

Eastern Michigan University
Division of Academic Affairs

Request for Inclusion of a Course in the
General Education Program:
Education for Participation in the Global Community

DEPARTMENT/SCHOOL: MATHEMATICS
SCIENCES

COLLEGE: ARTS AND

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1. **SUBJECT CODE, NUMBER, AND TITLE:** MATH 306 TEACHING OF HIGH SCHOOL
MATHEMATICS
2. Credit Hours (3) three
3. Catalog Description Consideration of the mathematics program in the junior and high school, its organization and content, methods of teaching and learning. *Does not count on the major or minor. Not open to freshmen, sophomores or students on academic probation.* Prerequisites: MATH 120 and CURR 305.
4. This course is (check one):
 - an existing course with no revisions (need not go through the input system)
 - an existing course with revisions (attach this form to Request for Course Revision form)
 - a new course (attach this form to Request for New Course form)
5. Check the General Education requirement this course is intended to meet. If the course is to be proposed for more than one requirement, submit a separate form for each one.
 - Effective Communication**
 - Quantitative Reasoning (*QR designation*)**
 - Writing Intensive (*WI designation*)**
 - Perspectives on a Diverse World**
 - Global Awareness
 - U.S. Diversity

Knowledge of the Disciplines

Arts

Humanities

Science

Social Science

Learning Beyond the Classroom (*LBC designation*)

Self and Well Being

Community Service, Citizenship, and Leadership

Cultural and Academic Activities and Events

Career and Professional Development

International and Multicultural Experience

Undergraduate Research

6. *Rationale. Provide a concise, clear, jargon-free explanation of why this is a General Education course and how it fits into this specific area of the program. (The rationale should explain to students why they are taking the course. It should address both why it is part of the General Education program and why it fits into the particular category.) This rationale should appear on the general course syllabus provided here and should be included in specific course syllabi given to students.*

Learning to teach mathematics involves a translation process of teacher's content, pedagogical, and personal practical knowledge (Shulman, 1988). This course will require you to communicate and document this translation process through writing responses to students' questions; role-playing professional experiences; summaries of school mathematics/technology journal articles; critical reviews of textbooks; and descriptions of students' thinking and teachers' actions from supervised field experiences in learning logs and journals.

As a teacher, you will be asking your students to read and write about mathematics. Research is clear that the use of writing exercises in math classes leads to both a better understanding of the material and heightened math communication skills (Countryman, 1999, NCTM, 2000). Furthermore, writing about math leads to a less restrictive view of mathematics - instead of a series of formulas and rigid answers, the students come to see mathematics as a process and a dialogue to which they too can contribute.

This course is part of the General Education program because you will not only use writing throughout the course to learn about mathematics education, but you will also learn about the role of writing to mathematics learning. In Teaching of

High School Mathematics you will scrutinize the English language and examine how it communicates mathematical ideas.

The purpose of including writing as an integral part of Math 306, is as Joan Countryman so eloquently expresses:

"Knowing mathematics is doing mathematics. We need to create situations where students can be active, creative, and responsive to the physical world. I believe that to learn mathematics, students must construct it for themselves. They can only do that by exploring, justifying, representing, discussing, using, describing, investigating, predicting, in short by being active in the world. Writing is an ideal activity for such processes" (p. 2, 1999).

7. Clearly and concisely explain how this course meets each of the General Education outcomes for the requirement checked in number five (all outcomes should be addressed). To do this, (a) list the General Education outcomes for the requirement and explain how the course meets each outcome; and (b) explain, in general terms, the method(s) of evaluation to be used in the course and how these methods assess the degree to which students have met the General Education outcomes for this requirement.

Outcome 1: Develop and employ successful, flexible writing and reading strategies that support sustained inquiry in a discipline.

Explanation of How Math 306 Meets Outcome I:

Math 306 will incorporate a variety of writing and reading strategies ranging from the informal to the formal, from brief to long-term. The techniques employed include reflection journals, autobiographies, summary and translation assignments, written descriptions of problems and reactions to role-playing, and formal action research papers. Specific assignments that meet Outcome I are described below:

I. Lesson Plans and Reflection Journals.

Students in Math 306 will not only write lesson plans for classes they will teach (10 lessons in schools with diverse populations), but also write reflections that help them to evaluate their strengths and limitations with respect to their instructional goals and to record their students' progress. Lesson plans and reflections are the major vehicles for recording and documenting teacher and student progress.

II. Math Autobiographies

Math autobiographies are a mixture of the personal and the formal; they involve sharing feelings and individual histories, and also give students practice in writing about math. They offer a way for the student to communicate strengths, fears, weaknesses, and beliefs to the methods teacher, make students feel connected to

mathematics by showing them how math can be incorporated into their lives, and unite a class as a community of shared feelings. Autobiographies are to be written at the beginning of the semester, to help open up dialogue and understanding between teacher and student.

