

Post Training Assignment

Review of Article: A World of Difference....Classrooms abroad provide lessons in teaching math and science

A summary of the article:

The Third International Mathematics and Science Study (TIMSS) conducted an international comparison of 8th grade classrooms in Asia and several European countries. They studied how the classrooms were organized, the kind of math problems that were given, and how these problems were worked on by the students.

Higher achieving countries like Hong Kong, Japan, Switzerland all taught mathematics using different methods. Problems designed to teach skills, versus those designed to teach conceptual understanding varied as well. United States students were also given both types of problems. When working on conceptual understanding, the teachers in the US stepped in and did the work for the students. Students weren't given the opportunity to explore or discuss the mathematical and conceptual relationships.

If the U.S wants to develop higher achieving students, the methods of teaching need to be changed. Teachers need to avoid stepping in and giving the answers to the students. They must allow students an opportunity to think and reason about mathematical concepts, and discuss the relationships.

Changing the methods of teaching won't happen overnight. They must be done gradually by incorporating small changes into their daily and weekly routines.

Three changes, mentioned in the article, which can be made to teaching to improve student's achievement, are listed below:

- 1). Teachers need to spend time focusing on planning lessons and reflecting on their effectiveness.
- 2). Teachers need to be given examples of alternative teaching methods.
- 3). Teachers must have the opportunity to study student responses. They need to learn how to analyze and interpret student's thinking, so they can adjust and make significant changes in their teaching strategies.

In order for the US to compete with some of the higher achieving countries, teachers need to make some changes to their teaching methods. The emphasis needs to be on developing lessons that deepen the student's conceptual understanding and allows sharing of ideas through class discussions.

2). How does it connect to our work at the institute?

As I was reading this article, I thought I was sitting in one of Mark's workshops and he was giving me the information. I knew I wasn't in one of his workshop, but everything written in the article completely connects to everything Mark has been doing with us at the institute. The three changes that were mentioned in the article are the same as the steps we need to do in our problem solving projectsPlan, analyze, reflect.

I have heard this quote several times during our institute sessions, "Make small changes, Do it again". The article emphasizes that change won't happen overnight. Change is a gradual process that takes time. At the institute, we are learning to make changes to our teaching strategies that will be beneficial to our students. We are learning to choose problems that are non-routine that can be solved using multiple strategies. These types of problems will enable the students to become better problem solvers and higher achievers.

The article was very informative and relates well to everything we are doing at the institute. I enjoyed reading it; I have shared it with some of my colleagues.

3). How did it impact your teaching?

Being told to change the way I have been teaching for the past 20 years is extremely difficult, but seeing proof that your method may not be producing higher achieving students, really makes you think. I have been following the advice from both the article and the institute, make small changes and do it again. Every week, I have been giving the students a non-routine math problem. The students work independently on the problem as I walk around the room to observe their strategies. I ask questions, redirect students that may have gotten side tracked, and ask them to verbalize their thinking. We have a discussion about the multiple strategies that were used, challenges that were faced, and how can this problem relate to similar problems. The students have become more comfortable and confident working on these non-routine problems. Students of all ability levels can be successful with some or all parts of the problems. I have made some changes to my teaching methods, and I think we all have benefited from them. We still have a long way to go, but it's a start.

4). If the article describes an activity, try it out in your classroom. Describe what happened when you tried the activity. What worked? What would you do differently next time? What did this experience teach you?

The only problem in the article was--"Find a pattern for the sum of the interior angles of a polygon"

The intent is for the students to explore the relationship among the measures of angles in figures with different numbers and sides and detect a pattern in the way that the sums can be calculated. The article showed two different teaching approaches to one concept. In the first approach, the students were given the opportunity to explore the concept. In the second approach, the teacher jumped in and gave the students the answer, and didn't allow them to make the connection.

I took that original question and made a problem for my class to try, and here's what happened.

I handed the paper to my students. They read it and most were confused about some of the terms being used. All of the students knew what triangles, squares, parallelograms, and rectangles were, but many didn't know rhombus, or hexagon. This led to a discussion about shapes and the number of different sides they had. We talked about pentagons, hexagons, and octagons, decagons and how many sides they each had. Everyone knew the sum of the interior angles of a triangle was 180 degrees and that squares and rectangles had 4, 90 degree angles. I asked the students if there was a tool that is used to measure angles. Wilmer, an engineer in his country, knew there was but couldn't think of the name of it. He was able to describe what it looked like to the rest of the class. A few of the students who were in my class last year remembered the name, and came up with the word protractor. Paula, a former student, explained to the class how it can be used to measure angles. I passed out the protractors to give the students an opportunity to use them with this problem.

After a lengthy discussion about shapes and angles, I asked the students to use the information we just talked about to try the problem.

What worked?

The students immediately began drawing figures of the shapes they knew, and labeling the angles. (Triangles, squares, rectangles) As I was walking around the room, I saw that the students were using different strategies to find the sum of the interior angles. I liked the way Amy divided the figures into shapes she was comfortable with, rectangles and triangles. All the students had addition skills, so the computations weren't difficult for them. Most could figure out the sums of the 3, 4, 5, 6, and 8 sided figures, but seeing a pattern or developing a rule was challenging. Some began to get frustrated, but I didn't jump in and give the answer. I, instead, started using questions to draw out the responses. This approach worked for some students, but others just wanted me to give them the answer. My class is slowly realizing that the answers will not be told to them; it will be drawn from them through questioning. Questioning and discussing worked well with this problem.

