Video Analysis Project

A Closer Look at Questioning Strategies

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Classroom Interactions

Introduction – For my Video Analysis Project I am choosing to focus on my whole-class questioning strategies. I feel that questions are vital to any atmosphere where learning is taking place. Questions are what drive an active student-centered classroom. I feel that many types of questions are beneficial; however, I am curious to see what combination of questioning strategies provides the teacher with the most information about what the students understand both procedurally and conceptually. I believe that while higher order questions are probably the most effective, lower level questions are also necessary. Thus it is important that there are questions of all types, but what combination of questions works best in a time-restricted classroom where the teacher must cover a specific amount of material in a designated time, while ensuring that the students are following along and understanding the material.

Research Question – What types of questions provide the teacher with the greatest amount of student understanding?

Summary on Questioning – According to "Focusing on Students' Mathematical Thinking" by M. Lynn Breyfogle and Beth A. Herbel-Eisenmann, it is important that students have time to think about the question they were asked. They need time to process and many times pre-service teachers are told to count to seven before calling on a student for an answer. This serves two purposes, the first is to allow the students to absorb what was said and to begin thinking of an answer, the second purpose is that by waiting what may sometimes seem like a insistently long time, the students must think about an answer instead of knowing that the teacher will immediately call on another student who is volunteering an answer. Waiting for a period of time after asking a question also allows for better thinking. Another technique they suggested was to challenge students' right answers. Many times teachers find that when they challenge the student and require them to defend their answer, the student has some misconceptions. By requiring elaboration, also referred to as "pressing for student thinking", another strategy from the article, we require the student to justify his or her answer, providing deeper insight into the level of conceptual understanding. Effective instruction includes question types that can provide the teacher with information about the substance of the student's learning. Teacher's questions give students an opportunity to communicate their reasoning process, providing teachers with detailed information about how the students think and what knowledge they are gaining from the lesson. In "Unveiling Student Understanding: The Role of Questioning in Instruction" by Azita Manouchehri and Douglas A. Lapp, the authors stress that questions are important to students' learning because they guide what the students focus on. They address how the teacher's questions are what allow students to express what they know and understand about a concept. Questions that access both procedural skills and conceptual knowledge are the most beneficial. An article published by a Learning and Teaching Center based out of British Columbia, titled, "Using Classroom Questions Effectively", listed many reasons why teachers should include questions in their lesson. Some of these include: encouraging personal connections to the content, to assess teaching effectiveness, to enhance learning through communication among learners and to assess learning. The article discusses different types of questions including, open

and closed form questions, as well as, convergent versus divergent and simple versus difficult, along with many others. The article stresses that the most crucial part of questioning and answering in the classroom is how the teacher immediately responds to the answer given by the student. The teacher's response will either reinforce the student's confidence even if they provide an incorrect answer because they know that it is okay to try and be wrong. If the student notices even the slightest criticism, their confidence will diminish greatly, making them less likely to volunteer answers. A teacher should want to avoid this as much as possible because as mentioned above, questioning students is a very valuable technique in determining what the students know.

Research Methods – The questioning strategies will be analyzed through the video recording taken during the lesson. The teacher questions and student answers have been transcribed. By reading and analyzing the questions asked by the teacher and the answers given by the students I will be able to make note of the type of question asked and the value of the answer given in terms of the amount of student knowledge the teacher is presented with. Each question will be classified as one of the following four types of question and will be denoted at the beginning of the question. Following each student answer will be a number from 0 to 2 which will represent the amount of student understanding the teacher received from the student or the whole class in response to the presented question. A response tagged with a 0 means that the teachers gained no knowledge of the student's understanding of the content. A 1 means that the teacher gained some information but strongly believes if the student had been pressed harder that they would have gotten more information. A 2 means that the answer given satisfies the question asked and the teacher is content with the amount of knowledge displayed.

Controlling question – A question that seems to control or sway the student's answer. This does not reveal much about the student's level of understanding, or misunderstanding.

Closed form question – A question that seeks a particular answer, right or wrong, true or false.

Open form question– These questions include a how and/or a why, their goal is to promote a description of a strategy or method used.

Challenge question – A question that follows after a student has given an answer to the initial question. This challenge question requires the student to elaborate and explain how they found that answer. Not just accepting a correct answer and assuming that the student used proper reasoning to arrive at that answer.