III. Translating and Summarizing Professional Literature

Students will be asked to read an article in the NCTM journal, the Mathematics Teacher, and create a two-page summary of the article: one-page includes a synthesis of the article while the second page is to be an activity page for students. Future teachers are to not only summarize, but also translate the language of professional journals to language and directions that secondary mathematics students will understand.

IV. Written Descriptions of Problem Solving Processes

Throughout the course (when content is introduced), students are to write a two-page explanation in response to the following questions they are likely to encounter in the classroom:

- Why does a negative times a negative equal a positive?
- Why do I switch the direction of the less than symbol when I multiply both sides by a negative number?
- In every triangle that I tried in Sketchpad, the angles add up to 180 degrees. I don't need to do a proof, do I?
- I am not convinced that $.99999\dots=1$
- How do I know parallel lines never intersect?

V. Reaction to Role Playing

Educating James: Math 306 students will select and plan accommodations for "James," a 7th grade student with special needs. The purpose of the case-based activity is for students to collaborate with a colleague or colleagues to discuss and determine specific strategies they would use to instruct a middle school student with special needs.

The assignment involved teaming a special education and mathematics major to develop a response to meeting the needs of "James" a special needs child. At the conclusion of meetings (with special education methods students and mathematics education), each team is to type a two-page (single spaced) report that details:

- Physical accommodations for James.
- Instructional materials that you will use to teach James about percentages.
- Types of lesson modifications that could be used during each of the units' instruction.
- Types of activities ensuring transitional needs.
- Assessment accommodations.
- The role of the special education and mathematics teacher.

VI. Formal Research Paper: Experiencing All Phases of the Investigative Cycle

Students are to research a problem or critical issue occurring during their field

experiences and follow the protocols of action research and quantitative research design.

VII. Persuasive Writing: Textbook Review

In the Textbook Review assignment, Math 306 students will write a recommendation to their school administrator recommending a textbook based on criteria established by the National Research Council, (2005).

Assignment Rubrics will follow the description of each assignment.

Outcome 2: Use writing strategies that achieve the purpose(s) for writing and address the expectations of audience(s) within a disciplinary context.

Future teachers need opportunities to organize, interpret, construct, symbolize, communicate, to plan, infer, and reflect on how their students learn. (Recommendations of Mathematics Association of America, 2002).

One of the surest paths to these skills is a writing exercise that requires future teachers to not only research and communicate their decision of selecting a textbook, but also to persuade others (colleagues and administrators) of their point of view.

Textbook Review

The Assignment: Students will analyze high school textbooks and evaluate texts based on the *Michigan High School Grade Level Content Expectations* (November, 2005) and the National Research Council's definition of mathematically proficient students (see Draft of Michigan Department of Education High School Standards, November 2005). This assignment is a persuasive writing assignment. Future teachers are to convince high school administrators of textbooks to purchase.

Points of Evaluation: Based upon a thorough review of a unit in each series, base your decision of which textbook to adopt by the following:

- Type of Knowledge (Procedural, Conceptual, Strategic, Value, and Reasoning)
- Manipulatives/models used to support learning.
- Technology integrated in the lesson:
- Adaptations for diverse learners:
- Amount of time you think it should take you to complete all of the student activities.
- How easy was it to develop a lesson plan from this textbook?
- What additional materials or activities would you include if you were to actually teach this class?

Justification of Decision: Based on this information, write a three-to five- page summary for your principal and on behalf of your colleagues advocating for a

particular text. Remember, to be concise, clear, and specific in your arguments. Persuade your principal with arguments that you believe address accountability (MEAP testing) issues and yet at the same time respond to what research and professional organizations support as effective practice.

