Appropriately Challenging Gr 4 – 6 Students

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What do you think?

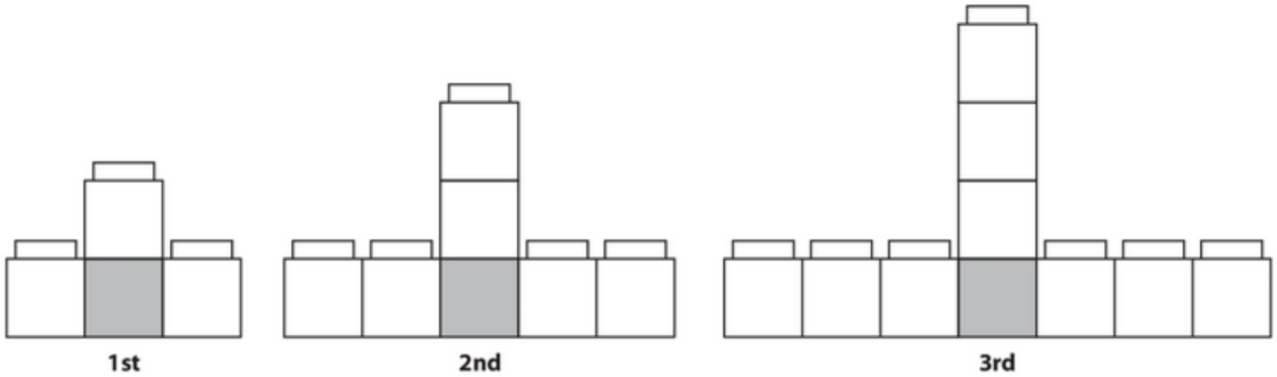
- 1 to 3:15 high achieving (vs contests and acceleration)

What I have observed

- What strong students really need and really enjoy are problems that lead to generalizations and deeper insights.
- They also like to think of “unique” ideas.
- Many of the kinds of open questions we looked at yesterday morning do that well.

For example

- Usually we ask students to continue patterns, e.g. .



But consider this instead

- A growing pattern includes the numbers 47 and 71 somewhere.
- It grows at a constant rate.
- What could the pattern be?

OR

- How could you continue this to be a pattern, but one that other people might not even think of?
- 5, 8, 11,….

Here are many more examples

- You have two small groups of counters, the same size.
- You have two large groups of counters, each double the size of the small group.
- List a bunch of possible totals you could have.
- List a bunch you could not have.

Here are many more examples

- You have bags of 6 counters, 9 counters or 20 counters, as many of each as you want.
- List a bunch of totals you CANNOT get using those counters.
- Do you think you have all of the impossible totals?

Here are many more examples

- You add two numbers.
- You subtract the same two numbers.
- The sum is double the difference.
- What could the numbers be?

Here are many more examples

- You represent a number with counters.
- If you group the counters into 3s, there is 1 left over.
- But if you group them into 4s, there are 3 left over.
- How many counters could there be?

Here are many more examples

- I say the number 4.
- You apply a math “rule” and the answer is 22.
- What could the ”rule” be?

Here are many more examples

- You will think of a number and follow my steps.
- I will be able to tell you what number you thought of.
- Your job is to figure out my trick.

The trick

- Add 8 to your number.
- Double it.
- Subtract 10.
- Divide by 2.

Another example

- You multiply two numbers that are two apart.
- You multiply the number between them by itself.
- What happens?

Another example

- You build a rectangle with square tiles.
- You calculate the perimeter.
- Then you cut the rectangle in half and calculate the new perimeter.
- What can the fraction of the new perimeter to the old one be? Can it be 2/3? Can it be 3/4?

You can adapt this by

- cutting the rectangle area into thirds.
- halving the perimeter instead of the area

Another example

- Students also enjoy “two truths and a lie” sorts of problems- first solving them, but then creating them.

Which is the lie?

- A: I add 3 consecutive numbers and get 102.
- B: I add 4 consecutive numbers and get 80.
- C: I add 5 consecutive numbers and get 95.

Another important strategy

- Ask lots of questions that students need to answer without actually referring to the problem.
- It requires lots of predicting and reasoning.

For example

- WITHOUT GETTING THE ANSWER, which do you think is greater: 18 x 78 or 17 x79?
- WITHOUT GETTING THE ANSWER, how do you know which is greater:
  584 ÷ 3 or 298 ÷ 6?

For example

- WITHOUT GETTING THE ANSWER, A store sold some lottery tickets for $2 and some for $5. They collected $167. Did they sell an odd number of $5 tickets or an even number?
- WITHOUT SOLVING, tell how you know that there cannot be a positive solution to $100x + 8 = 87x + 2$.

Conjectures

- A student notices something and you turn it into a conjecture.
- For example, a student notices that if you compare 1/10 to 2/3, 1/10 is smaller and that 1 and 10 are far apart, but 2 and 3 are close together.

You ask

- Is this true or false? How do you know?
- If a and b are closer together than c and d, then $a/b > c/d$.

Or

- A student notices that when you think about 1/5 and 1/2, 2/7 (that comes from adding numerators and adding denominators) is in between them.

So you ask

- Conjecture: Is this true or false? How do you know?
- To get a fraction between two given ones, just can always add the numerators for the new numerator and add the denominator for the new denominator, e.g. between 1/3 and 3/5, use 4/8.

Let’s look at a lesson

- Here is a lesson for all kids I wrote for Grade 5.
- I think that lessons of this sort will be appropriate for all students and will appropriately challenge strong students.
- MathUp 5, Multiplying, Lesson 5

Let’s talk about this

- Do you think we are stretching kids?
- Do you think your stronger kids would like this? Your other kids?
- How could we take a particular topic that you have to teach and create something? Let’s try together.