What would you do differently?

If I tried this problem again, I would introduce the protractors ahead of time. I had manipulatives, but trying to use a protractor on such a small object didn't work so well. I would give them paper and scissors to cut out shapes, so they could measure the angles more easily.

What did this experience teach you?

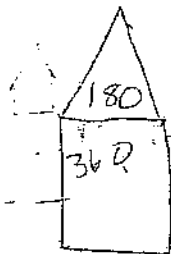
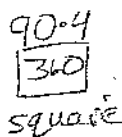
When working with adult students, never take anything for granted and don't assume. I assumed all the students would know the names of the 5, 6, 8, and 10 sided figures. What I assume will be an easy task for the students, may really be a huge challenge for them. I still have a lot to learn about planning lessons, introducing concepts to my class, analyzing student's work and reflecting about the success of the lesson. It will take time, but my class and I are moving in the right direction.

Samples of work by Amy, Walter, and Ajsa

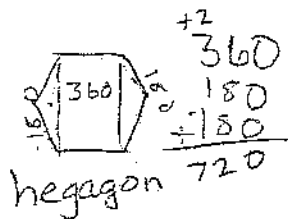
Name: Amy F.

A polygon is a plane figure with at least 3 straight sides and angles. Examples are: triangle, rhombus, parallelogram, and hexagon.

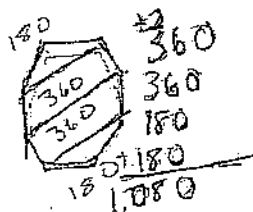
- 1). Find a pattern for the sum of the interior angles of a polygon. Start with a three sided figure, then a four sided figure, and so on. Please show all your work
- 2). Once you see a pattern, can you develop a rule for the sum of the angles if you knew the number of sides?



$$\begin{array}{r} +1 \\ 360 \\ +180 \\ \hline 540 \end{array}$$

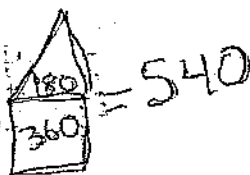


octagon



pentagon

add 180 each time, then multiply the total number of angles.



$$3 \text{ sides} = 180^\circ$$

$$4 \text{ sides} = 360^\circ$$

$$5 \text{ sides} = 540^\circ$$

$$6 \text{ sides} = 720^\circ$$

$$8 \text{ sides} = 1080^\circ$$

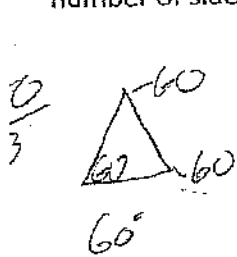
add 180 every time
 $180 + 180 = 360$

Name: Walter

A polygon is a plane figure with at least 3 straight sides and angles. Examples are: triangle, rhombus, parallelogram, and hexagon.

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2). Once you see a pattern, can you develop a rule for the sum of the angles if you knew the number of sides?



$180 \cdot 2$

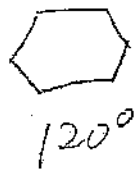


$\frac{360}{4}$



$180 \cdot 3 = \frac{540}{5}$

108°



$180 \cdot 4 = \frac{720}{6}$



$180 \cdot 6 = \frac{1080}{6}$

$$\frac{180^\circ (\# \text{ of sides} - 2)}{\# \text{ of sides}}$$

10 sides

$$180^\circ (10 - 2)$$

n of interior Angles

$180(8)$

1440

10

144° per Ang

$180^\circ (\# \text{ of sides} - 2) = \text{Int. Angle.}$

$180^\circ (10 \text{ sides} - 2)$

$180^\circ (8) =$

1440 Total

Aisa

Name:

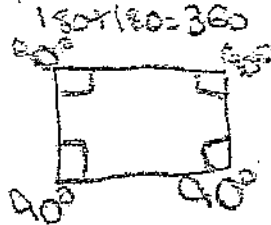
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$$\frac{180^\circ}{3} = 60^\circ$$



$$\frac{360}{4} = 90^\circ$$

$$360 + 180 = 540$$



$$90 + 90 = 180$$

$$540 + 180 = 720$$

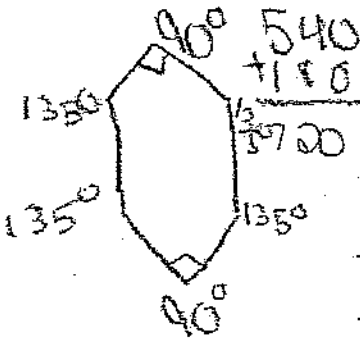
$$120 + 25 = 145$$

$$12 \text{ sides } 12 - 2 = 10$$

$$Y = 180(X)$$

$$Y = 180(10)$$

$$Y = 1,800$$



$$90 + 90 = 180$$

$$720 - 180 = 540$$

$$\frac{540}{4} = 135$$

$$Y = (X - 2) \times 180$$

X represents the number of sides of the figure.