Method of Evaluation of Textbook Assignment

Score Level	Communication	Strategic Knowledge	Mathematical Knowledge
4	Provides a complete response with a clear, unambiguous explanation or description of textbook; may include an appropriate and complete examples (please include pages); communicates effectively to the principal; presents strong supporting arguments that are logically sound and complete; and may include examples and counter- examples	May use relevant outside information of a formal or informal nature; identifies all the important elements of a textbook; reflects an appropriate and systematic strategy for critically analyzing content and pedagogy; and gives clear evidence of a decision.	Shows understanding of the textbooks' mathematical concepts and principles; recognizes appropriate mathematical terminology and notation; and executes algorithms completely and correctly.
3	Provides a fairly complete response with reasonably clear explanations or descriptions; may include a nearly complete, appropriate example from a textbook; generally communicates effectively to the principal; presents supporting arguments that are logically sound but may contain some minor gaps.	May use relevant outside information of a formal or informal nature; identifies the most important elements of the problem and shows a general understanding of the relationships among them; and gives clear evidence of a solution process. Arguments are convincing, but incomplete and may lack pedagogical implications.	Shows nearly complete understanding of the text's mathematical concepts and principles; uses nearly correct mathematical terminology and notations in drawing on arguments; and identifies rigorous explanations and definitions of textbooks. Explanations are generally correct but may contain minor errors.
2	Makes significant progress toward an argument of an appropriate textbook, but the explanation or description may be somewhat ambiguous or unclear, may include an example that is flawed or unclear. Communication may be somewhat vague or difficult to interpret, and arguments may be incomplete or may be based be on a logically unsound premise.	Identifies some important elements of the decision, but shows only limited understanding of the relationships among criteria. Gives some evidence of appropriate textbook selection criteria, however priorities are misplaced.	Shows understanding of some of the textbook's mathematical concepts and principles. Responses may contain serious computational errors.
1	Has some satisfactory elements but may fail to complete or may omit significant parts of the decision-process; may include an example that incorrectly represents the textbook, or diagram may be unclear, and difficult to interpret. Explanation or description may be missing or difficult to follow. Lacks specific explanations.	May attempt to use irrelevant outside information; fails to identify important elements or places too much emphasis on unimportant elements; may reflect an inappropriate decision-making process; and gives incomplete evidence of a decision.	Shows very limited understanding of the textbook's mathematical concepts and principles; may misuse or fail to use mathematical terms. Response may contain major computational errors.
0	Communicates ineffectively; may include examples that completely misrepresent the textbook's situation.	May attempt to use irrelevant outside information; fails to indicate which elements of the decision are appropriate.	Shows no understanding of the textbook's mathematical concepts and principles.

Outcome 3: Formulate research questions and employ strategies for researching and responding to those questions.

Formal Research Paper: Experiencing All Phases of the Investigative Cycle

Future teachers design their own statistical projects based on students' learning. They are to follow the guidelines provided by the American Statistical Association (ASA) at www.amstat.org/education/poster1.html. The ASA guidelines help future teachers experience all phases of the research process. Approximately two weeks are allotted in class to identify a quantifiable problem of interest based on their field experiences at Ypsilanti High School, make a plan for investigating it, gather data of student learning, analyze the data, draw conclusions, and write a formal report. Future teachers use the computer software, Fathom, a statistical package for helping formulate and investigate statistical conjectures, since it allows users to quickly import data, calculate summary statistics, test hypotheses, and build graphs and tables. Future teachers have some freedom to choose the problem that they would study (with permission of teacher). In all cases they are to investigate learning of their students in Ypsilanti (a ten-week field experience). All data is confidential and only pertains to the class the future teacher is observing.

Because of the diversity of the questions that are possible, future teachers may choose a number of different types of methods for completing the research project: surveys, interviews, and observation. Once the data has been gathered, student may use Fathom and Excel to help analyze the data. Using Fathom and Excel enable students to quickly produce such graphical displays as scatterplots, histograms, and dot plots. Fathom also allows students to produce summary statistics, such as the mean, median, quartiles, mode, and correlation coefficients, as needed. These summary statistics play a role similar to that played by the graphs, since they lead students to think about their initial conjectures and formulate new conjectures that were base on the data.

To conclude the project, each group/individual will present its finding to the entire class. This project not only allowed students to develop statistical thinking and to master mathematics, but it also gives a framework for studying their future students' learning. Too often, teachers use paper and pencil tests to check for understanding. This project allows them to communicate and investigate ways to evaluate and study their future students' work.

Research in Teaching Project
Evaluation

Choose multi-variables or single variables based on your field experience:
Relationship of homework assigned and the type of problems on exams; types of questions used in the class; number of interruptions; etc. Please organize your paper in the following manner:

Introduction (10 pts)

- Provide a rationale for investigating the variables that you have chosen.
- What is the purpose of your study?

Background (20 pts.)

- What does research say about the variable(s) you have chosen?
- What are some interesting questions that you have as you begin your study?

Method (10 pts.)

- What are the methods that you used to collect and analyze data?
- What technology did you use?

Data Analysis (20 pts.)

- Are the graphs of data complete with axis clearly identified?
- Copy and past all Fathom or Excel output into this section. Once you have your Fathom output pasted into a Word Document, you can move the output around in the document even on a computer that does not have Fathom. You might want to copy and paste your output before writing the other sections of this report.
- Are there unusual values in the data set? What makes them outliers? Are you choosing to throw out any of the unusual values before you plot a regression line? If so, justify the decision to disregard outliers.