Transcript with coding –

5:20 – 9:45 Questioning begins when we review as a class what they found for their descriptions and pictures of: acute, right and obtuse triangles.

[OPEN] *Me* - Who would like to share with the class their description of acute angle? Kaitlin.

Kaitlin - A triangle that has a measurement of 180°. The angles. **[1]**

[CHALLENGE] *Me* - Which angles? How many angles?

Whole class - All 3. **[1]**

[CHALLENGE] *Me* - All 3? What do you guys think?

Whole class – At least one. At least two. **[1]**

[CHLLENGE] *Me* – One, two three?

Me - Okay well the description I have for acute triangle is where all three interior angles are less than 90°.

[OPEN] *Me* - Who wants to describe right triangles? Jacob.

Jacob - A triangle that has one 90° angle. **[1]**

[CHALLENGE] *Me* – Is it at least one 90° angle?

Jacob - At most. It can't have more than one. **[1]**

[CHALLENGE] *Me* - What would be wrong if it had two 90° angles?

Jacob - It would be a square. **[1]**

Student – All three angle measures have to add up to 180°. **[1]**

Me- Repeat above quote, we would have an angle that measures 90°, another angle measure of 90° and that adds up to… 180°. Sienna.

Sienna – You need all three angles to add up to 180°, but if two of them are 90° that adds up to 180°. **[2]**

[CLOSED] *Me* – And then our third angle would be what?

Sienna – Nothing. **[1]**

[CLOSED] *Me* – Zero, so that's what shape? Jacob.

Jacob – A straight line. **[2]**

[OPEN] *Me* – Okay, description for obtuse triangle? Tristian.

Tristian – A triangle with one obtuse angle. **[2]**

[CLOSED] *Me* – Repeat above quote. Does anybody have anything different? No? Do you guys agree with that?

[CLOSED] *Me* - Called on a random student, do you agree with our description?

Student - If it has more than one obtuse angle, then the sum of the three angles would be greater than 180°. **[2]**

[CLOSED] *Me* – Are there any questions about this paper?

11:49 – 13:30 Questioning about labeling real-world triangles.

[CLOSED] *Me* - Raise your hand to tell me which one you found is an acute triangle?

Student – The gator pennant. **[1]**

[CHALLENGE] *Me* – Why do you say that? Because you can look at it and say that I can tell that all three of these are less than 90°. Are there any other acutes? Geneva.

Geneva – The Dorito. **[1]**

[CONTROLLING] *Me* – For the same reason, right?

[OPEN] *Me* - Okay, what about the right triangle? Jeremy.

Jeremy – The sailboat. **[1]**

[OPEN] *Me* - Now what about an obtuse triangle? George.

George – The framework. **[1]**

[CHALLENGE] - *Me* – Ok, which angle? (labeled them a, b, c.)

George – A. **[2]**

25:30 – 27:22 Questioning about cooperative group activity.

Me – Now what we are going to do is talk about some characteristics of triangles. (told students what we are going to be doing.)

Me – Alright guys can I have your attention? Put your protractors down, pencils down. Um, let's talk about these triangles.

[CLOSED] *Me* - What kinds of different triangles did you have?

Student – Acute, obtuse and right. **[2]**

[OPEN] *Me* – Repeat above quote. Good, what did you notice about the angle measurements?

[CLOSED] *Me* - What did they sum to?

Whole class – 180°! **[2]**

[CHALLENGE] *Me* – All of them or some of them?

Whole class – All of them! **[1]**

[CHALLENGE] *Me* – And why is that?

Student – Because they are triangles. **[1]**

Me – But they are different types of triangles.

Students – A triangle is a triangle, all triangles sum to 180° **[2]**

29:25 – 30:00 Discussion about tearing angles to find a line.

[CLOSED] *Me* – Instructed students to rip the triangle papers.

Students – It equals 180°, it forms a straight line. **[1]**

30:23 – 31:00 Questioning about isosceles triangles.

Me – Now we are going to move on and talk about isosceles triangles.

[OPEN] *Me* – Who can define what an isosceles triangle is?

Jacob – Isn't it where two sides of the triangle are congruent? **[2]**

Me – Jacob said an isosceles triangle has two congruent sides. Now I want you to write your own definition on your paper.

34:15 – 37:25 Discussion about Isosceles and the Conjecture.

[CLOSED] *Me* - What did you guys put for here? (one of the base angles.)

Whole Class - 45°. **[1]**

[CLOSED] *Me* – And what about here?

