Local Unit: **Graduate School of Education**

Course Abbrev.: EDCI

Full Course Title: Curriculum Development in Mathematics Education

Abbrev. Course Title (max. 24 Characters): Curr Devel in Math Educ

Credit Hours: 3

Program of Record: Mathematics Education Leadership

Submitted by: Patricia S. Moyer-Packenham

Date: 1/15/04

<table>
<thead>
<tr>
<th>Repeatable for Credit?</th>
<th>Y=Yes, not within same term</th>
<th>Up to _____ hours</th>
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<tbody>
<tr>
<td>N=New</td>
<td>T=Yes, within the same term</td>
<td>Up to _____ hours</td>
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<td></td>
<td>N=Cannot be repeated for credit</td>
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Activity Code: ___X___ LEC - Lecture, ______ LAB.- Lab, ______ RCT - Recitation, ______ STU - Studio,______ IND - Independent Study, ______ INT - Internship

Catalog Credit Format: _3_:__3_:__0__ Course Level: GF (500-600) _X_ GA (700+)

Grade Type: __GT__ GR: graduate grading, normal (A, A-, B+, B, C, F, IN, AB)


Maximum Enrollment: ____15_____

Submit for New courses - First term to be offered: _____Fall 2005_____

Prerequisites: Admission to the Mathematics Education Leadership Masters Degree Program or Instructor Permission

Corequisites:

Catalog Description for the course proposal (35 words or less): **EDCI 645, Curriculum Development in Mathematics Education (3:3:0).** Engages students in analysis, design and evaluation of school mathematics curricula. Yearlong seminar for Master’s level students in the Mathematics Education Leadership cohort program.

Submit for Modified or Deleted courses as appropriate: effective:

Last Term Offered _____ Previous Course Abbreviation _____ Previous Number _____

Description of modification:

Approval Signatures:

Dept/Prog: __________ Joan Isenberg ___________________________ Date: __2/2/04______

College Committee: __ Joan Isenberg ___________________________ Date: __2/2/04______

Graduate Council Representative: ___________________ Date: __________
GEORGE MASON UNIVERSITY
Graduate Council Course Coordination and Approval Form

Approval from other units:
Please list those units outside of your own who may be affected by these changes in the course. Each of these units must approve this change prior to its being submitted to the Graduate council for approval.

<table>
<thead>
<tr>
<th>Unit: NONE</th>
<th>Unit head:</th>
<th>Date:</th>
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<td>Unit:</td>
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<td>Date:</td>
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</tbody>
</table>

Graduate Council approval: __________________________________________

Graduate Council representative: ___________________________ Date: ______

Attach copy of school/college/institute course proposal form or modification memo showing approval date and background data on course.
I. Course Description

Yearlong seminar for Master’s level students in the Mathematics Education Leadership cohort program. Engages students in analysis, design and evaluation of school mathematics curricula.

Prerequisite: Admission to the Mathematics Education Leadership Master’s Degree Program

II. Student Outcomes

This course is designed to enable students to:
A. Identify standards-based school mathematics curriculum projects K-12; Analyze key characteristics of outstanding curriculum materials for school mathematics.
B. Examine learning theories that have been influential in mathematics education and identify ways those theories have been translated into curriculum materials and strategies for teaching.
C. Evaluate research on NSF-funded and commercially developed school mathematics curriculum materials to make informed choices.
D. Present and discuss a set of school mathematics curriculum materials in depth.
E. Design a small curriculum project based on key design principals.

III. Relationship to Program Goals and Professional Organization

EDCI 645 is designed to enable mathematics education leaders to evaluate mathematics curriculum materials appropriate for school mathematics. The course was developed according to the joint position statement of the Association of Mathematics Teacher Educators (AMTE) and the National Council of Teachers of Mathematics (NCTM) on Principles to Guide the Design and Implementation of Programs in Mathematics Education.

This position statement indicates that the core knowledge expectations in mathematics education include:
• Design effective curricula and learning environments to facilitate the development of deep and connected mathematical understanding,
• Lead curriculum design, analysis and evaluation,
• Study different strands of curricula,
• Compare international curricula, and
• Demonstrate knowledge of historical, social, political, and economic factors impacting mathematics education and curricula.

