



UNIVERSITY STUDIES COURSE APPROVAL REQUEST

FACULTY AND CHAIR SPONSOR SHEET

COURSE NAME/DEPARTMENT/NUMBER: MTH 488 MATHEMATICAL INQUIRY II

CLUSTER REQUIREMENT: 5B LEARNING THROUGH ENGAGEMENT

As a condition of approving this course for University Studies credit, we agree:

That each offered section of this course shall have a syllabus explicitly listing the learning outcomes for this Cluster Requirement along with the course-specific learning outcomes.

That each offered section of this course shall follow the general spirit of the Master Syllabus, with the understanding that different instructors may emphasize different elements of the course and/or use different pedagogical approaches or assessments.

That a syllabus for each offered section of this course will be emailed to the University Studies Director prior to the end of the semester in which it is offered.

That all faculty teaching this course will make available to the University Studies Director and the University Studies Committee any and all student work for the purposes of program assessment, with the understanding that such assessment will take place on a multi-year cycle, that such assessment will keep anonymous the identities of both the students and the instructors, that the responsibility for the collection of student work will fall in the main on the University Studies Director or designee and that this collection shall entail minimal disruption to the operation of the course.

Chair: Saeja O. Kim Saeja O. Kim Professor 03/22/2016
Printed Name Signature Academic Rank Date

Faculty Sponsor: GARY E. DAVIS G. E. Davis PROFESSOR 3/22/2016
Printed Name Signature Academic Rank Date

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BA/BS Accelerated program

Mathematics & Education

Proposed University Studies 5B: Learning Through Engagement

MTH 488 Mathematical Inquiry II (3 credits)

Pre-requisites: MTH 487

Course description: Course promotes engagement of students with communities of practicing mathematics teachers. Focus is on problems of, and issues related to, the learning and teaching of algebra. Students will read research-based articles and discuss these via social media with practicing mathematics teachers and mathematics educators.

Course Overview:

The infusion of research and research-based practices for mathematics teaching is intended to present a transition for future teachers, from that of a student engaging in these practices, in MTH487, to that of a teacher learning how to foster such practices, and becoming a participant in the community of mathematics teaching. Common Core does not give instruction or specific direction on how to teach, only that the mathematical practices should be fostered in the classroom. But one does not directly lead to the other. So this course, as an experience of such an example, can help make that bridge.

Learning Outcomes:

Course-Specific Learning Outcomes: Upon completion of this requirement, students will be able to:

1. Engage a community of practicing mathematics teachers in issues of learning and teaching algebra.
2. Garner current best community practice in the teaching and learning of algebra from professional association websites, and blogs and social media postings of practicing mathematics teachers.
3. Identify key mathematics educators who take a lead in raising issues of teaching and learning algebra.
4. Articulate coherently their own findings and reflections on the teaching and learning of algebra using a variety of professional publications and social media outlets.

University Studies Learning outcomes: Upon completion of this requirement, students will be able to:

1. Identify the needs and resources of the communities to which they belong.
2. Apply knowledge and skills gained through academic study to real problems and/or opportunities within their communities.
3. Describe the connections between learning on campus and the issues and needs of broader academic, professional or civic communities.
4. Articulate the value of engagement to other members of their communities.

Texts/Assigned Readings/ Resources:

Prescribed readings:

