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Kindergarten Math Interview

INTRO

Freckles is an eager student. She actively participates in all classroom activities. She often raises her hand to offer answers or ideas and she is well liked. She says, "Math is something important that other people want you to do, but you don't want to do it." She also says she likes math and she and her friend are good at it. When asked how she knows her friend is good at it, she says, "Because I see her writing a lot".

← that's interesting how does that mean she's good at math.

Unfortunately the timing of our field assignment prevented us from seeing a "normal" two weeks. Our teacher was gone for two days and when she returned she was knee deep in administering the DRA. Meanwhile, the whole school was preparing for an art auction. As a result, we only saw two math lessons/activities. The first math lesson was taken from an Addison/Wesley curriculum; a "Problem of the Day". There was a picture of a fish tank containing three fish and a large plant. The teacher gave the problem: "There are two fish hiding behind the plant. How many fish are in the tank?" The students were sitting in the rug area without paper, pencil, or manipulatives. Freckles raises her hand to offer an answer as usual, but she is not called on. After a student gives the correct answer and an explanation of having counted on her fingers, the teacher asks for someone to write the equation up on an easel. Then the students are asked to rewrite the equation in another way. The emphasis of the lesson is the ability to write an equation horizontally and vertically. Freckles is fully engaged and raises her hand throughout the lesson. The students are then given small squares of paper and asked

how do you write an equation vertically?

to return to their desks and solve the problem: "Now there are five fish hiding behind the plant. How many fish are in the tank? Write two different equations." Freckles returns to her desk and eagerly gets to work. Some of the students ask for help and are clearly puzzled. Freckles does not ask for help and confidently shows me her work. This is what was on her paper:

$$\begin{aligned}5+0&=0 \\2+3&=5 \\8+9&= \\5+5&=10\end{aligned}$$

Unfortunately, I was unable to question her about her answers. After everyone turns in their paper, the class goes over the correct way of solving the problem. One student wants to change hers because she "messed up". Freckles appears unconcerned when confronted with the correct equations.

This lesson was my first opportunity to see some of Freckles' mathematical understanding. I surmised: she has memorized some math facts, but when confronted with a context for the numbers she misunderstands how to interpret the information in the problem into a computation. However, she is unaware of her confusion. The teacher said the class had not done math for about two weeks. I went into the interview considering Freckles lack of recent practice and was curious to see if a one-on-one situation would elicit more insights into Freckles' ability to interpret information from a story problem.

THE INTERVIEW

Problem: "On Tuesday 5 eggs hatched. On Wednesday 4 eggs hatched. How many baby chicks are there?" Eggs hatching and baby chicks are a familiar context for these kids. Just days before the librarian's egg hatching project had come to fruition.

Strategies: Freckles guesses “three” right away, without using any of the materials provided (paper, pens, unifix cubes). I ask her to pause and think about the problem for a minute. I read the problem again. She puts out five fingers and then with the same hand she puts out four fingers. “I know the answer”, she says. I ask her to draw a picture or use the cubes to show me how she got her answer.” She wants to know if she should draw how many eggs there were. I tell her to draw whatever makes sense to her. She draws four eggs and labels them “Wisday”. Then she draws 5 eggs and labels them “Tusay”. As she is drawing I reread the problem and change the wording to include four *more* eggs hatched. I ask her to tell me about the picture. She tells me her answer is four eggs. She explains, “there was five and then there was four more and I counted and then I end up with four”. I ask her to show me how she counted it. She reiterates the fact that there are five and then four and then she says, “then there are no more answers so you would stop on four so then I think it would be four”. I ask her to explain what she means by “no more answers”. She says, “When someone is asking two questions and they think that there are more and then they stop at the last one, but it is really second, it doesn’t make sense.” She tries to explain further, I can’t follow what she says. She ends by saying, “they think that there are more questions and they stop.” At this point I’m fairly certain she does not see this problem as a joining problem. I ask her to show me how she counted. She uses her picture to show me that there are five and then you take one away. “Then you stop and there are no more answers so you stop at four.” I ask her to show me with the cubes and reread the problem adding “more and how many all together”. She puts five cubes together and takes one away to get four. She sticks with the answer of four.