IV. Nature of Course Delivery

The delivery of this course combines methods of lecture, discussion, independent study/research, student presentation, and writing.

V. Texts and Readings

Required Texts:

NSF-Sponsored Curriculum (online resource). The K-12 Mathematics Curriculum Center. (www.edc.org/mec/curricula.htm)

**Selected Articles:**


**Additional Resources:**


Subscription to *Teaching Children Mathematics* (for the elementary grades) or *Mathematics Teaching in the Middle School* (for the middle grades) journals available from the National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091; 703-620-9840; nctm.org website.

**VI. Course Requirements, Assignments, & Evaluation Criteria**

The assignments across the semesters are intended to develop skills in mathematics curriculum analysis and evaluation. Students conduct in-depth study of mathematics curriculum materials, investigate NSF-funded mathematics curriculum projects, examine research on mathematics curriculum projects, and present an evaluation of their findings. All assignments are to be completed on time so that class members might benefit from the expertise and contributions of their colleagues.

**A. Written Review and Presentation (20%)**

Conduct a review of five school mathematics curriculum projects. Identify characteristics that curriculum projects share and those that make each project unique. Prepare a summary of the projects for discussion and presentation during a class session. The review should be 8-10 pages (double-spaced typed) in length.

**B. NSF–Funded Curriculum Review and Presentation (35%)**

Select one mathematics education curriculum project funded by the National Science Foundation (NSF). Conduct an in-depth analysis of the curriculum materials. Research and evaluate the NSF-funded project on a variety of attributes (which may include scope and sequence, relationship to NCTM Standards, content, research that has been published on the curriculum, etc.). Use evaluation indicators to identify key characteristics of outstanding curriculum materials in the set of materials. Complete a written analysis identifying areas of weakness in the materials and suggested improvements for the designer (approx. 10-15 pages in length). Use Powerpoint and other forms of technology to prepare and present your findings during a class session.

Written Review – 25%

Presentation – 10%

**C. Curriculum Design Project (35%)**

Design a small mathematics curriculum project (approximately 2-4 lessons). There are some common characteristics of high quality curriculum materials in mathematics. The purpose of this assignment is to integrate your knowledge of these design characteristics
into the creation of a curriculum development project. Set goals for your project. Identify your audience and their needs. Select the critical/essential understandings of the audience for your project.

Curriculum materials are designed with a wide variety of goals and content. The purpose of this assignment is to develop a small curriculum design project for an audience of learners.

**Project Example:** design curriculum or activities for teachers or students using the web authoring tools.

**Project Example:** design curriculum for students using one or two virtual manipulatives.

**Project Example:** design curriculum lessons for classroom instruction.

D. Discussion Record (10%)

During each class session, students participate in discussions of readings and student presentations and provide written feedback to class members. A discussion record is maintained during each of these class sessions documenting the participation of each class member. Students are graded on their contributions to these discussions and on their written evaluation feedback for class members.

### Evaluation Criteria

Graduate Grading Scale

<table>
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<th>Grade</th>
<th>Percentage</th>
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<tr>
<td>A</td>
<td>93%-100%</td>
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<tr>
<td>A-</td>
<td>90%-92%</td>
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<tr>
<td>B+</td>
<td>87%-89%</td>
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<tr>
<td>B</td>
<td>80%-86%</td>
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<tr>
<td>C</td>
<td>70%-79%</td>
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<tr>
<td>F</td>
<td>Below 70%</td>
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</table>

