from prior posts.</td>
</tr>
<tr>
<td>1</td>
<td>Message was unrelated to discussion.</td>
</tr>
</tbody>
</table>

**Assignments**

*Attendance and Participation*
All students are expected to read the assigned readings before the date stated. Additional research on each topic is encouraged and will add much to our discussions. Students are also encouraged to discuss each topic in relation to professional experiences. Each student will complete assignments and participate in electronic discussions via our class discussion.
Participation is critical to attaining goals and objectives for the course. Students are expected to monitor and respond to each of the weekly discussions, participate actively in those discussions, and provide meaningful input into the topic. Each discussion posting will be assessed using the discussion forum rubric.

**Student Interview (NBPTS 3)**
It is critical within teaching to understand students’ prior knowledge as you design learning experiences. One way to assess this is through individual interviews. You will design, conduct, and synthesize one math and one science interview with a student within your K-6 field placement and will post it within our discussion forum. You will then analyze and compare your findings with peers’ postings as you respond to two of your peers’ interview postings.

**Curriculum Awareness Survey (NBPTS 4)**
The purpose of this assignment is to collect and analyze information to inform mathematics and science curriculum instruction and alignment among content standards and available teaching materials and to design effective implementation of the curriculum within the local system and community of your school. You will conduct a needs assessment/curriculum awareness survey within your school building by evaluating the math and science curricula and administering a survey to students, peers, administrators, and parents. If you are not currently teaching, contact a local school district to ask if you may conduct your awareness survey there. The written portion of this project will include the points and questions listed below. You will synthesize your collected data to develop a plan with specific recommendations for improving the curriculum and/or curriculum implementation for math and science. Be sure to use the rubric to consider all curricular aspects. Results will be shared within our discussion forum using the appropriate format specified by your instructor.

**Internet Site Review (NBPTS 2,3)**
The Internet is a powerful tool that can enhance your curriculum or lead you to pull your hair out. Various studies have shown that most educators do not know how to properly evaluate websites though they are being used in classrooms daily. Within this assignment, you will learn how to evaluate the internet for use within your classroom. After assessing your chosen math and science sites, you will post your findings as well as information about the sites within our course discussion forum.

With thousands of sites for every imaginable topic, one person possibly cannot tap into all of the best sites available. Together, we can share our favorite sites with others and make an enormous task more manageable and fun. As we explore the different sites shared, you will have a better sense of each site through hands-on exploration time. After all, we learn more by doing.

**Software Review (NBPTS 2,3)**
Like the Internet Site Review, you will learn how to evaluate software for use within your classroom. After assessing your chosen math and science software, you will post your findings as well as information about the sites within our course discussion forum. Sharing these within our discussion forum will allow you and your peers to collect a list of quality software.

**Journal Review (NBPTS 5)**
The purpose of this assignment is to increase your awareness of current issues within the area of
elementary science and mathematics and to provide an opportunity for you to thoughtfully analyze and reflect on current issues in this area. You will write a summary of a primary journal article including bibliographic information. Each will present this information to the class within a discussion forum posting and will lead an online discussion about the content. APA 6th Edition will be the expected style-guide.

**Integrated Unit (NBPTS 1,2,4,5)**

You will be creating an integrated math and science unit that allows students the opportunity for exploration, concept development, and concept application through inquiry. At a minimum, you will be creating three lessons that should reflect a balance of math and science and will contain at a minimum: standards, objectives, materials, strategies and adaptations for meeting the needs of special populations, assessment strategies, as well as examples of literature and technology integration.