Results (20 pts.)

- What information is provided by the data? What are some questions that you can now answer since you know the results? What are the answers to these questions, and how did you find them? Do not overestimate your results or underestimate your results.

Conclusion (10 pts.)

- What did you learn that you did not previously know? Is there anything you would do differently you were to write the paper again? What are some other interesting studies that could be done that are related to what you did this paper?

Outcome 4: Use discipline-specific genres to communicate information.

There are three assignments in Math 306 that will give evidence of students' writing in discipline-specific genres to communicate content and pedagogical knowledge. For future teachers, writing lesson plans, proofs, and personal reflections are essential genres. Each of these three assignments will be described and a rubric for evaluation will follow.

Lost in Translation: Problems

The assumption that the traditional curriculum for a mathematics major is adequate preparation for students preparing to teach secondary school is simply incorrect. IT is not enough for secondary mathematics teachers to have an understanding of advanced mathematics—they must also be able to connect their advanced coursework to the material they will teach: In order to do this, future secondary teachers will write two-page essays as a response to typical high school students' questions, in ways that are both mathematically sound and also accessible and compelling to a 15 year old:

The following questions are examples of such questions:

- Why does a negative times a negative equal a positive?
- Why do I switch the direction of the less than/greater than symbol when I multiply both sides by a negative number?
- In every triangle that I tried in Sketchpad, the angles add up to 180 degrees. I don't need to do a proof, do I?
- How do I know parallel lines never intersect?
- I think that the numbers 1 has three different square roots, 1, -1, and .99999999...
- I am sure that .000000 is a square root of 1 because when I multiply it by itself on my calculator I get 1.000000000.

Rubric for Lost in Translation: Process of Explanation

The rubric articulates, at six levels, the extent to which student work accomplishes the purpose of the task and demonstrates mathematical understanding, reasoning, thinking, communicating, and use of tools and techniques.

Grade: 4.0

Solid work that may go beyond the requirements of the task(s), showing for example:

- complete understanding of the task's mathematical concepts and processes.
- clear identification of all of the important elements of the task(s).
- where appropriate, clear evidence of doing purposeful mathematics, including investigating, experimenting, modeling, designing, interpreting, analyzing, or solving.
- excellent prose and mathematical supporting arguments that may include examples or counter-examples.
- creativity and thoughtfulness in communicating the results and the interpretations of those results, to an identified audience, using dynamic and diverse means.
- multiple solutions based upon different assumptions about or interpretations of the task(s).
- unusual insights into the nature of and the resolution of problems encountered in the task(s).
- a high level of mathematical thinking that includes, where appropriate, making comparisons, conjectures, interpretations, predictions, or generalizations.
- exceptional skill in choosing appropriate mathematical tools and techniques in the resolution of problems in task(s).

Grade: 3.5

Fully achieves the requirements of the task(s), showing for example:

- good understanding of the task's mathematical concepts and processes.
- identification of most, if not all, of the important elements of the task(s).
- evidence of doing purposeful mathematics, including where appropriate, investigating, experimenting, modeling, designing, interpreting, analyzing, or solving.
- clear, successful communications with an identified audience.
- one solution and interpretation of those results.
- evidence of mathematical thinking that includes, where appropriate, making comparisons, conjectures, interpretations, predictions, or generalizations.
- use of variety of tools and techniques appropriate to the form of the task(s) and the requirements of the task.

Grade: 3.0

Substantially completes the requirements of the task(s), showing for example:

- an understanding of most of the task's mathematical concepts and processes.
- identification of the important elements of the task(s), but some less important ideas are missing.
- some aspects of investigations, experiments, model building, designs, interpretations, analysis, solutions required by the task(s) may be missing, but most of the parts are included.
- adequate communication with an identified audience, but with limited clarity and variety.
- occasional evidence of mathematical thinking involving comparisons, conjectures, interpretation, predictions, or generalizations.
- a limited variety of tools and techniques used to resolve the situation presented in the task(s).

Grade: 2

Limited completion of the requirements of the task(s), showing for example:

- an understanding of some of the task's mathematical concepts and processes, but with evidence of gaps in those understandings.
- identification of some of the important elements of the task(s), but assumptions about some of the elements may be flawed.
- communication of some ideas, but generally makes inadequate attempts to communicate, often failing to address the identified audience, and difficulty in expressing mathematical ideas.
- inadequate mathematical thinking that includes ineffective analysis procedures, limited solution strategies, unclear mathematical arguments, and inappropriate interpretation of results.
- a selection of some inappropriate tools and techniques used to resolve the situation presented in the task(s).

