Formative/Summative Assessments with Conceptual/Procedural Knowledge
Lesson Plan

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Time Frame: 50 minute seminar

Overall Topic(s): Discuss the purpose and design of Summative/Formative Assessment with Conceptual/Procedural Knowledge

Goals:

At the end of this session, GSIs will be able to

- Explain the differences and similarities of conceptual/procedural understanding as well as formative/summative assessments.
- Generate a formative/summative assessment checking conceptual/procedural knowledge.
- Justify their position of their assessment using words such as "more summative" or "less formative".

Materials:

- Previous Reading by students of Mathematical Association of America's Instructional Practices Guide **pages 49-64**
- Teaching Handout
- Chalk or Whiteboard
- Mathematics textbooks students are using to teach.

Outline, Possible Timing, & Important Points to Remember:

(10-20 mins) Have discussion of reading and pose the following questions to students about the reading:

- In your own words, how would you describe a summative assessment and a formative assessment? Do you agree with the article's definitions?
- (Poll Question) Classify the following assessments as more summative or more formative in your classroom. exit slip, weekly quiz, partner quiz, pop quiz, homework
- How about the article's description of conceptual and procedural knowledge? Do you agree with their definition?
- Can you think of a problem that uses procedural knowledge in your graduate classes that would be thought of as using conceptual knowledge for your undergraduate students?

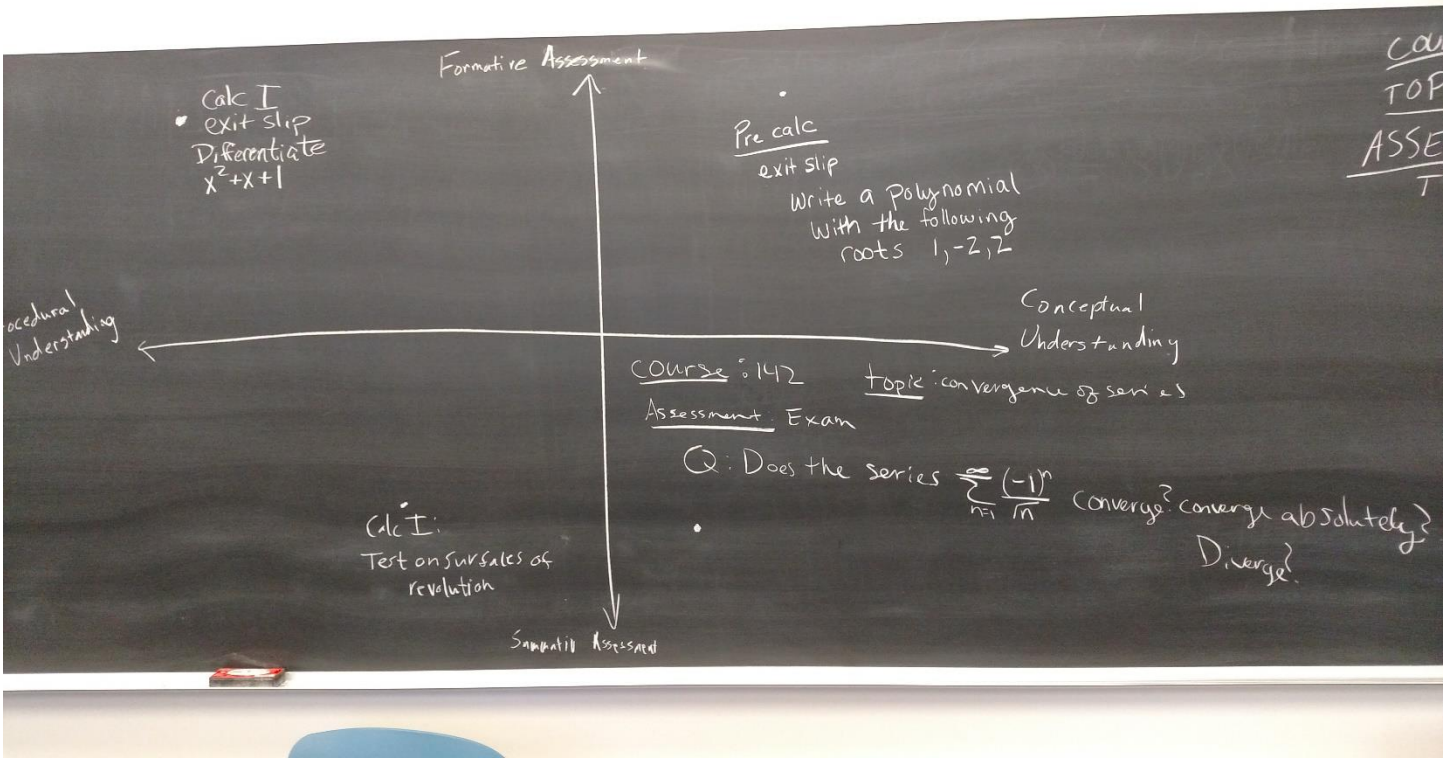
(20-30 mins) Work on Handout

- Read Handout: Clarify the purpose and goal of the activity.
- Break the class into groups of 2-3 students (or larger if needed, but have at least 4 groups, one for each quadrant).
- Have each group put a problem up on the board, make sure to get **one problem from each quadrant**. The point is to have them actually concretely make such problems and justify why they belong where they do.
- *NOTE: The axes are to provide a space to discuss more or less, not to be specific about what concrete values should be placed on the axes.*
- *NOTE: If a group puts their problem on an axis, make sure they explain how they believe there is a "balance" between the two opposing issues. For example, if someone puts their problem on the horizontal axis, have that group explain why it is not more or less summative/formative.*

(10 mins) Have groups share their work and discuss

- Have each group justify why they belong in that quadrant where it is. Provide a space after each group shares for other groups to ask questions or provide an argument for why it should be elsewhere.
- *NOTE: Try to have a board space where you can see all problems of all students all at once. If this is not possible, refer to previous groups problems.*

Example of student work.



Remark:
The use of conceptual/procedural understanding instead of knowledge was done with one of my classes prior to the MAA IPG, but should be modified to use the word knowledge to align with the reading on MAA IPG. The purpose of the activity is to have graduate students communicate and use the language of conceptual/procedural knowledge with formative/summative assessments to be able to communicate to others why and how they perceive assessment and knowledge. This expands upon the MAA IPG explanation of the definitions to be able to have TAs make sense of the definitions in their classes. Moreover, it is to help them deconstruct the dichotic nature behind the definitions given to formative and summative assessment.

Formative/Summative Assessments with Conceptual/Procedural Knowledge
Student Handout

- To what extent do your assessments assess students' understandings of lesson goals?
- Is there a range of assessments as opposed to a single task/test?
- Could a student be successful on the assessment system without truly understanding?
- Could the student understand and not be successful on the assessment system?

"When the cook tastes the soup, that's formative assessment; when the customer tastes the soup, that's summative assessment."-*Robert Stake*

Deconstructing Dichotomies
So far, we have thought of summative/formative and conceptual/procedural as separate entities or dichotic. This is the first step in understanding distinction of categories. The next step is to understand how these terms are not disjoint and can be thought of on a spectrum.

Activity
(15 mins) Consider the graph below. Work with one other person to create an assessment that assesses conceptual/procedural knowledge using formative/summative assessment. Make sure to include the following information: COURSE, TOPIC, ASSESSMENT TYPE (e.g. Math 141, implicit differentiation, in-class opening Problem of the Day)

We will share our problems on the board and explain to the class why we placed our assessment in the appropriate quadrant and why it is more to the left or right. Feel free to copy down the problems if you want to use them or their concepts.