- Haas, M. (2005). Teaching methods for secondary algebra: A meta-analysis of findings. *Nassp Bulletin*, 89(642), 24-46.
- D'Ambrosio, B. S., Kastberg, S. E., & Viola dos Santos, J. R. (2010). Learning from student approaches to algebraic proofs. *Mathematics Teacher*, 103(7), 489-495.
- Blanton, M. L., & Kaput, J. J. (2005). Characterizing a classroom practice that promotes algebraic reasoning. *Journal for Research in Mathematics Education*, 412-446.
- Choike, J. R. (2000). Teaching strategies for "Algebra for all". *Mathematics Teacher*, 93(7), 556-560.
- Martin, W. G. (2009). The NCTM High School Curriculum Project: Why It Matters to You. *Mathematics Teacher*, 103(3), 164-166.
- Russell, A. R. (2004). Pick's Theorem: What a Lemon! *Mathematics Teacher*, 97(5), 352-355.
- Driscoll, M., & Moyer, J. (2001). Using students' work as a lens on algebraic thinking. *Mathematics Teaching in the Middle School*, 6(5), 282-289.
- Avila, C. L., & Ortiz, E. (2012). Produce Intrigue with Crypto! *Mathematics Teaching in the Middle School*, 18(4), 212-220. Most of the readings and resources (including videos and webinars) are web-based, including resources of professional societies (National Council of Teachers of Mathematics, American Mathematical Society, & Mathematical Association of America) and web resources from practicing teachers and mathematics educators.

- [National Council of Teachers of Mathematics](#) (\$44/year student e-membership):

- o Founded in 1920, the National Council of Teachers of Mathematics (NCTM) is the world's largest mathematics education organization, with 80,000 members and more than 230 Affiliates throughout the United States and Canada. The National Council of Teachers of Mathematics is the public voice of mathematics education, supporting teachers to ensure equitable mathematics learning of the highest quality for all students through vision, leadership, professional development, and research.

- o [Professional Development Guides](#) (organized by grade bands).

- o [Webinars and Webcasts](#) E-seminars are recorded professional development webinars with facilitator guide and handouts - free for NCTM members. Webcasts of Annual Meeting Keynote Sessions offer notable and thought provoking leaders in math education and related fields as they inspire attendees at NCTM Conferences.

- o [Classroom resources](#). Includes [Share and Review Resources](#), Lesson plans, Interactives & mobile apps, Problems, Success Stories.

- American Mathematical Society blog on [Teaching & Learning Mathematics](#):

"About this Blog All articles published on this blog are written either by the editors or by a contributing author following an invitation from the editorial board. All articles published on this blog go through an editorial review/revision process prior to publication. We typically publish three articles per month, appearing approximately every 10 days. The goal for this blog is to stimulate reflection and dialogue by providing mathematicians with high-quality commentary and resources regarding teaching and learning. Because there is no simple solution to the challenges facing mathematics education, this blog will serve as a big tent, giving voice to multiple contributors representing a wide range of ideas. Contributions will include practical "teaching tips," commentary on current mathematics education research, discussions of social/curricular educational policy, and more. Our focus will include both postsecondary and PreK-12 education, because mathematics education does not abruptly stop and start anew as students make institutional transitions. Issues that affect both high- and low-achieving students will be addressed, as well as issues that affect students who are minoritized in their mathematical communities. We welcome ideas for posts and pointers to interesting materials or events; please feel free to add your contributions in the comments."

- American Mathematical Society [Blog on Math Blogs: K-12 Mathematics Math Education](#)
- The Reflective Educator: [Mathematics Education Blogs](#) (links to 347 mathematics education blogs)
- [Twitter](#): there are many thousands of mathematics teachers and mathematics educators on Twitter. Students will establish a Twitter account and be given a list of several hundred mathematics teachers and educators to begin following and engage in conversation about the learning and teaching of algebra.

Example Learning Activities and Assignments:

Learning Activity	University Studies Learning Outcome addressed
Set up Twitter account and follow prescribed mathematics teachers & mathematics educators. Set up blog on the learning and teaching of algebra. Follow selected blogs from <i>The Reflective Educator</i> and post on those blogs, based in in-class readings and discussion. Discuss major issues of the teaching and learning of algebra through articles, videos and podcasts from the National Council of Teachers of Mathematics.	Identify the needs and resources of the communities to which they belong.
Discuss, through Twitter and blog posts and comments, the real problems faced by classroom teachers in algebra classes, based on increasing knowledge of literature.	Apply knowledge and skills gained through academic study to real problems and/or opportunities within their communities
Detailed written accounts of the expressed, and learned, needs of practicing teachers and what is learned from a detailed analysis of the research literature.	Describe the connections between learning on campus and the issues and needs of broader academic, professional or civic communities.
Open forum on benefits of community engagement in the teaching and learning of mathematics, including a detailed map of the community of mathematics educators with whom student engaged, and the nature and value of that engagement.	Articulate the value of engagement to other members of their communities.

