Activity

1

Your Own Understanding

Educator: Damon Ellingston, Mathematics
Context: In-class; MATH 151 – Derivative Calculus
Keywords: mathematics, conceptual knowledge
Student Activity Time: 15 minutes

After a class session focused on derivative rules, an educator administered a conceptual questionnaire examining students' understanding of the topic.

Introducing the Reflection Activity

Even with detailed conversation in class, some students may not have the deeper conceptual understanding of a topic to move forward with confidence in learning other material. In a calculus course, an educator used a set of reflective prompts to gauge students' conceptual understanding of derivatives. The purpose of this activity was to allow students an opportunity to articulate their understanding of a derivative.

The educator used a class session to work through multiple examples and conceptual models of derivatives with the class. At the end of the class session, the educator asked students to write a response to three questions about their understanding of the concepts of the derivatives. The prompts were:

1. What is your strongest point of understanding derivatives?
2. What is your weakest point of understanding derivatives?
3. What will help you strengthen your understanding of this topic?

The educator reminded students to use their own language to explain what they did and did not understand. The educator also noted that the activity was anonymous, would not be graded, and would be used as feedback by mathematics educators. After a 10-15 minute time period, the educator collected all of the student responses and analyzed them for themes to address with the class in the next session.

After completing the activity, students identified strategies for themselves and for the educator to use in ensuring that they fully understood the concept of derivatives. Some students developed additional confidence in their understanding, and a greater sense of awareness of their responsibility in learning the material.

Recreating the Reflection Activity

	Description
1	Teach the concept at hand in class.
2	Ask students to respond to the three question prompts in writing.
3	Collect student responses and analyze.
4	Use the student responses in the next class session.

In the words of the Educator: Tips and Inspiration

Remember - it is not just about time. There's never enough time when you're teaching math and astronomy. After a while, you're just talking over students' heads and not getting through to them. It's hard to know what is wrong when your students aren't getting traction. When you ask students about what would help, some say they need more practice, but some will say things like "reading doesn't help me, I need more examples." So that's something that you can do immediately to change the class. Some students will say they need more conceptual descriptions and not just numbers, and that's actionable too.

Focus on what they feel. One of the key points is that it needs to be about what it means to them. I ask them to explain what a derivative means if you were explaining it to a friend. It's their explanation; I don't want them to tell me back what they read in the book, or what I taught. It's in their words. It's also helpful to stretch them a little beyond their capacity before you give them the questionnaire, so then they don't have to understand it at my level, but their own understanding. A few students write as if to show that they have read the book and know the definition, but remind them to focus on what they know.

What was the inspiration for the reflection activity? I got the idea for this from the CPREE website – the blog pots about Muddiest Points. This one just rang my bell right away, because yesterday I spent literally a half an hour analyzing the derivative of 1/x, what does it mean? Why is it -1/9, why is it negative. They just spent a lot of time narrowing down what it means. It was really good intellectual work, but now it's time to harvest the field. I wanted to see if their understanding of the derivative deepened a little bit. What is the point that you understand the least? I did it a little differently, but I just wanted them to come up with their own definition. At first I put an example in there, but I took it out. I want them to think about their operational knowledge, not focus on one problem. Having them try to articulate their understanding is helpful, because they spend a lot more time thinking about it.