MATH 4100 TOPICS IN MATHEMATICS EDUCATION (LECTURE 5)

JOE TRAN

Abstract. Discussion prompt on eliminating homework. Homework best practices. Mathematical task on convincing someone that 3/7 is larger than 4/11. Benefits of diagnostic questions. Criticism of multiple choice questions.

1. Discussion Prompt

Prompt 1. *We should eliminate homework.*

- **No, we should not eliminate homework.**
  - What if the test was homework based, and on the test, you are stuck on the question, and the teacher tells you, well if you did the questions then you would know how to do it.
  - Parents: More homework will allow students to improve their grades.
  - Teachers: Needs the extra practice for the students to do well in this class.
  - Homework is for your learning, knowledge checking, and conceptualizing with the ideas.
- **Yes, we should eliminate homework.**
  - Students may make an excuse that they won't have enough time to do homework, but use that as an excuse to play video games or waste time scrolling through TikTok, or just napping.
  - Students: I do not have the motivation to do my homework, I am just going to skip, no big deal, but why...?
- **Depends**
  - It depends on what kind of "homework" are we talking about here? Homework assignments? Or homework for your own benefits?
  - What if you get Chegg or AI to do it?

2. Homework Best Practices

- Assign homework with clear purpose (Shellard 2005)
- Communicate expectations to students/parents (Horowitz 2005)
- Use to enrich classroom curriculum (Plato 2000)
- Match it to students' skills (Marzano 2007)
- Keep drill work to a minimum (Bluestein 2006)
- Be intentional (McBeath 1996)
- Explicitly teach needed skills (Paulu 1998)
- Monitor the amount assigned (Hancock 2001)

Date: February 5, 2024.

- Coordinate with other teachers (Simplicio 2005)
- Don't use as a punishment (Silvis 2001)
- Don't assign at the end of the class (Brewster 2000)
- Flexible homework completion policy (Battle-Bailey 2003)
- Provide Feedback (Walberg 2004)

3. Mathematical Task

Prompt 2. *How would you convince someone that $\frac{3}{7}$ is bigger than $\frac{4}{11}$.*

- **Students who would answer this correctly**
  - Find the common denominator between $\frac{3}{7}$ and $\frac{4}{11}$.
  - Draw a pie chart.
  - Convert it to something that students would be able to see easily.
  - Use a calculator.
- **Students who would answer this incorrectly**
  - They might just look at the 3 and the 4 and argue that 4 would be larger than 3 so $\frac{4}{11}$ is larger than $\frac{3}{7}$,
  - They could also argue that because 11 is larger than 7, so $\frac{4}{11}$ is larger than $\frac{3}{7}$.

Why would this be a good question:

- Encourages students to think
- Encourages students to take time to articulate.
- Provoke discussions and disagreements.

This is an ideal in a *summative assessment.*

4. Benefits of Diagnostics

For any assessment strategy—formative or summative—to work, students must actively and honestly participate. *What are some factors that prevent this?*

- Fear of mistakes
- Students opting out
  - ★ A small discussion group surrounded by many sleepy onlookers.
- Finding comfort in one correct answer.

What makes a good diagnostic assessment? (Barton, 2018)

- It should be clear and unambiguous
- It should test a single skill/concept.
- Students should be able to answer it in less than 10 seconds
- You should learn something from each incorrect response without the student needing to explain.
- It cannot be answered correctly while still holding a key misconception.

Prompt 3. *Consider the power series $\sum_{n=1}^{\infty} \frac{(x-4)^n}{n3^n}$.*

(a) *Use the ratio test to identify which of the conditions on the values of x listed below will ensure the power series converges. What is the radius of convergence of this power series.*

Options: *(A) $|x-4| < \infty$, (B) $|x-4| < 3n$, (C) $|x-4| < 1$, (D) $|x-4| > 1$, (E) $|x-4| > 0$.*

5. Criticism of MC Questions

- Students can guess
- Students can work backwards to get the answer.
- We do not have the chance to see what other answers students would have came up with.
- These are trick questions.
- The exam is not multiple choice.
- They are easier than "normal" questions.
- The distractions are dangerous—they can cause students to develop misconceptions.

The most common misconceptions we believe our students to hold may not be the same as the ones they do in fact hold—the curse of knowledge.