Artifacts generated by assignments will include:

1. A LaTeX document that contains detailed analysis of, and reflections on, the prescribed readings.
2. A collection of weekly written reports of blog postings and Twitter conversations with mathematics educators.
3. A detailed map of the community of mathematics educators with whom student engaged, and the nature of that engagement.
4. A LaTeX mid-semester and final semester report.
5. A blog, with weekly blog postings, related to the teaching and learning of algebra.
6. A detailed annotated bibliography on the teaching and learning of algebra, produced using BibTeX.

Sample course Outline:

Course topics are laid out below week by week. The exact topics covered and their sequence may vary slightly from semester to semester.

Course Topic	Week of Semester
<ul style="list-style-type: none"> • Introduction to research in the teaching and learning of algebra. Discussion and synthesis of major research findings. • Set up Twitter account and follow mathematics teachers & educators from prescribed list. 	1
<ul style="list-style-type: none"> • Professional Development: Detailed study of D'Ambrosio, B. S., Kastberg, S. E., & Viola dos Santos, J. R. (2010). Learning from student approaches to algebraic proofs. <i>Mathematics Teacher</i>, 103(7), 489-495. • Begin work on annotated bibliography on the teaching and learning of algebra 	2
Begin reading and commenting on mathematics education blogs listed on <i>The Reflective Educator</i> . Class discussion of major issues raised.	3
<ul style="list-style-type: none"> • Podcast: <i>Focus in High School Mathematics: Reasoning and Sense Making</i> (NCTM) • Detailed Study of Martin, W. G. (2009). The NCTM High School Curriculum Project: Why It Matters to You. <i>Mathematics Teacher</i>, 103(3), 164-166. 	4
Professional Development: Detailed study of Choike, J. R. (2000). Teaching strategies for "Algebra for all". <i>Mathematics Teacher</i> , 93(7), 556-560.	5
Implementing the Grades 9-12 Common Core State Standards with NCTM Resources (9-12) – video, in-class discussion, blog & Twitter discussion.	6
Effective Mathematics Instruction: The Role of Mathematical Tasks (K-12) – video, in-class discussion, blog & Twitter discussion.	7

Using Multiple Representations in Algebra (6-12) – video, in-class discussion, blog & Twitter discussion.	8
Professional Development: Detailed study of Blanton, M. L., & Kaput, J. J. (2005). Characterizing a classroom practice that promotes algebraic reasoning. <i>Journal for Research in Mathematics Education</i> , 412-446.	9
<ul style="list-style-type: none"> • We're Writing in Secret Code: I Think It's Algebra - – video, in-class discussion, blog & Twitter discussion. • Detailed Study of Avila, C. L., & Ortiz, E. (2012). Produce Intrigue with Crypto!. <i>Mathematics Teaching in the Middle School</i>, 18(4), 212-220. 	10
Discussion of NCTM Classroom Resources for Algebra and application in developing lesson plans.	11
Class discussion of major issues raised on blogs and Twitter. Planning for final summary blog posts.	12
Work on interviews with members of mathematics education community to produce podcast for blog.	13
Open forum on benefits of community engagement in the teaching and learning of mathematics.	14

Where Departmental time and resources allow, visits to local High School classrooms will be arranged.

Assessment

FORM OF ASSESSMENT	% OF FINAL GRADE
Weekly written detailed analysis of, and reflections on, the prescribed readings.	30%
Weekly written reports of blog postings and Twitter conversations with mathematics educators.	30%
Mid-semester summary reflection on class activities	10%
End of semester summary reflection on class activities	10%
Detailed map of the community of mathematics educators with whom student engaged, and the nature of that engagement.	10%
Detailed annotated bibliography on the teaching and learning of algebra	10%