

SERVICE LEARNING FOR MATHEMATICS EDUCATION TIER 3 CAPSTONE

I. Course Information

- **Department:** Mathematics
- **Course Code and Number:** MAT 496
- **Number of Credits:** 3 credits
- **Course Title:** Service Learning For Mathematics Education
- **Course Description (maximum of 100 words):** The purpose of the course is to enhance the preparation of pre-service teachers concurrently with their student teaching. Student teachers will design, analyze and reflect on teaching techniques to be used in the field. Student teachers will also perform case studies that will encompass and address various issues; most importantly, demonstrate positive impact on the learning of their secondary students. This course is taken concurrently with MAT 494, *Student Teaching (Mathematics)*.
- **Prerequisite:** Departmental permission.
- **Mode of instruction:** The teaching in this course will be based on case studies and class presentations. Student teachers are expected to participate in class discussions and activities, to complete assignments, and to present some of them in class.
- **Date course to be first offered:** Spring 2014
- **Required Textbook:** None
- **Reference Textbooks:**
 - B. Roe, E. Ross, S. Smith (2009): *Student Teaching and Field Experiences Handbook*, 7th Edition – Pearson.
 - G. Posner, C. Vivian (2009): *Field Experience: A Guide to Reflective Teaching*, 7th Edition – Prentice Hall.
 - Smith et al (2004): *Using Cases to Transform Mathematics Teaching and Learning: Improving Instruction in Algebra* - Teachers' College Press.

- Smith et al (2005): *Using Cases to Transform Mathematics Teaching and Learning: Improving Instruction in Geometry and Measurement – Teachers’ College Press.*
- C. Charles (2010): *Building Classroom Discipline – Prentice Hall.*
- A. Bullock, P. Hawk (2009): *Developing a Teaching Portfolio: A guide for Preservice and Practicing Teachers – 3rd Edition- Prentice Hall.*

II. Rationale for Course Proposal

This course is proposed to satisfy the Capstone component in Tier 3 of the Liberal Education Program. This proposal is a redesign of MAT 496 (*Student Teaching Seminar*), in which we incorporate the service component to the student teaching experience. In fact, the teaching and learning experience in this course is based on service learning that is reciprocal by its very nature; not only will our student teachers learn from their practice in the field, but at the same time they will provide service to the schools.

The revision we are proposing is not an update, but a restructuring in the form and content of the course, while at the same time, having our student teachers provide service to the community during their student teaching experiences. For the form, we propose to change the course from a 1-credit, Pass/Fail course to a standard 3-credit course, which will require meeting with the candidates for 3 hours on a weekly basis. For the content, the teaching will be based on case-studies and presentations. The syllabus emphasizes the standards set forth by the National Council of Teachers of Mathematics (NCTM), the Common Core Standards (CCS), the National Council for Accreditation of Teacher Education (NCATE), and the Connecticut Common Core of Teaching (CCT) that are required for all future teachers. While many of these standards were discussed in previous courses, learning occurs best when one is actively involved with the learning. Hence, emphasizing and discussing teaching methods and techniques while student teachers are involved in their classrooms will enhance their practical development.

Currently, student teachers in MAT 496 complete a minimum of 15 hours of field work before their student teaching (MAT 494, a ten-week experience) begins. Concurrently, they meet on campus with their university supervisors weekly or bi-weekly in the student teaching seminar to

discuss their field work. Discussions center on classroom management, lesson planning, initiation and closure, discourse, technology, and differentiated instruction. Based on our experience, many of these topics need to be revisited and discussed over the course of the semester. However, due to the short time that is allocated to the current course (1-credit), few of these topics can be addressed. At present, the seminar is considered more as a follow-up meeting on the field work, as opposed to a course per se.

The course is expected to run once a year, in the spring semester.