VII. Course Schedule

Class meets 10:00 – 2:30 PM, Saturdays

<table>
<thead>
<tr>
<th>Week – Class</th>
<th>Topic and Reading</th>
</tr>
</thead>
</table>
| 1            | The K-12 Mathematics Curriculum Center  
NSF Sponsored Curriculum Materials (online resource) |
| 2            | National Council of Teachers of Mathematics  
Principals and Standards for School Mathematics (2000)  
School Mathematics Curricula: Recommendations and Issues (Senk Ch#1) |
| 3            | Elementary Grades Curriculum Projects (Senk Ch#2-4) |
| 4            | Elementary Grades Curriculum Projects (Senk Ch#5-7) |
| 5            | Curriculum Issues of Standards, Testing, and Equity (Schoenfeld article)  
Standards-Based Mathematics Curriculum Materials (Trafton article) |
| 6            | Middle Grades Curriculum Projects (Senk Ch#8-9) |
| 7            | Middle Grades Curriculum Projects (Senk Ch#10-12) |
| 8            | High School Curriculum Projects (Senk Ch#13, 18, 19) |
| 9            | Curricular Controversy in the Math Wars (Reys article)  
Implementing Standards (Jacob article) |
| 10           | Curriculum Projects Presentations |

VIII. UNIVERSITY POLICIES

The university has a policy that requests students to turn off pagers and cell phones before class begins.

**HONOR CODE**

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of George Mason University and with the desire for greater academic and personal achievement, George Mason University has set forth a code of honor that includes policies on cheating and attempted cheating, plagiarism, lying and stealing. Detailed information on these policies is available in the GMU Student Handbook, the University Catalog, of the GMU website (www.gmu.edu).
INDIVIDUALS WITH DISABILITIES POLICY
The university is committed to complying with the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 by providing reasonable accommodations for applicants for admission, students, applicants for employment, employees, and visitors who are disabled. Applicants for admission and students requiring specific accommodations for a disability should contact the Disability Resource Center at 993-2474, or the University Equity Office at 993-8730.