You're asking good Qs to see if she understands her thinking

Reflection: We did a poor job in constructing our question. There was no clear joining action. Freckles extracts the correct numbers from the problem, but she compares the two numbers rather than joining them. She compares them by saying you take one away from five to get four. The language of the problem confused her. I think she saw this problem as a number sequence problem or an "identify the pattern" problem. She guesses three from the outset. If you were counting down from five, three would be the correct response. I think this is why she says it doesn't make sense that there aren't any more questions. I think she was expecting me to say, "On Friday _____ eggs hatched". I decide to try another story problem without days of the week and including the words "more" and "all together" for each reading of the problem. Her interpretation of the problem does reveal her keen ability to identify patterns. She linked the progression of the days of the weeks with the decreasing amount of eggs hatching each day. (This is pretty amazing. I didn't figure this out until I finished this paper and finally it dawned on me what she meant by "no more questions" and why she guessed "3" so quickly.)

so - it'd be interesting to see if a diff. more explicit joining action will (which help see you th.

good try. ne

Problem: "Julia has four stickers, Gabriel gives her five more stickers. How many stickers does she have all together?"

Strategies: Immediately she writes ten at the top of her paper. I reread the problem. She draws five boxes for stickers. Below these she writes Gabriel. Below Gabriel she draws five more boxes. When I ask her to show me how she got her answer she counts the boxes, "1,2,3,4,5,6,7,8,9,10". I ask her if she can write an equation and I reread the problem again to see if she might change her five boxes to four. She does not. She uses the ten she has already written on her paper and writes $10+5=5$ and 10

that's a good hypothesis.

so I'm wondering if you asked her to show you where she drew 4 stickers, if she'd catch that she drew 5



$$\begin{array}{r} +5 \\ = \\ \hline 5 \end{array}$$

I wouldn't teach kids to write vertical equations -- well -- that's not the right way of saying that -- may talk to me about this

Reflection: Freckles recognizes the joining action of the problem, however she extracts an incorrect number from the problem. Based on her work I saw in class, I know she knows $5+5 = 10$. Perhaps she was unwilling to change her initial answer and chose the facts that would make it true. Her counting reveals an understanding of one-to-one correspondence. However, her equations reveal misunderstanding about the meaning of the symbols + and =. She has a procedural knowledge that tells her "number + number = number", but she may not understand the meaning of the symbols. Now, I would ask her to read her equations to see if she could catch her mistake. And, if not, I would ask her to try and show me with the cubes $10+5$, maybe removing the picture from sight. Also, I would ask her what she thinks the + and = symbols mean.

H'd you, great to hear her interpretation of why she wrote $5+5=5$

We move on to counting problems.

Problem: I lay out 30 unifix cubes and ask her to count them out loud. We wanted to include counting problems in the interview because we saw so little counting in the classroom and we were curious about the kid's abilities. Also we chose the limit of thirty based on the Seattle Public School's Kindergarten Frameworks.

(by the way, quite typical to expect kids in K to be able to go to 100, 30 really, real basic, real minimum standard)

Strategies: Freckles handles this task quite handily. She counts out loud correctly. As she counts she uses one finger to slide the cube off to the side. As she counts higher her piles get closer together. She ends with 29 because she loses track of the boundary between her piles. I decide to try fifty cubes and see if a second time around she will figure out to keep her pile further away from each other. We start all over. She counts using a finger from each hand to separate cubes she has counted. At 21 she realizes she

is getting her piles mixed up and starts over. She counts correctly to 47, moving one cube for each number, however her method of separating results in some uncounted cubes getting into the counted pile. I ask her if she can draw a picture of her counting.

She writes: 47 + cubes
 = cubes
 47 I cawntidid
 47 cubes

She reads, "47 plus cubes equals cubes."

this is fascinating!