III. Course overview

In several schools, many students struggle with mathematics and several teachers struggle with the teaching of mathematics and in incorporating teaching techniques that focus on meaningful mathematical tasks. During their field experiences in courses prior to student teaching, and then the first few weeks prior to student teaching, pre-service teachers have observed and will observe several teaching and learning difficulties related to mathematics. In order to better prepare them for their teaching careers and at the same time to provide service to the schools that welcome them and train them, student teachers will work on a mini-project aiming at improving one problematic topic that they observe in the field. This could be related to using an innovative method of teaching to engage and motivate students in learning mathematics, such as inquiry-based learning, problem-based learning, project-based learning, or integrating technology in their teaching or to differentiating instruction to accommodate diverse populations and learning styles. This will be done by reflecting and preparing a plan of action, using methods of teaching that they learned in MAT 490, *Mathematics (Secondary School)* and other courses in their undergraduate studies, and using technology. **(Values discussed: Civic Engagement; Human Diversity; Embedded Competency: Creative Thinking).**

Class activities and discussions will focus on classroom management techniques, addressing different learning styles, and assessment techniques. Student teachers will prepare activities that address different learning styles, prepare and analyze tests to be used in their classes, and reflect on their test results.

Hence, this course will provide student teachers with a forum in which they can bridge their understanding of teaching from the theoretical knowledge gained from university courses to the practical knowledge they are experiencing in the classroom. At the same time, it will enable them to be innovative by bringing solutions to current classroom problems.

The teaching methodology for this course will be based mainly on case studies; class activities and presentations will be used as well. Case studies will consist of, but will not be limited to, videos, lesson scripts, students' errors, scenarios that teachers may face in the classroom (all of which we have collected from previous years), recommendations of cooperating teachers, recommendations of research studies, and other resources related to mathematics education. Thus, the main sources of learning will come from non-textbook sources (**Area of knowledge: Intellectual Foundations**).

In their project, student teachers will use what they have learned in their undergraduate courses (education, psychology, mathematics and mathematics education) to choose and use new approaches and techniques in the preparation of unit plans that suit their students (**Embedded Competency: Creative thinking**). They will use technology to enhance the teaching of mathematics (**Embedded Competency: Technology fluency**) and differentiate their teaching according to students' needs (**Value discussed: Human Diversity**). The project ends with the assessment of the learning of students and the effectiveness of the teaching. (**Value discussed: Ethical judgment**).

After planning their units, student teachers will teach and reflect on their teaching (**Embedded Competencies: Oral communication, Written communication**). Student teachers will present their work in a portfolio, combining their observations, plan of action, results, and personal reflection.

IV. Tier 3 requirements – Explanation

VALUES

- ***Civic engagement:*** In this course, student teachers will have the chance to reflect on their future role as innovative teachers and active members in the society and the community. Student teachers will take the initiative to propose new techniques and work on them in their classes to improve an identified problematic situation. The project that they will do in this course will make a difference in the class of the hosting school. This will culminate with sharing innovative techniques that enhance the teaching and learning of mathematics with their cooperating teachers and school.
- ***Human diversity:*** Catering for their students' differences and needs is an important role for any teacher. Class discussions will focus on the richness that students' diversity bring to any classrooms. Understanding the background of students is an important factor to know how to better deal with different students. Throughout their field experiences and project, student teachers will prepare differentiated instruction that targets different learning styles and needs. Student teachers will be continually assessed in this area through the university supervisor's visits, the cooperating teacher's evaluations, and the lesson plans submitted.
- ***Ethical judgment:*** This value will be discussed with the "Assessment and grading," which is very often subject to biased judgment. Grade inflation and grades to gain popularity will be the main topics through which the questions of professional ethics will be discussed.

COMPETENCIES

- ***Oral communication:*** This is an essential competency for success for future teachers. Throughout their class activities and field work, student teachers will need to present lessons. They will receive feedback from their instructor and field cooperating teachers about their interactions with students.
- ***Written communication:*** While much of teaching is based upon oral communication, teachers must be adept at explaining themselves via the written word, particularly when it comes to composing assessments in which the directions are clear and the problems are well-stated. In addition, teachers must be able to provide written correct and concise feedback to their students on these assessments. Finally, teachers must demonstrate the ability to reflect critically on their lessons and teaching, using actual examples and/or data, along with proper grammar, spelling, and syntax; this will be accomplished through reflective papers and weekly journals.