<table>
<thead>
<tr>
<th>Assignments</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance and Participation</td>
<td>20</td>
</tr>
<tr>
<td>Student Interview <em>(due week 3)</em></td>
<td>10</td>
</tr>
<tr>
<td>Curriculum Survey <em>(due week 6)</em></td>
<td>20</td>
</tr>
<tr>
<td>Internet Site Review <em>(due week 4)</em></td>
<td>5</td>
</tr>
<tr>
<td>Software Review <em>(due week 4)</em></td>
<td>5</td>
</tr>
<tr>
<td>Journal Review <em>(due weeks 2 - 7)</em></td>
<td>10</td>
</tr>
<tr>
<td>Integrated Unit <em>(due week 8)</em></td>
<td>30</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
# 8-Week Course Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic(s)</th>
<th>Learning Objective(s)</th>
<th>Reading(s)</th>
<th>Assignment(s)</th>
</tr>
</thead>
</table>
| 1    | Content Standards | • Develop an understanding of the national education standards for mathematics and science  
• Identify ways math and science standards impact teaching and learning  
-Chapter 1 - Introduction  
-Chapter 2 - Principles and Definitions  
-Chapter 3 - Science Teaching Standards  
-Introduction, Principles for School Mathematics, and Standards for School Mathematics  
Text: *Activities for Integrating Science and Mathematics* Introduction & pages viii and ix, Organizational Matrix: Science and Mathematics Standards – begin to review activities | Readings  
Review all Course Information including Syllabus and Course Assignments  
Create a pacing plan to work on assignments  
Post Bio  
Discussion Post 1: Standards |
| 2    | Inquiry          | • Develop an understanding of recent trends in mathematics and science education  
• Assess the value of teaching using an inquiry approach  
• Identify the basic processes involved in inquiry based learning                                                                                                                                                                                                                     | Online Text: *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning*  
-Where Inquiry Happens: Inquiry, Equity, and Practice  
-Learning Mathematics in a Community of Inquiry  
Text: *Activities for Integrating Science and Mathematics* -Continue to review activities  
*Please be sure to explore additional resources to supplement* | Readings  
Journal Reviews I – post and respond (review posted by Sunday midnight – responses due week three on Sunday)  
Discussion Post 2: Inquiry in the Classroom |
your learning throughout the course
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic(s)</th>
<th>Learning Objective(s)</th>
<th>Reading(s)</th>
<th>Assignment(s)</th>
</tr>
</thead>
</table>
| 3    | Misconceptions  | • Develop an understanding of the impact of misconceptions in the classroom  
• Examine ways to identify misconceptions in the classroom  
• Identify possible means of misconceptions and increased awareness for diverse students | Online Text: *Adding it up: Helping children learn mathematics*  
-Hispanic and Anglo Students' Misconceptions in Mathematics [http://www.ericdigests.org/pre-9213/hispanic.htm](http://www.ericdigests.org/pre-9213/hispanic.htm)  
-Science Misconceptions Research and Some Implications for the Teaching of Science to Elementary School Students [http://www.ericdigests.org/pre-925/science.htm](http://www.ericdigests.org/pre-925/science.htm)  
-"Science Myths" in K-6 Textbooks and Popular culture [http://amasci.com/miscon/miscon.html](http://amasci.com/miscon/miscon.html)  
Text: *Activities for Integrating Science and Mathematics*  
-Continue to review activities  
*Please be sure to explore the additional resources to supplement your learning* | Readings  
Journal Reviews II – post and respond (review posted by Sunday midnight – responses due week four on Sunday)  
Interviews (due Sunday)  
Discussion Post 3: Misconceptions |
| 4    | Technology      | • Define how technology can be used to enhance curriculum  
• Critically examine various technological websites for integration into the curriculum  
• Critically examine software for integration into the curriculum | Online Text: *Educating teachers of science, mathematics, and technology: New practices for the new millennium*  
-The Continuum of Teacher Education in Science, Mathematics and Technology: Problems and Issues  
-The Critical Importance of Well-Prepared Teachers for Student Learning and Achievement  
Text: *Activities for Integrating Science and Mathematics*  
-Continue to review activities  
*Please be sure to explore additional resources to supplement your learning throughout the course* | Readings  
Journal Reviews III – post and respond (review posted by Sunday midnight – responses due week five on Sunday)  
Internet Site & Software Reviews (due Sunday)  
Discussion Post 4: Technology Integration |
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic(s)</th>
<th>Learning Objective(s)</th>
<th>Reading(s)</th>
<th>Assignment(s)</th>
</tr>
</thead>
</table>
| 5    | Understanding How Children Learn | • Understand the need for systematic approaches to teaching  
  • Explain age related difficulties that may arise with math and science concepts  
  • Identify characteristics of effective teaching in the areas of science and mathematics | Online Text: *How students learn: Science in the classroom*  
-Introduction  
-Scientific Inquiry and How People Learn [http://www.nap.edu/catalog/11102.html](http://www.nap.edu/catalog/11102.html)  
Online Text: *Adding it up: Helping children learn mathematics*  
-Chapter 1: Looking at Mathematics and Learning  
-Chapter 3: What is there to know?  
Pdf files: Characteristics of Learners, Experiential Learning, What is Active Learning?  
Text: *Activities for Integrating Science and Mathematics*  
-Continue to review activities Please be sure to explore additional resources to supplement your learning throughout the course | Readings  
Journal Reviews IV – post and respond (review posted by Sunday midnight – responses due week six on Sunday)  
Discussion Post 5: How Students Learn |
| 6    | Questioning Strategies for Inquiry Based Teaching and Learning | • Describe the methods for ascertaining prior knowledge  
  • Evaluate strategies for developing effective questioning  
  • Explain the role of questioning in teaching math and science | Text: *Activities for Integrating Science and Mathematics*  
Please be sure to explore additional resources to supplement your learning throughout the course | Readings  
Journal Reviews V – post and respond (review posted by Sunday midnight – responses due week seven on Sunday)  
Curriculum Awareness Survey (due Sunday)  
Discussion Post 6: Questioning |
| 7 | Diversity in the Math/Science Classroom | Explain the various needs students may exhibit in the inclusive classroom  
- Evaluate lesson plan and classroom modifications that may be required to accommodate all learners  
- Create lesson plans with accommodations/modifications  

Text: *Activities for Integrating Science and Mathematics*
- Continue to review activities  
- Critical Issue: Remembering the Child: On Equity and Inclusion in Mathematics and Science Classrooms [http://www.ncrel.org/sdrs/areas/issues/content/cntareas/math/ma800.htm](http://www.ncrel.org/sdrs/areas/issues/content/cntareas/math/ma800.htm)  
- Basic educational options for gifted students in schools [http://www.davidsongifted.org/db/Articles_id_10270.aspx](http://www.davidsongifted.org/db/Articles_id_10270.aspx)  

Please be sure to explore additional resources to supplement your learning throughout the course | Strategies | Readings  
Discussion Post 7: Diversity |
|---|---|---|
| 8 | Assessment | Explain the purposes of assessment  
- Describe appropriate ways to accommodate learners in assessments  
- Create lesson plans containing quality assessments  

Online Text: *Inquiry and the National Science Education Standards: A Guide for Teaching and Learning*
- Chapter 12: Developing Understanding Through Model-Based Inquiry [http://www.nap.edu/catalog/11102.html](http://www.nap.edu/catalog/11102.html)  

| Readings  
Discussion Post 8: Assessment  
Integrated Unit (due Sunday) |
E-Bibliography
Susan Gilroy, email: ecm@apus.edu

Per email on July 24, 2010, Sue Gilroy stated she could not find any resources for this course.