Whole Class – 45°. **[1]**

[CLOSED] *Me* – So they are the same?

Whole Class – Yes. **[1]**

[CLOSED] *Me* – Did you measure them with a protractor?

Whole Class – No. **[1]**

[CHALLENGE] *Me* – You didn't use a protractor? Then what did you do?

Jacob – You subtract from 180° then divide by 2. **[1]**

[CHALLENGE] *Me* – What did you subtract?

Jacob – The number given. **[1]**

[CHALLENGE] *Me* – So what about our obtuse triangle?

Student – 180° minus 126° divided by 2. **[2]**

[CHALLENGE] *Me* – Then how about our acute triangle? (same answers)

[OPEN] *Me* - What did they all have in common?

Student – They are all triangles. **[1]**

[OPEN] *Me* – Right, they are all triangles, what else do they all have in common?

Student – They are all isosceles triangles, they all equal 180°. **[2]**

[CONTROLLING] *Me* – They are all isosceles triangles, do you see that?

[OPEN] *Me* - What did we notice about the base angles for each triangle?

Student – They are congruent. **[2]**

Student – Isosceles Triangle Conjecture - If a triangle is isosceles then its base angles are congruent. **[2]**

[CONTROLLING] *Me* – Repeat above quote. Correct, and we see that right here right?

38:00 – 41:00 Discussion about converse.

[CLOSED] *Me* - The next one says the Converse of the Isosceles Triangle Conjecture. What is a converse? Zachary.

Zachary – If the base angles are congruent then it is isosceles. **[2]**

[OPEN] *Me* – Can you draw what the converse conjecture would look like on your paper?

42:05 – 44:40 Is an equilateral isosceles?

[CLOSED] *Me* – Would an equilateral triangle be an isosceles triangle?

Whole class – No! **[1]**

[CHALLENGE] *Me* – No? Why not?

Students explaining that an isosceles need the 2 base angles to be congruent but an equilateral has 3 congruent angles. **[2]**

[OPEN] *Me* - What do we need to be an isosceles triangle?

Whole Class – Two congruent sides. **[2]**

[CLOSED] *Me* – Right, and there would be two congruent angles. Does an equilateral triangle have two congruent sides?

Whole Class – Yes/No. **[1]**

[CONTROLLING] *Me* – Yes! It has three, so that means it has two, right? Okay, are there two congruent angles?

Student – Yeah. **[1]**

Adonna – But…

[OPEN] *Me* – But what?

Adonna – But there is another angle. **[2]**

[CLOSED] *Me* – Draws an equilateral triangle on the overhead. And asks, are there two congruent angles in this picture?

Whole Class – Yes. **[1]**

Geneva – But an isosceles ONLY has two. **[2]**

[CLOSED] *Me* – Do I have the word only on here? (referring to the conjecture) It needs to have two and it does have two.

[CLOSED] *Me* – Do you guys have any questions? Are you guys clear that this does fit the description of an isosceles triangle?

Results of Data Analysis – After looking at the data it is apparent that all four types of questions were used in the lesson. After going through and classifying each type of question as either a controlling, closed, open or challenge question I evaluated each answer given to me by the student(s) assigned it a number from zero to two depending on the amount of student knowledge each question prompted. These results can be seen in the table below.

Table of Results:

	Controlling	**Closed**	**Open**	**Challenge**	**Total**
0	0	0	0	0	0
1	1	11	5	10	27
2	0	6	7	5	18
Total	4	18	13	15	45 answers to 50 questions.

In looking at the above table one can see that each type of question prompted an answer, however the amount of student knowledge made visible to the teacher varies. In my opinion all questions asked throughout the lesson provided the teacher with some form of student knowledge. I was glad to see that I only asked 4 controlling questions, because I feel that controlling questions are not beneficial to either the teacher or the student. As one can see, only one of the four controlling questions received an answer. The other three times a controlling

question was asked a student answer wasn't even given, I found that I moved on without waiting for a response, mainly because I knew a response would be useless. I had already given the students the answer with the way that I had formed my question.