- **Technological fluency:** Technology plays an important role in classrooms nowadays and especially in the teaching of mathematics. Simulations and interactive software help learners in their mathematics learning. Student teachers need to plan lessons where they integrate technology to enhance the teaching and learning of mathematics.
- **Creative thinking:** Classroom problems can never be listed, since they continuously change. In their mini-project, student teachers are asked to analyze a current class situation and to propose a project to improve the teaching of mathematics. They need to make creative decisions based on what they have learned in several courses, to propose a plan of action, and at the end to analyze and reflect on their project, i.e., explaining and justifying what worked and analyzing what did not.

AREA OF KNOWLEDGE

- **Creative Drive:** During their student teaching, students must prepare a mini-project for intervention where they need to use an innovative teaching technique in their classes in order to better teaching mathematics. Students need to identify a need in their classroom, based on their observations, and then decide on the technique they will be using to enhance the learning of mathematics in their classroom. For their projects, students will have to examine several different strategies learned in their previous courses and use them to create and design a project that targets their objectives. At a second stage, students will actually present the project in their classrooms, and reflect on their practices.

V. Learning Objectives

GOALS: Our goals are to ensure that student teachers are well-prepared to teach mathematics and are performing service to the community by providing quality student teaching while learning from their experiences. Student teachers will integrate skills and knowledge acquired in the LEP program and their certification program.

OBJECTIVES: As a result of this course, student teachers will:

- OBJ 1: Analyze and reflect on one's field experience and make ethical and professional decisions. (NCATE 16.1; CCT 6.1)
- OBJ 2: Select, design, and use worthwhile mathematical tasks, problem-based or inquiry-based activities, and technology-based mathematical activities. (NCATE 8.1, 8.7, 8.8, 8.9; CCT 3.5, 3.6)
- OBJ 3: Design tasks and questions that promote discourse in the classroom. (NCATE 8.3; CCT 3.8)
- OBJ 4: Design differentiated instruction. (NCATE 8.1, 8.7; CCT 3.7)
- OBJ 5: Address equity and diversity in the classroom. (NCATE 7.1, 8.1; CCT 2.1, 3.7)
- OBJ 6: Provide evidence of implementing a variety of teaching strategies learned in the secondary methods class, including implementation of a discipline policy, implementation of good questioning strategies, use of technology or manipulatives, use of writing in the

classroom, effective assessment strategies, and identifying and planning instruction for at-risk students. (NCATE 8.1-8.4, 8.7-8.9, 16.3; CCT 2.4, 3.4-3.7, 4.1-4.3, 4.5, 4.6)

- OBJ 7: Prepare a portfolio which includes a mini-project about innovative teaching activities aiming at enhancing the learning of mathematics, as well as case studies following up on the progress of three students of different abilities in a given class. (NCATE 8.4, 8.7, 16.3; CCT 3.2, 3.5, 3.6, 4.1, 4.6).
- OBJ 8: Understand and abide by the professional standards of conduct for teachers. (CCT 6.11)
- OBJ 9: Understand the role of professional development in becoming an effective teacher. (NCATE 8.5-8.6; CCT 6.2)

NB: The numbering of the NCATE Standards is based upon the NCTM 2003 Standards, and could be subject to change in the future.

VI. Assessment

Individual instructors may vary assessment modes, but typically grades will be based on a combination of activities (homework or classwork assignments, a project and a portfolio), distributed as follows:

- Field observations of student-teaching done by the university supervisor (lesson plans and teaching) 10%
- Field observations of student-teaching done by the cooperating teacher 10%
- Short assignments (including class activities or presentations) 15%
- Journal entries (self-reflection) 15%
- Portfolio (including a mini-project about innovative teaching activities aiming at enhancing the learning of mathematics, as well as case studies following up on the progress of three students of different abilities in a given class)
 - Mini-Project 25%
 - Case studies 25%

VII. Course outline

The proposed course will accompany Student Teaching (MAT 494) where student teachers start with class observations (for four weeks), then assume their first preparation for teaching (for a month), followed by a second and a third preparation at regular intervals toward the end of the semester.

The following table represents a sample of teaching and assessment activities for each of the course objectives.