Prefix, Number and Name of Course: MED 307 Uses of Technology in the Teaching of Mathematics

Credit Hours: 3
In-Class Instructional Hours: 3 Labs: 0 Studio: 0 Field Work: 15

Catalog Description:
Prerequisites: Upper division status and permission of instructor.

Reasons for Revision:
This revision is proposed to update the content of the course because of the rapidly-changing nature of technology in mathematics education, and in order to submit the course for Intellectual Foundations Technology and Society designation.

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>Course Content References</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students will:</td>
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<td>1. use a variety of technological applications from the fields of mathematics and others, to solve problems, organize and analyze data, and explore mathematical topics.</td>
<td>I, II</td>
<td>In-class assignments, projects, exams, assignments</td>
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<td>2. critically evaluate a variety of technology applications for appropriateness to the curriculum and pedagogical implications.</td>
<td>II, IV</td>
<td>Assignments, projects, written reflections</td>
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<td>3. describe how to use a variety of technological applications, available in and out of mathematics classrooms, to develop critical thinking, problem solving, and performance skills.</td>
<td>II, IV</td>
<td>Lesson plans, unit plans</td>
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<td>4. critically assess the impact of technology use and nonuse on students’ development of critical thinking, problem solving, conceptual and procedural understandings, and performance skills.</td>
<td>II, III, IV</td>
<td>Written reflections, lesson plans, unit plans</td>
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<td>5. identify the benefits and limitations of teaching mathematics with technology and demonstrate the ability to incorporate technology in the development of lessons targeting conceptual understanding.</td>
<td>I, II, III, IV</td>
<td>Lesson plans, unit plans, written reflections, projects</td>
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<td>6. plan instruction and adapt pedagogical approaches to utilize technology in creating meaningful learning environments for diverse learners based on knowledge of subject matter, students, community, and curriculum goals.</td>
<td>II, III, IV</td>
<td>Lesson plans, unit plans</td>
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<td>8. critically reflect upon and respond to positions of various stakeholders from outside the school community regarding the need for and development of a technologically literate citizenry.</td>
<td>III</td>
<td>Assignments, written reflections</td>
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<td>9. demonstrate they are reflective practitioners who are able to adapt to new developments in technology, and critically evaluate and defend their own use of such technology when developing lessons.</td>
<td>I, II, III, IV</td>
<td>Lesson plans, unit plans, written reflections</td>
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<td>10. critically evaluate their private and public use of social networking media so as to conform to expected professional norms of technological behavior appropriate for an educator</td>
<td>III, IV</td>
<td>Assignments, written reflections</td>
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Course Content:

I. Currently available technology
   A. Computers and software
      1. Computers as tutor
      2. Computers as means of exploration, development, and evaluation of conjectures
      3. Computers as tool: software
      4. Computer programming
   B. Calculators
      1. Experience with a variety of calculators currently available
      2. Calculator as a tool
   C. Internet
      1. Resource for curriculum, content, and pedagogy
      2. Research tool including journals and data resources
      3. Limitations and cautions
   D. Other examples of technology

II. Teaching with technology
   A. Utilizing technology to teach mathematics
      1. Accessibility of technology (classroom, school, home)
      2. Attributes of technology relevant to teaching and learning mathematics
      3. Pedagogical implications (conceptual development, problem-solving, etc)
      4. Assessing the role of technology in achieving particular learning outcomes
   B. Creating a unit plan
      1. Critique of sample unit plans from a student’s and a teacher’s perspective
      2. Identify topics from state curriculum guidelines that may benefit from technology-enhanced instruction
      3. Assess appropriateness of technology and instructional plans utilizing the technology
      4. Develop lesson components utilizing technology including rationale for technology use

III. Current and historical issues regarding technology in mathematics education
   A. Changing role of technology in education
   B. Impact of technology in mathematics classroom on
      1. Content
      2. Teacher
      3. Student
      4. Community
   C. National and state level recommendations and requirements
   D. Positions of and reactions to stakeholders regarding technology use (parents, employers, unions, educational organizations, political groups, etc.)
   E. Professional norms of behavior of educators regarding technology use

IV. Field experience
   A. Critically evaluate role of technology in a variety of instructional settings
   B. Participate in instruction using a variety of technologies

Resources

Scholarship:

Althoen, Steven C. and Brandell, Joseph L., Investigating Bricard’s proof of Morley’s Theorem with the Geometer’s Sketchpad, *Mathematics Teacher*, 102 (9), 2009.

Edwards, Michael T., and Reinhardt, Jeffrey A., Monte Carlo approximation methods (using Fathom), Mathematics Teacher, 100 (6), 2007.


MacKinnon, Dan, Constructing and exploring Pascal’s Triangle in Tinkerplots, Mathematics Teacher, 102 (8), 2009.

Mathews, Susann M., and Reed, Michelle K., Using Fathom to solve the high dive problem, Mathematics Teacher, 101 (7), 2008.


Muller, Kimberly O., How technology can motivate the learning of proof. Mathematics Teacher, 103 (6), 2010.


N.C.T.M., Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics, Reston, VA, 2006

Nickell, Jennifer, Useful online and teacher production tools of the Geometer’s Sketchpad. Mathematics Teacher, 100 (8), 2007.


Starling, Tina T., and Hollebrands, Karen F., Investigating star polygons (with Geometer’s Sketchpad), Mathematics Teacher, 103(7), 2010.

Shafer, Kathryn, Scrambling data with Fathom to simulate the null hypothesis, Mathematics Teacher, 103 (6), 2010.

Thames, Mark H. *Using math to teach math: Mathematicians and educators investigate the mathematics needed for teaching*, Mathematical Sciences Research Institute, 2006.


Tucker, John M., A lesson on the slopes of perpendicular lines (using Geometer’s Sketchpad), *Mathematics Teacher*, 103(8), 2010.


**Periodicals:**

*Mathematics Teacher*

*Teaching Children Mathematics*

*Teaching Mathematics in the Middle School*

**Electronic Sources**


[www.nctm.org](http://www.nctm.org)

[www.greenglobs.net](http://www.greenglobs.net)

[www.education.ti.com](http://www.education.ti.com)

[http://www.wmich.edu/cpmp/index.html](http://www.wmich.edu/cpmp/index.html)

[http://srri.umass.edu/tinkerplots-project](http://srri.umass.edu/tinkerplots-project)
