MATH 4100 Topics in Mathematics Education **Lecture 1**
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1. Course Outline

1.1. **Content.** We will be covering the following in this class.

- Wait time
- Classifying mathematical tasks
- Asking mathematical questions
- Multiple representatives
- Manipulatives
- Symbols, notations, and communication
- Educational technology
- Math anxiety
- Authentic examples
- Assessments, worked examples and diagnostics

1.2. **Grading.** The following is the grading scheme for the class.

- 20% Weekly Readings (5 readings, 4% each)
- 45% Reflection Assignments
  - 20% Reflection Assignment 1
  - 25% Reflection Assignment 2
- 10% Participation
- 25% Communication Project

Reading #0, a calibration activity will show you how the system works, will be due next Monday at 11:30 AM.

You are expected to use the course materials to analyze and/or explain something you have experienced or witnessed as a student and/or instructor.

To obtain an A in this class, need to go above and beyond for the case-by-case analyses.

Submit all assignments on eClass, which will all be online.

1.3. **Expectations.** Expected to...

- Attend every class and take notes.
- Participate in each activity.
- Use the course materials heavily in the assessments.
- Ask frequent questions.
- Disagreements with each other
- Listen and respond to feedback.
- Take advantage of the opportunity this course provides in enhancing your unique skill set.
- 3 hours of class, 6 hours of work outside.
- Solicit and respond to feedbackModel good pedagogical practice
- Encourage you to personalize your learning
- Provide constructive feedback
- Have high expectations

2. Typical Class Structure

2.1. **Discussion Prompt.** A prompt on the board/screen when you arrive in class and there will be group discussions/breakout rooms.

2.2. **Math Activity.** A math problem to work on in groups and you'll discuss how the readings apply to the problem.

2.3. **Education Topic(s).** One or two math education topic with activities and discussions

2.4. **Case Study.** A specific educational problem to discuss and debate.

3. Discussion Prompt

3.1. **Prompt.** What was your best learning experience? (i.e., best teacher, best class, etc.)

3.2. **Prompt.** What was your worst learning experience?

3.3. **Prompt.** "We have trained students to know that if they wait long enough, we'll give them the answer." What are your thoughts on this quote?

- In high school, students would wait for a long time for their teachers to provide them with an answer because the student would not know how to approach it at all.
- In university level math course, students would get stuck on a problem, so they would circle it and eventually come back to the question.

3.4. **Could put on a reflection.**

- How the style of a textbook can affect students learning. (Some textbooks can have no solutions, partial answers, answers to even problems, or full solutions)
  - When having full solutions, there are some positive aspects and negative aspects.
  - When having partial solutions, there are more positive aspects than negative aspects.
  - When having no solutions, there are more positive aspects than negative aspects, but can also have more negative aspects than positive aspects as well.

4. Wait Time

If teachers can increase their pauses after:

- They ask a question, and
- After a student responds,

there are significant positive changes. The threshold waiting time is 2.7 seconds, above which there are significant improvements and below which there is little effect. (1986, Rowe)

What do you think are the specific benefits to wait time? *The benefits of wait time include digesting the information that is being provided to the student, allowing the student to catch up in the moment you are currently pausing, or to think about the question and be able to provide an answer.*

- Increases the quality of the answer from wait time.
- Take a moment to refine what you are about to say.
- Allows more students to be more heard.
- More time for students to think with each other, rather than having the teacher replying.

- Have students start reflecting on the answer that they know is correct, and be able to explain to others why their answer is correct.
- A right amount of wait time would allow more participation allotted.

Research supported benefits to students:

(1) Length of student responses increases 300%-700%
(2) More student responses are supported by evidence.
(3) Number of questions asked by students increases.
(4) Student-student exchanges increases.
(5) Fewer 'I don't know' responses.
(6) Less disciplinary issues.
(7) Increased variety of students participating.
(8) Student confidence increases.

Research supported benefits to teachers:

(1) Teachers demonstrate greater flexibility.
(2) Teachers ask less questions, but the questions are higher-order (inviting elaboration or opposing viewpoints).
(3) "Invisible students" become visible.

5. The Math Part

Given an isosceles triangle, $\triangle ABC$ with $\angle ABC = 74°$, find the reflex angle of $\angle ACB$.

(a) $74°$
(b) $254°$
(c) $286°$
(d) $307°$

Proof. We claim that the reflex angle of $\angle ACB$ is $286°$. Because $\triangle ABC$ is an isosceles triangle, then $\angle ABC = \angle ACB = 74°$. Then because $\angle ABC + x = 360°$ is the complete angle of a circle, then $x = 286°$. □

Students may answer A because because they might've only found that $\angle ABC = \angle ACB$, but might not have found the *reflex* angle as asked.

Students may answer B by adding the angle $\angle ACB = 74°$ and $180°$.

Students may answer D because they might have not considered what sides are the same, so they may have assumed that the other angles are the same, but halved, i.e. $74° + 53° + 53°$, and then $360° - 53° = 307°$. Misunderstood how the triangle is given.