Essential Understandings (What topics must the students know before this topic is taught):
Materials Needed:

Teaching Plan

Teaching Activity:	Differentiation for this Activity:	Formative Assessment(s) for this Activity:

Lesson Plan and Reflection Rubric

Grades for Lesson Plans and Reflections will be based on the following three parts:

1. Execution (I will observe at least two of your lessons) (33%).

This part covers how well you actually teach your class. Some questions I will be thinking about while I watch you include... Did you present the material clearly and efficiently? How well did your activities work, and what did you do during class to help ensure that they worked well? How did you handle questions and confusion? What did the rest of the class walk away with at the end? How could you tell (assessment)? What would you change if you were to teach the lesson again?

2. Mechanics (33%)

I want your lesson plan to be formal enough to put into your portfolio. Please address the following components:

Motivation/Objectives

In more detail, describe why you are teaching this lesson or what you want your students to learn from it. You should definitely address the mathematical content of the lesson (i.e., say what the mathematical ideas are you want your students to learn), but you can also work the educational angle... You are trying to get your students to

learn these ideas in a certain way. You must include the Michigan Standards in your objectives.

You may also want to consider the broader context in which this lesson is situated. What did your students see during the previous classes? What will they see next? Think about how your lesson fits in to the bigger picture.

Materials

If you are using manipulatives, graphing calculators, or anything else, mention it here. If all you use is chalk and the board, that's fine, but say that this is all you need.

Outline of the lesson itself

How are you going to run the class? If you are presenting a problem, or if your students are solving a problem, you should have the solution worked out in advance (at the very least, you will avoid embarrassment this way... trust me ;-). Are you going to have the class work in groups? Will you present the material at the board? Is there some activity you want the class to do? Are you going to have a whole class discussion? If so, what points do you want to come up during the discussion? Regardless of what you plan to do, you should write it down in enough detail that someone else could read your lesson plan and do the same thing for their class!

Assessment

How are you going to gauge your students' learning? This section could include homework assignments, questions to ask the class, things to look for on their papers during group work... In general, you want to think about your objectives for the lesson when determining how you want to assess learning.

Reflection/Conclusion

Take a step back and think about your lesson. Where else would you like to take it? If you had more time, what else might you do? What do you feel are the strong and weak points of your lesson? Are there things you did in your lesson that would work well for teaching other topics?

3. Content (33%)

The mechanics section should give you some idea of what blanks to fill in. The content part has to do with how well you fill in those blanks in your lesson plan. How well did you identify the key mathematical points, and how well did you articulate them? Is the lesson or activity you planned a good way to introduce those ideas to the students? Are the assessments you came up with a good way for you to tell whether or not they learned the material?

Math Autobiography

Purpose of the Assignment: As your instructor, I want to get to know you as a person and as a student of mathematics. This will help me better meet your needs. It

also helps our department as we work to improve our services to students. This exercise will be invaluable as you begin to teach mathematics. Knowing your beliefs and how they may differ from students will go a long way to helping them to learn mathematics.

Content: Your autobiography should address the four sections listed below. I've listed some questions to help guide you, but please don't just go through and answer each question separately. The questions are just to help get your thinking. Remember the purpose of the paper. Write about the things that will give me a picture of you. The key to writing a good piece is to give many details. See the example below:

Not enough detail: I hated math in fourth grade, but it got better in sixth grade.

Good detail: I hated math in fourth grade because I had trouble learning my multiplication tables. I was really slow at doing problems, and I was always the last one to finish the timed tests. It was really embarrassing. ...

Section 1: Introduction

- How would you describe yourself?
- Where are you from? How did you decide to attend Eastern Michigan?
- What is your educational background? Did you just graduate from high school? Have you been out of school for a few years? If so, what have you been doing since then?
- General interests: favorite subjects in school, favorite activities or hobbies.

Section 2: Experience with Math

- What math classes have you taken and when?
- What have your experiences in math classes been like?
- How do you feel about math?
- In what ways have you used math outside of school?

Section 3: Learning Styles and Habits (specifically for math)

- Do you learn best from reading, listening or doing?
- Do you prefer to work alone or in groups?
- What do you do when you get "stuck"?
- Do you ask for help? From whom?
- Describe some of your study habits. For example: Do you take notes? Are they helpful? Are you organized? Do you procrastinate? Do you read the text?

Section 4: The Future

- What are your expectations for this course?
- What are your responsibilities as a student in this course? What do you expect from your instructor?

- What are your educational and life goals?
- How does this course fit into your educational goals?