Reflection: Her use of the + and = symbols again reveals her limited understanding of the meaning of the symbols. Her counting reinforces my estimation of her solid understanding of one-to-one correspondence. Her less than systematic method for separation seems appropriate for Kindergarten. Now, I would ask her if she could think of a quicker way to count the cubes, to see if she would suggest counting by twos, or fives, or tens. If she didn't suggest any of those methods I would ask her to do so starting with the tens. I might say I noticed her piles were getting mixed up and ask how she might avoid this. This was another missed opportunity to explore her understanding of the + and = signs.

Problem: I asked her to count out loud from 80 to 120.

Strategies: She counts correctly starting from 80. She self corrects herself at 111. She counted 110, 112, pause 111, 112, 113...She keeps going beyond 120. I stop her at 123 because I'm getting nervous about the time. I ask her how high she could go; she says

“one hundred and thousand”. I ask what is the highest you ever counted. She says, “one hundred and six thousand”.

Reflection: Freckles counts well and with confidence. Now, if I had time I would let her keep counting as far as she could go. I might ask her to write one hundred and thousand to see what she would come up with. This might reveal some of her understanding about large numbers.

Problem: Can you count by tens to 50? We chose this limit based on Seattle Public Schools Kindergarten frameworks.

Strategies: She counts by tens to fifty in a flash. I ask her to count to 100. She does this in a flash, too. I ask her if she can go past 100. Still counting fast, she gets to 100 and counts 101,102,103,104,105,106,107,108, 109, 120. I stop her there.

Reflection: Freckles has a firm grasp of counting by tens up to 100. When she gets to 109 she jumps to 120 skipping 110. Previously, she counted beyond 109 correctly. Perhaps her speed of counting contributed to this miscounting.

Next we move on to estimation. I'm particularly interested in this problem because the teacher has told us that her students are very apprehensive about estimating because they want to get the “right” answer.

Problem: I show her a sandwich baggy of bread clips and ask her if she can tell me how many are in the bag. There are 52 clips in the bag.

ask her how she came up with her answer.

Strategies: Without hesitation she says forty. Now, I ask her to count the bread clips. This time she takes more care with separating the counted from the uncounted. At 32 she realizes she forgot to move a clip. She stops, add a clip, and counts out her “already counted” pile to make sure she has 32 and continues on from 33. Although she does use more care with separating, the piles still manage to co-mingle. She arrives at 46. I ask her to draw me a picture of her counting. This time she writes numerals from 1 to 46 with no spaces in between the numerals. She goes back and separates the numbers with lines. She does an adequate job of placing her lines; only seven are out of place. This inaccuracy is probably due to her speed of undertaking the task. Next I ask her, “How close was your guess?” She answers seven and I ask her to show me how she figures this out. Using her picture of numerals she points to forty and counts 1, moves to forty-one and counts two, and so on to arrive at 7.

Reflection: I was so surprised at how deftly she handled this task. She understood that the difference between the two numbers could be found by counting the numbers in between. Now, I would try more problems of this type to see if she consistently counted up from the correct starting point. This would be a great way to introduce subtraction. I wonder how she would respond to a subtraction story problem? Would she answer in the same way if I had asked her to find the difference between the two numbers? I would give her a subtraction result unknown problem, to see if her understanding could apply to a story context.

ask her how she came up with her answer.
tell me more what are you thinking here?

CONCLUSION

Freckles is confident about her math abilities. She counts beyond 120, she has a solid understanding of one to one correspondence, she can estimate with ease, and she can count by tens up to 100. Given an experiential context of estimating and evaluating the estimate for accuracy she is able to identify the difference between two digit numbers! Freckles will benefit from more exposure to a variety of story problems, where the emphasis is on how the problem is solved, rather than creating an equation. Her use of equations in the interview reveals her limited understanding of the + and = symbols. Rather than provide explicit instruction about these symbols, I would try to give her regular practice with story problems and ask her to explain her thinking with pictures, words, or manipulatives. Her understanding of these symbols will develop as her understanding of whole number operations deepens.

Nice job - it was really cool to see the difference between the two word problems you posed. Action can really make a difference in how young kids make sense of situations. You got to see some emerging understanding about joining, & counting, + symbolic use.

Ell.