

Which lesson or lessons are shown in the video clips?

In the video entitled *LP #1—Helping Norma and Jose*, I gave students about ten to fifteen minutes to complete their homework after we spent several minutes taking notes. This clip corresponds to the lesson plan *LP #1—3.09.15*. In the video entitled *LP #2—Using Pyth. Thm on 45-45-90*, I am at the chalkboard helping students figure out the side lengths of a 45-45-90 triangle with a hypotenuse of 1 unit. Unfortunately, I did not place the camera in a position where I could be in the clip, but we can see a majority of the students in the class. In this clip, I am using a 45-45-90 triangle that I cut out and taped to the chalk board. At about the 5:45 mark, I taped another 45-45-90 triangle next to the original triangle to create a square. This clip corresponds to the lesson plan *LP #2—3.12.15*.

Promoting a Positive Learning Environment

In *LP #1—Helping Norma and Jose*, I was able to create a positive environment by trying to get the students to work together. By asking Jose and Espoir what problem they were working on, I was able to get Jose into the conversation as I was helping Norma (Espoir was still working on copying the notes). However, in this case, I noticed that Jose misunderstood how to complete the problem, and this alerted me to the fact that I needed to spend some individual time working with him as well. I was able to challenge the students to engage their learning in this clip by asking them how they got the answers they wrote on their papers. Instead of simply telling them the processes they needed to use to solve the problems and correcting them, I asked them to explain their thinking. In Jose's case, this allowed me to see and address a misconception he had. In addition, I gave Jose over a minute to work on the problem after we talked about it and then checked in with him after he completed it. This allowed me not only to watch him do the work but also able to get Robert started on a portion of the homework.

In *LP #2-- Using Pyth. Thm on 45-45-90*, I challenged students to engage their learning by providing them with the space to think about the answers to the questions I asked. However, there are still times when I quickly responded to my own questions or jumped onto a solution that a student provided. At the chalk board, I am using a manipulative to try to respond to students with varying abilities. In addition, at the four-minute mark, I tried to encourage students to seek out multiple pathways to solving a problem so that they could effectively explain it to others and so they can remember it. In this clip, you can hear multiple students respond to my query about the two sides of the 45-45-90 triangle by paraphrasing the Isosceles Triangle Theorem. However, I wanted students to explain what this means and why it works for this triangle. By attaching another triangle onto the first and creating a square with both of them together, I gave students a visual representation of what we were talking about. This allowed us to use the Pythagorean Theorem to figure out the side lengths of that triangle and later apply it to our unit circle diagram.

Engaging Students in Learning

In this second clip, I attempted to break away from the routine of having students take notes in favor of engaging them in a conversation about 45-45-90 triangles. All of my students took a geometry class within the last two years and have already learned about triangles and the theorems associated with them, though their understanding may be a little fuzzy at this point. Because I knew they already received some of this instruction, I wanted to challenge them to develop deeper conceptions of the ideas rather than simply throw formulas and explanations at them. To this end, I made an effort to ask them why their answers to my questions made sense to them. One example of this is at the ten-minute mark, when the student in the foreground suggested that we flip the fraction in order to get the root out of the denominator. I followed his

reasoning and he realized that $\frac{1}{\sqrt{2}} \neq \frac{\sqrt{2}}{1}$. In asking them to explain their solutions to me, I was trying to help students develop their mathematical reasoning because, as I explained at one point during the clip, math should be logical rather than the result of some magical formula or process. If they cannot explain it to a stranger why the math makes sense, it is likely that students don't fully understand the ideas themselves.

Deepening Student Learning during Instruction

The first video clip gives several good examples of eliciting student response and formatively assessing their understanding to further develop their ideas about the math. By asking both Norma and Jose how they made sense of the problems they were working on, I was able to quickly find out any misconceptions they had. Though I had initially hoped for Jose and Norma to work together on the problem that Norma had asked me about, I realized that Jose needed some individual help with the same problem. Once I asked Norma to explain her thinking to me, I was able to confirm her thinking and eliminate confusion.

As explained above, I cut out several triangle manipulatives so that students could get a visual representation of the ideas we were talking about. Though this entire chapter is about the unit circle, I wanted students to see how we could find the important points on this circle using triangles and their properties. In the second clip, I taped several of these triangles onto the chalk board so that students could see the relationship we were talking about. In a previous lesson, I used a 30-60-90 triangle we had worked with to show them how we could find other relevant points on the unit circle. By taking this 30-60-90 triangle and moving it around our circle, students had the opportunity to see that the other coordinate pairs are simply different combinations of the sides of this triangle, though some are positive and some are negative. My hope was that they could then apply this reasoning to our new triangle.

Analyzing Teaching

When analyzing the second clip of my teaching, it became apparent that I was not distributing the student voice equitably in the classroom. Because I was standing at the side of the classroom and not at the front, I did not have my Popsicle sticks—I normally use these to call on students—close at hand and forgot about using them. As a result, only several students actually participated in the discussion I tried to lead. In addition to using Popsicle sticks to select students or group to answer a question, I could have had them turn and talk to their respective neighbors before talking out to the whole class. I sometimes provided students with private think time during our conversation, and this time would have been enhanced had I asked them to share their responses with one another. Furthermore, because asking students to talk to one another about their thoughts on the math doesn't always lead to conversation, I should have given them sentence frames to provide them the vocabulary to engage in this discussion.

During the clip, you can see and hear several times when I ignored the student who appears in the foreground. Though his ideas were incorrect, I definitely missed these opportunities to engage his misconceptions on the topic we were discussing. Although I am aware that I cannot entertain every single idea that students come up with, it seems that I didn't acknowledge enough of this student's contributions to the discussion. I could have brought forth some of his ideas to the entire class and asked them what they thought about it. I don't think these students are conditioned to respectfully critique one another's ideas, and this may have created a space for that to take place. It is crucial that students experience the kind of learning that allows them to collaborate with one another and discuss their ideas. However, I fear that my students are too "comfortable" with a classroom culture that is centered on the teacher's instruction and intellectual authority. It takes time to foster a collaborative learning environment,

and it has to start with my ability to create the space for students to talk about the math. This includes giving them the vocabulary needed for these conversations.

Andrew Constantinescu
andrewconstant@gmail.com
(503) 734 - 9599