Assignment Requirements

Format:

- Double-spaced
- 1 inch margins
- 12 point type

Minimum length: 2 pages

Your paper needs to have the following information in the upper right corner:

Math Autobiography

Your name

Course name

Time course meets

Rubric for Math Autobiography

This paper will be graded for writing style and composition in the same way that you would be graded in a writing course. If this is an issue for you, have someone proof read it for you. I am happy to proofread papers that are brought to me during my office hours. I will be using the following rubric.

Criteria	Points
Content: <ul style="list-style-type: none"> • Each section is fully covered and includes relevant detail. 	8 (2/section)
Format <ul style="list-style-type: none"> • Double-space, 1-inch margins, 12 pt type • Minimum length (2 pages) 	1 1
Writing Style and Composition	5

Outcome 5: Understand conventions for communicating, disseminating, and interpreting information within a discipline.

Careful reasoning and communication are closely linked. A future teacher who clearly understands a careful argument in mathematics is capable of describing the argument to others. In addition, a requirement that future teachers describe an argument or write it down tests whether understanding has truly occurred. The following assignments require that students describe an argument or write it down tests whether understanding has truly, occurred. Communicating mathematical ideas with understanding and clarity is not only evidence of comprehension; it is also essential for learning and using

The following assignments within the Math 306 class will assist students in the communication, dissemination, and interpretation of mathematics for teaching.

Analysis and Summary of Journal Articles: Future teachers are asked to select, read, and summarize an article from the *Mathematics Teacher*. Students are to not only summarize, but also to create an activity page for students based on an article. This two-page assignment has many benefits for future teachers. A feature of the assignments is a class discussion of the conceptual and procedural nature of the tasks described in the article. Students share the student activity pages with classmates.

Educating James. The purpose of the case-based activity is for students to collaborate with a colleague or colleagues to discuss and determine specific strategies they would use to instruct a middle school student with special needs. The case (Casat, Pearson, Casat, J, 2001) describes “James,” a 12-year old African American male living with his 67-year old maternal grandmother. He had repeated third grade and at the time of referral was having increasingly significant problems with inattention, over-activity, and impulsivity in the form of disruptive behavior and talking. James was below grade level in both reading and math, and according to the teacher, was noted to have problems with short-term memory, following directions.

Based on the identified problems and need, the following recommendations were made regarding treatment interventions:

1. A trial on stimulant medication, such as methylphenidate, to address target symptoms of inattentiveness, distractibility, impulsivity, poor personal organization, and over-activity.
2. Short-term individual therapy to improve self-monitoring and self-efficacy.
3. A High Risk Intervention worker for the home on a weekly basis to help with improving problem-solving and effective communication between James and his grandmother, and to aid the grandmother in development of more effective parenting skills.
4. A classroom program of clearly defined behavioral expectations and systematic reinforcements for positive responses.
5. An Individual Educational Program written by the Learning Assessment Team according to IDEA process and guidelines.

The assignment involved teaming a special education and mathematics major to develop a response to #4 above. At the conclusion of meetings, each team is to type a two-page (single spaced) report that details:

1. Physical accommodations for James.
2. Instructional materials that you will use to teach James about percentages.
3. Types of lesson modifications that could be used during each of the units’ instruction.
4. Types of activities ensuring transitional needs.
5. Assessment accommodations.

The role of the special education and mathematics teacher.

Methods of Evaluation: Rubrics for Assignments

Score Level	Communication	Strategic Knowledge	Mathematical Knowledge
4	Provides a complete response with a clear, unambiguous explanation or description; may include an appropriate and complete diagram; communicates effectively to the identified audience; presents strong supporting arguments that are logically sound and complete; and may include examples and counter-examples	May use relevant outside information of a formal or informal nature; identifies all the important elements of the problem and shows an understanding of the relationships among them; reflects an appropriate and systematic strategy for solving the problem; and gives clear evidence of a solution process. Solution process is complete and systematic.	Shows understanding of the problem's mathematical concepts and principles use appropriate mathematical terminology and notation; and executes algorithms completely and correctly.
3	Provides a fairly complete response with reasonably clear explanations or descriptions; may include a nearly complete, appropriate diagram; generally communicates effectively to the identified audience; presents supporting arguments that are logically sound but may contain some minor gaps.	May use relevant outside information of a formal or informal nature; identifies the most important elements of the problem and shows a general understanding of the relationships among them; and gives clear evidence of a solution process. Solution process is complete, or nearly complete, and systematic.	Shows nearly complete understanding of the problems' mathematical concepts and principles; uses nearly correct mathematical terminology and notations; and executes algorithms completely. Computations are generally correct but may contain minor errors.
2	Makes significant progress toward completion of the problem, but the explanation or description may be somewhat ambiguous or unclear, may include a diagram that is flawed or unclear. Communication may be somewhat vague or difficult to interpret, and arguments may be incomplete or may be based on a logically unsound premise.	Identifies some important elements of the problem but shows only limited understanding of the relationships among them. Gives some evidence of a solution process, but the solution process may be incomplete or somewhat unsystematic.	Shows understanding of some of the problems' mathematical concepts and principles. Response may contain serious computational errors.
1	Has some satisfactory elements but may fail to complete or may omit significant parts of the problem; may include a diagram that incorrectly represents the problem situation, or diagram may be unclear, and difficulty to interpret. Explanation or description may be missing or difficult to follow.	May attempt to use irrelevant outside information; fails to identify important elements or places too much emphasis on unimportant elements, may reflect an inappropriate strategy for solving the problem; and gives incomplete evidence of a solution process. Solution process may be missing, difficult to identify, or completely unsystematic.	Shows very limited understanding of the problem's mathematical concepts and principles may misuses or fail to use mathematical terms Response may contain major computational errors.
0	Communicates ineffectively; may include drawings that completely misrepresent the problem situation. Words do not reflect the problem.	May attempt to use irrelevant outside information; fails to indicate which elements of the problem are appropriate; and copies part of the problem but without attempting a solution.	Shows no understanding of the problem's mathematical concepts and principles.