ATTENDANCE POLICY
Students are expected to attend the class periods of the courses for which they register. Although absence alone is not a reason for lowering a grade, students are not relieved of the obligation to fulfill course assignments, including those that can only be fulfilled in class. Students who fail to participate (because of absences) in a course in which participation is a factor in evaluation, or students who miss an exam without an excuse, may be penalized according to the weighted value of the missed work as stated in the course syllabus (GMU University Catalog, pg. 32).
<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>MEETS REQUIREMENTS (A, A-)</th>
<th>NEEDS IMPROVEMENT (B+, B, C)</th>
<th>INC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF Project Identification</td>
<td>Select and identify one NSF-funded project. Summarize the key goals and characteristics of the project in one- two paragraphs.</td>
<td>Project selected is not an NSF-funded project OR the summary of the project does not contain key goals and characteristics of the project.</td>
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<tr>
<td>Scope and Sequence</td>
<td>Provide an overview of the scope and sequence of the project identifying all of the mathematics content in the project. Organize the mathematics by content strands in the form of a table or list.</td>
<td>Scope and sequence overview may be missing some of the mathematics content in the project OR scope and sequence may not be organized in the form of a table or list.</td>
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</tr>
<tr>
<td>Relationship to NCTM Standards</td>
<td>Provide a two-page summary detailing how the designers of the curriculum related the materials to the NCTM 2000 Standards. Provide specific examples/evidence from the curriculum and from the Standards to show the link between the two documents.</td>
<td>The summary may be too brief OR the summary may not detail the relationship between the curriculum and the NCTM 2000 Standards. The summary may make general statements without providing specific examples/evidence that show the link between the two documents.</td>
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<tr>
<td>Research</td>
<td>Cite research that has been published on the curriculum materials to show its effectiveness for mathematics teaching. Use APA to list citations (at least 4) and provide a one paragraph abstract summarizing the findings of each research study on the curriculum.</td>
<td>The summary may not cite any research on the curriculum materials OR the list of citations may not follow the APA guidelines OR one paragraph summarizing the findings of each research study is unclear or missing.</td>
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</tr>
<tr>
<td>Areas of Weakness in the Curriculum</td>
<td>Identify five areas of weakness in the curriculum materials. Support your selection of these weaknesses by providing examples and explanations based on research, readings, and other sources. (2 paragraph minimum for each weakness)</td>
<td>Less than five areas of weakness were identified OR no/insufficient support is provided for the selections OR the support is based only on opinion rather than research, readings, and other sources. (2 paragraph minimum for each weakness)</td>
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<tr>
<td>Suggestions for Improvement</td>
<td>Make five suggestions for improving the curriculum materials. Base your suggestions on key indicators of mathematics curriculum development, research, readings, and other sources. (2 paragraph minimum for each suggestion)</td>
<td>Less than five suggestions for improving the curriculum materials were identified OR no/insufficient support is provided for the suggestions OR the suggestions are not based on key indicators of mathematics curriculum development, research, readings, and other sources. (2 paragraph minimum for each suggestion)</td>
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</tr>
<tr>
<td>Professional Writing Quality</td>
<td>The review follows professional standards of writing and is free of spelling, grammar, and language mechanics errors. The review is 10-15 pages in length.</td>
<td>The review contains spelling, OR grammar, OR language mechanics errors. The review is less than 10 OR more than 15 pages in length.</td>
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<tr>
<td>CRITERIA</td>
<td>MEETS REQUIREMENTS (A, A-)</td>
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<tr>
<td>Audience / Needs</td>
<td>The project identifies the target audience for the curriculum and the needs of the audience. It provides information such as grade level, prerequisite knowledge, materials requirements, etc.</td>
<td>The project does not identify the target audience for the curriculum OR it does not indicate the needs of the audience OR this information is too brief to make an accurate assessment of the audience.</td>
<td></td>
</tr>
<tr>
<td>Core Feature: Content / Concepts</td>
<td>The project clearly identifies the mathematics content and concepts. The design of the project places the focus of the learner’s activities on the mathematics, rather than on the activities.</td>
<td>The project does not have a clear focus on the mathematics content and concepts OR the design of the project places the focus on the activities, rather than on the mathematics.</td>
<td></td>
</tr>
<tr>
<td>Core Feature: Learner Involvement</td>
<td>The project actively engages the learner in the study of mathematics.</td>
<td>The project does not provide opportunities for much learner engagement with the mathematics.</td>
<td></td>
</tr>
<tr>
<td>Core Feature: Coherence / Mathematics is Developmental</td>
<td>The project demonstrates a developmental progression where mathematics concepts build from one unit to the next. A culminating experience/project ties together important concepts and content.</td>
<td>The project units seem disconnected OR the developmental progression of the mathematics is unclear OR concepts do not build on each other. There is no culminating experience/project OR the culminating project does not tie together important concepts and content.</td>
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<tr>
<td>Structural Feature: Form</td>
<td>The project identifies the form of the curriculum materials (student groups, whole-group instruction, computer lab, etc.). The project describes why this particular form was selected and how it serves to support the core features of the design.</td>
<td>The project does not identify the form of the curriculum materials OR uses too many different forms in disconnected ways. The project does not describe why this particular form was selected OR how the form will support the core features of the design.</td>
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</tr>
<tr>
<td>Structural Feature: Duration</td>
<td>The report identifies the duration of each unit and unit segment of the project. The project describes why this duration was selected and how it supports the core features of the design.</td>
<td>The report does not identify the duration of each unit and unit segment of the project. The project does not describe why this duration was selected OR how the duration will support the core features of the design.</td>
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</tr>
<tr>
<td>Technology</td>
<td>The project incorporates the use of technology in a meaningful way that supports the knowledge construction process for the learner.</td>
<td>The project does not incorporate technology OR uses technology in a peripheral/disconnected way OR the technology does not support the knowledge construction process for the learner.</td>
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<tr>
<td>Evaluation</td>
<td>The project evaluates one aspect of the curriculum materials (ex: student achievement, student attitudes, student discourse, etc.) and includes examples of the documents used for evaluation. Report your findings at the end of the project.</td>
<td>The project does not have a clear plan of evaluation OR examples of the documents used for evaluation are not included.</td>
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</tr>
<tr>
<td>Professional Writing Quality</td>
<td>The design project follows professional standards of writing and is free of spelling, grammar, and language mechanics errors. The review is at least 4 lessons in length.</td>
<td>The design project contains spelling, OR grammar, OR language mechanics errors. The review is less than 4 lessons in length.</td>
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