

EDCI 591 Special Topics: Mathematical Reasoning and Inquiry

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Dates & Weeks:	06/19 – 07/28 (Non-Standard Term Dates)
Place	Internet/Online: Synchronous Online Platform (WizIQ) and Non-Synchronous Online Platform (D2L)

Course Description

This course is designed to enhance students' understanding of the nature and methods of mathematical reasoning and inquiry by means of discussion and practice. The content will focus on dual enrollment (DE) mathematics topics including rates of change, additive versus multiplicative scales, quadratic models, counting techniques and probabilities, one, two, and three dimensional measurement, similarity and proportionality.

Learning Outcomes

Students will be able to:

1. Identify and construct mathematics tasks that promote inquiry and develop reasoning and critical thinking abilities,
2. Evaluate the validity of secondary dual enrollment (DE) student solution strategies by deepening their conceptual understanding of core concepts in common DE courses,
3. Assess secondary DE students' mathematical reasoning and diagnose misconceptions, and
4. Use secondary DE student misconceptions as a bridge to deeper conceptual understanding and procedural fluency.

Required Texts

English, L., 1997 (Ed.). *Mathematical reasoning: Analogies, metaphors, and images*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Academic Expectations

For further information visit www2.montana.edu/policy/student_conduct/cg600.html

1. **Academic Misconduct** – Section 420 of the Student Conduct Code describes academic misconduct as including, but not limited to, plagiarism, cheating, multiple submissions, or facilitating others' misconduct.
2. **Plagiarism** – Paraphrasing or quoting another's work without citing the source is a form of academic misconduct. Even inadvertent misuse or appropriation of another's work (such as relying heavily on source material that is not expressly acknowledged) is considered plagiarism. If students have any questions about using and citing sources, they are expected to ask for clarification.
3. **Collaboration** – University policy states that, unless otherwise specified, students may not collaborate on graded material. Any exceptions to this policy will be stated explicitly for

individual assignments. If students have any questions about the limits of collaboration, they are expected to ask for clarification.

4. **Behavior** – Section 310.00 in the MSU Conduct Guidelines states that students must:
 - A. be prompt and regular in attending classes;
 - B. be well prepared for classes;
 - C. submit required assignments in a timely manner;
 - D. take exams when scheduled;
 - E. act in a respectful manner toward other students and the instructor and in a way that does not detract from the learning experience; and
 - F. make and keep appointments when necessary to meet with the instructor.

In addition to the above items, students are expected to meet any additional course and behavioral standards as defined by the instructor.

5. **Withdrawal** – The instructor will support requests to withdraw from this course with a “W” grade for "extraordinary reasons."
6. **Students with Disabilities** – If students have a documented disability for which they are or may be requesting an accommodation(s), they are encouraged to contact the instructor and Disabled Student Services as soon as possible.
7. **Email Policy** – The instructor(s) will communicate with students via both D2L and the university e-mails
8. **Student Educational Records** – All records related to this course are confidential and will not be shared with anyone, including parents, without a signed and written release. If students wish to have information from their records shared with others, they must provide written request/authorization to the department. Before giving such authorization, students should understand the purpose of the release and to whom and for how long the information is authorized for release.
9. **Academic Honesty**– Students are expected to adhere to the highest standards of academic honesty. Plagiarism occurs when a student uses or purchases ghostwritten papers. It also occurs when a student utilizes the ideas of or information obtained from another person without giving credit to that person. If plagiarism or another act of academic dishonesty occurs, it will be dealt with in accordance to the academic misconduct policy.

Course Requirements

Students will turn in all assignments on D2L.

1. **Professionalism/Participation** (10 points) –
Students are expected to be professional at all times. As professionals, they are expected to attend and participate in all synchronous online meetings (15 hours). They must demonstrate their contribution of 30 hours to D2L’s discussion board.
2. **Math Education Articles** (40 points) –
Students are expected to answer assigned questions and complete assigned tasks based on their reading of assigned articles. They must submit the digital copy of their answers to D2L by the assigned due day.

Article	Due Date
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Article Set #1	6/29
Article Set #2	7/06
Article Set #3	7/13
Article Set #4	7/20

Note. One to two of each students' work samples will be selected and published on D2L.

3. Mathematical Reasoning and Inquiry Tasks (50 points) –

Students are expected to solve and reflect on five weekly mathematical reasoning and inquiry tasks assigned by their instructors. These tasks will be assessed using a rubric that will be available in D2L.

Evaluation Procedures

<u>Requirement</u>	<u>% of Grade</u>	<u>Assessment Tools</u>
Professionalism/Participation	10%	Teacher Evaluation
Math Education Articles (4)	40%	Teacher Evaluation
Mathematical Reasoning and Inquiry Tasks (5)	50%	Teacher Evaluation
Total	100%	

Grading Policy

Final grades will be distributed according to the following scale

A	93 Points & above
A -	90 – 92.9 points
B+	87 – 89.9 points
B	83 – 86.9 points
B-	80 – 82.9 points
C+	77 – 79.9 points
C	73 – 76.9 points
C-	70 – 72.9 points
D+	67 – 69.9 points
D	63 – 66.9 points
D-	60 – 62.9 points
F	59.9 points & below

Tentative Course Schedule

Week 1: Discussion

Read English pp. 3-16. Give an example from your practice that demonstrates your understanding of the distinction between analogy, metaphor, and metonym as discussed in the reading.

Week 1: Assignment

Identify a common misconception that you see regularly in your professional practice. Find a word problem that typically exposes this misconception. Construct an analogy, metaphor, or metonym that will address this misconception.

Week 2: Discussion

Read English pp. 93-114. Write a response to the first bulleted item on p. 103.

Week 2: Assignment

Read carefully the description of the “Pebbles-in-the-bag” activity on pp. 99-100. Note that, as Davis & Maher point out, that “the entire activity has been carefully planned out in advance” (p. 100). Offer a similar description of an activity that you have conducted with students in your practice.

Week 3: Discussion

Read English pp. 191-216. Explain in your own words the difference between a source and target problem.

Week 3: Assignment

Choose one of the following concepts: rates of change, additive versus multiplicative scales, quadratic models, counting techniques and probabilities, one, two, and three dimensional measurement, similarity and proportionality. Find or construct two word problems that are structurally similar but have different contextual features (see p. 199).

Week 4: Discussion

Read English pp. 221-243. Summarize the distinctions between the interference and interpretation hypotheses in your own words.

Week 4: Assignment:

Reflect on the following excerpt from English p. 222:

Many students are so confused by such conflicting messages that they seem to give up on their attempts to understand the relation between content and structure in word problems. They seem to learn that, while in school, they will fare better if they completely ignore their world knowledge. These students mechanically translate problem texts into equations, using syntactic cues and key words in order to decide which solution procedures apply.

Identify an example of such a “conflicting message” from your experience. This could be something you observed as a learner or as a teacher. Summarize the situation and outline a lesson that could address the root of the “conflicting message.”

Week 5: Discussion

Read English pp. 267-278. Revisit your explanation of the distinctions between metaphor, analogy, and metonym from Week 1. Identify at least one thing that has change about your understanding.

Week 6: Assignment

Construct an outline of a lesson plan that employs metaphor, analogy, or metonym to teach a concept.