While I feel that asking challenge questions is an important and valuable way to probe the students further, I feel that too many times I would move on without reaching closure on a question. This in turn makes the probing ineffective. Hence the reason the table above shows that only a third of the challenge questions were productive. An example of this is when I asked the students to share with the class their description of what an acute triangle is. My open form question sparked a discussion about the number of angles that must be acute to form an acute triangle. I followed the open form question with three challenging questions to probe them further and get more information from them; however, we didn't reach a conclusion as a class. This is because I gave up and ended up telling the class the definition I had. This not only takes away from the student-centered classroom, but also idolizes the teacher as the only person with the correct answer. If I would have instead asked the class for reasons why they think an acute triangle must have 1, 2, or 3 angles we could have cleared things up further and I would have seen more student thinking. I feel that challenge questions are crucial to digging more information from the students; however, the level of efficiency depends on what the teacher does with the student answers.

Research typically states that open questions are better than closed form questions, and I agree, however I do feel that closed form questions are necessary throughout lessons. In looking at the data one can see that while more closed form questions were asked, the open form questions more often provided the teacher with more information about student understanding. Thus fewer, well-designed questions present more information than a lot of basic questions. A closed question that showed very little student knowledge was when we were discussing the base angles of an isosceles triangle and after we labeled both base angles 45°, I asked the class if the two base angles were the same. They said yes and this didn't tell me anything except that they were able to see that the two angle measures looked exactly the same. However, sometimes closed form questions can provide surprising results. An example of this is when I asked the class what their three triangles had in common, a question that was very broad and had many answers. The response I got was that they are all isosceles triangles and that they all equal 180°. This was the perfect answer; it was exactly what I was looking for. This made me aware of the fact that I should keep an open discussion going and allow the students to add to the discussion freely. I provided them time to think and explain instead of settling for a simple yes/no answer. This result is also due to the type of discussions the students are used to having in their day to day classroom. Their teacher doesn't simply accept yes/no answers, thus the students have learned that they must express their thinking out loud. An example of this is when I asked a student if they agree with the description we had come up with for an obtuse triangle. Instead of responding with a yes or no, she answered by saying, "If it has more than one obtuse angle, then the sum of the three angles would be greater than 180°." Thus I feel that while open form questions are very fruitful, closed form questions are necessary and can many times provide a good amount of information depending on the expectations of the students set by the teacher and how they have been taught to answer questions, as well as the amount of support the teacher provides.

Conclusion – To conclude about some of the different types of questions a teacher could ask and the effectiveness of each type with regards to the amount of student knowledge the teacher is presented with by the student answers, I feel that open, closed and challenge questions are all beneficial in providing the teacher with a varying degree of the students' knowledge. I feel that open questions provide the teacher with the greatest amount of student knowledge, however closed form questions are not to be counted out. If the classroom dynamics are structured so that the students know that they are expected to elaborate, closed form questions can also be helpful. I believe that ultimately it is not the type of initial question that is asked that is important, but rather how the students' answers are followed up by the teacher. Challenge questions should follow all types of questions throughout the entire lesson. When an initial question is answered and it does not provide a complete answer follow it up by asking the student what they mean, how they know what they know, or to explain why or why not.

In other words, a teacher can eventually reach the same results through constant questioning. If the teacher focuses on open form questions they will probably reach their desired information sooner than if they were to begin with closed form questions. The most essential part to questioning for student knowledge is to continuously probe the students for more and more explanation.

Reflections - I learned not to be afraid of straying from the lesson plan. While time is always a factor, many times going with the flow of the class works best and can provide numerous learning opportunities that were not necessarily planned for beforehand. When creating a lesson plan it is almost impossible to predict every single question that will be asked and each students' struggles. For this reason, while carrying out the lesson plan if the teacher sees that a student needs more clarification on a specific part the teacher should take the time to clarify the confusion. I should have taken a moment to alter my lesson plan during the review of the warm-up terms by asking a student to share with the class what their acute triangle looked like. Instead of drawing my own on the overhead, I should have had a student read off their angle measures. Another aspect to pay mind to is to not use special cases when drawing examples, unless discussing special cases of course. I did this on the overhead when I drew my example of an acute triangle. I drew a 60°, 60°, 60° triangle. The students need to understand that there are hundreds of different possibilities for acute triangles and they shouldn't begin to think that a 60°, 60°, 60° is the only case. Another area I have room to improve on is my wait time after posing a question. At one point in the lesson I asked, "Does anybody have anything different? No? Do you guys agree with that?" This didn't allow for any student response. I was glad to see that following eight different questions, both open and closed form, I asked challenge questions. I constantly tried to probe further I didn't settle. In-turn I found out a lot more about the students' knowledge.

Works Cited

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