8. Attach a syllabus (1-inch margins and 10-12 pt. font). The syllabus must include the rationale from #6 above and clearly reflect the outcomes and methods of evaluation detailed in #7 above.

Please submit all materials in electronic form.

Action of the Department/College

1. Department

Vote of department faculty: For _____ Against _____ Abstentions _____

Department Head

Date

2. College _____

College Dean

Date

Action of General Education Advisory Committee

Vote of General Education Committee: For _____ Against _____ Abstentions _____

Chairperson, General Education Advisory Committee

Date

Approval

Associate Vice-President for Undergraduate

References

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Syllabus

Math 306

Math 306: Math for Secondary Teachers

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Purpose of Course

The purpose of this course is to address the needs that future teachers engaging in school mathematics are likely to experience. These needs determine the content and assessments of this course. Recent research from the field of mathematics education (Ferrini-Mundi, 2005; NCTM, 2000, NRC, 2001) uncovered a widely-accepted “compendium” of teachers’ learning needs, it revealed a high level of consensus about the recognition that teachers need to:

- Learn more mathematics
- Learn about theories of teaching and learning
- Learn about students’ mathematical thinking
- Develop images of alternative classroom instruction
- Become familiar with and adopt effective teaching practices
- Attend to the emotional aspects of engaging in instructional innovation

Rationale for Including Math 306 as Writing Intensive Course

It is clear from the above list that learning to teach mathematics involves a translation process of teacher’s content, pedagogical, and personal practical knowledge Learning to teach mathematics involves a translation process of teacher’s content, pedagogical, and personal practical knowledge (Shulman, 1988). This course will require you to communicate and document this translation process through writing responses to students’ questions; role-playing professional experiences; summaries of school mathematics/technology journal articles; critical reviews of textbooks; and descriptions of students’ thinking and teachers’ actions from supervised field experiences in learning logs and journals.

As a teacher, you will be asking your students to read and write about mathematics. Research is clear that the use of writing exercises in math classes leads to both a better understanding of the material and heightened math communication skills (Countryman, 1999; NCTM, 2000). Furthermore, writing about math leads to a less restrictive view of mathematics - instead of a series of formulas and rigid answers, the students come to see mathematics as a process and a dialogue to which they too can contribute.

This course is part of the General Education program because you will not only use writing throughout the course to learn about mathematics education, but you will also learn about the role of writing to mathematics learning. In Teaching of High School Mathematics you will scrutinize the English language and examine how it communicates mathematical ideas.

The purpose of including writing as an integral part of Math 306, is as Joan Countryman so eloquently expresses:

"Knowing mathematics is doing mathematics. We need to create situations where students can be active, creative, and responsive to the physical world. I believe that to learn mathematics, students must construct it for themselves. They can only do that by exploring, justifying, representing, discussing, using, describing, investigating, predicting, in short by being active in the world. Writing is an ideal activity for such processes" (p. 2, 1999).

To be responsive to all students I will uphold the tenets of the following websites for foreign students and those with disabilities:

<http://www.math.emich.edu/access.services.html>

<http://www.math.emich.edu/SEVIS.html>

Contents:

I. NCTM *Principles and Standards*, Michigan's *Grade Level Content Expectations and High School Mathematics Expectations*

II. Theorists and Theories in Mathematics Education

III. Organizing Your Classroom: Your Home Away From Home

- A. Organizing Your Classroom
- B. Planning for Instruction: What Do I Do Now?
- C. The Art of Questioning
- D. Technology in the Middle School and High School Classroom

IV. Problem Solving, Reasoning, and Thinking

V. Day By Day Teaching

- A. The First Five Minutes: Getting Started
- B. The Next Fifteen Minutes: Ways of Presenting Usual Topics in Unusual Ways
 - 1, Quantitative Literacy
 - a. Representations and Properties of Number and other Systems
 - b. Calculation, Algorithms, and Estimation
 - c. Measurement and Precision
 - 2. Algebra and Functions
 - a. Symbols, Expressions and Operations
 - b. Functions

- c. Equations and Inequalities
- d. Mathematical Modeling
- 3. Geometry and Trigonometry
 - a. Two-Dimensional Figures and Their Properties
 - b. Three-Dimensional Figures and Their Properties
 - c. Relations Between Figures
 - d. Transformations of Figures in the Plane
 - e. Trigonometry and Vectors
- 4. Statistics and Probability
 - a. Univariate Data—Examining distributions
 - b. Bivariate Data—examining Relationships
 - c. Sample Surveys and Experiments
 - d. Statistical Inference—drawing Conclusions from Data
 - e. Statistical and Probabilistic Reasoning
 - f. Simulation and the Law of Large Numbers
 - g. Probability Models and Calculating Probabilities
 - h. Probability Distributions

VI. Diverse Learners

- A. Culture and Mathematics
- B. Adaptations for Special Needs Students

VII. Assessment

- A. Testing and Evaluating Students
- B. Alternate Assessment
- C. The MEAP

Assignments

I. Lesson Plans and Reflection Journals (20%).

Students in Math 306 will not only write lesson plans for classes they will teach (10 lessons in schools with diverse populations), but also write reflections that help them to evaluate their strengths and limitations with respect to their instructional goals and to record their students' progress. Lesson plans and reflections are the major vehicles for recording and documenting teacher and student progress.

II. Math Autobiographies (10%)

Math autobiographies are a mixture of the personal and the formal; they involve sharing feelings and individual histories, and also give students practice in writing about math. They offer a way for the student to communicate strengths, fears, weaknesses, and beliefs to the methods teacher, make students feel connected to mathematics by showing them how math can be incorporated into their lives, and unite a class as a community of shared feelings. Autobiographies are to be written at the beginning of the semester, to help open up dialogue and understanding between teacher and student.

III. Translating and Summarizing Professional Literature (15%)

Students will be asked to read an article in the NCTM journal, the Mathematics Teacher, and create a two-page summary of the article: one-page includes a synthesis of the article while the second page is to be an activity page for students. Future teachers are to not only summarize, but also translate the language of professional journals to language and directions that secondary mathematics students will understand.

IV. Written Descriptions of Problem Solving Processes (15%)

Throughout the course (when content is introduced), students are to write a two-page explanation in response to the following questions they are likely to encounter in the classroom:

- Why does a negative times a negative equal a positive?
- Why do I switch the direction of the less than symbol when I multiply both sides by a negative number?
- In every triangle that I tried in Sketchpad, the angles add up to 180 degrees. I don't need to do a proof, do I?
- I am not convinced that $.99999\dots=1$
- How do I know parallel lines never intersect?

V. Reaction to Role Playing (15%)

Educating James: Math 306 students will select and plan accommodations for "James," a 7th grade student with special needs. The purpose of the case-based activity is for students to collaborate with a colleague or colleagues to discuss and determine specific strategies they would use to instruct a middle school student with special needs.

The assignment involved teaming a special education and mathematics major to develop a response to meeting the needs of "James" a special needs child. At the conclusion of meetings (with special education methods students and mathematics education), each team is to type a two-page (single spaced) report that details:

- Physical accommodations for James.
- Instructional materials that you will use to teach James about percentages.
- Types of lesson modifications that could be used during each of the units' instruction.
- Types of activities ensuring transitional needs.
- Assessment accommodations.
- The role of the special education and mathematics teacher.

VI. Formal Research Paper: Experiencing All Phases of the Investigative Cycle (15%) Students are to research a problem or critical issue occurring during their field experiences and follow the protocols of action research and quantitative research design.

VII. Persuasive Writing: Textbook Review (10%)

In the Textbook Review assignment, Math 306 students will write a recommendation to their school administrator recommending a textbook based on criteria established by the National Research Council, (2005).

LATENESS OR POOR ATTENDANCE WILL RESULT IN A LOWERING OF YOUR FINAL GRADE. More than 10% absence or lateness is considered unacceptable in schools. Thus it will be the same in this class.

Grading Scale:

90-100 points = A

80-89 points = B

70-79 points = C

60-69 points = D

Below 60 =E