Cognitively Guided Instruction (CGI) for Mathematics: Kendra

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Overview

Kendra is an eight-year-old black female in the second grade. Her parents are married and she has one older brother and two older sisters. She comes from a lower middle class background and lives in Stapleton, Colorado.

Kendra is reading at a first grade level and was on the verge of being pulled out for math intervention, it was decided that she did not need to be pulled out for either math or reading. Within the second grade cohort, Kendra's *iReady* reading level (her math scores are not yet available) is placed in the 60th percentile, meaning 40% of her cohort scored higher than her and 60% of her cohort scored lower than her. Kendra's Developmental Reading Assessment (DRA) Level was at a 16 at the end of her first grade year. Kendra had a summer slip and returned to the second grade at a DRA 14. After 10 weeks in the second grade, Kendra is up to a 16 DRA level. Kendra's DRA levels are equivalent to a student at the end of first grade. Kendra's average DRA reading level should fall between 18 and 20 at the beginning of second grade. It is apparent with guided reading groups that Kendra is climbing back up the DRA level ladder and should be reading at the average second grade mid-year level soon.

I've observed Kendra when she took the reading *iReady* assessment. It takes her two to three times longer to complete the assessment than her peers. Some assumptions are that she must reread passages to comprehend the questions or that she may be dyslexic (according to her math teacher, Ms. Amelia). These two assumptions have been discussed among her reading teachers and her math teacher.

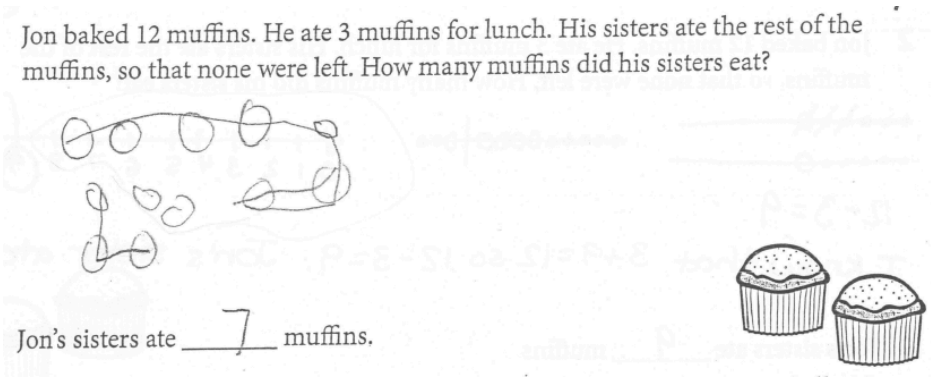
I chose Kendra for a mathematical interview because I wanted to further analyze her abilities to listen to mathematical problems compared to her abilities to read mathematical problems. I wanted to explore if she'd have solution successes and/or struggles.

Mathematical Interview

According to Ms. Amelia, Kendra's competencies in mathematics may be tied to her issues with reading comprehension or dyslexia. If Kendra cannot read to understand a mathematical problem, this may alter her performance in mathematics overall. If Kendra's mathematical performance is better when she is read the story problems, educators may conclude that reading is affecting her mathematical abilities. If Kendra performs the same when solving mathematical solutions when the story problems are read to her, educators could assume she may have issues in both reading and mathematics. If Kendra performs below average when the problems are read to her compared to when she reads the problems herself, then educators may want to visit the problem with listening skills along with comprehending verbal cues.

The following is from an example of Kendra's in-class math assignment:

Sample Separate/Change Unknown Problem



Proficient/Advanced Rubric Solution:

I know that 3 + 9 = 12 so 12 -3 = 9. Jon's sisters ate 9 muffins.

Kendra accounted for all 12 muffins. She then crossed out the 3 that Jon ate for lunch, however, she miscounted two of the muffins Jon's sisters ate and miscalculated the change.

During the math interview, I ensured that Kendra would succeed on the first story problem to increase her confidence for the future story problems. I gave Kendra several tools to help her solve the story problems. I explained to her that she could use any tool to help her formulate a solution. I placed the tools on the table and explained each object to her. The tools included: a ruler, flats, longs, cubes (pieces), dice, pencils, colored pencils, paper, a number line from 0-20, and a counter/number rack with beads. For every problem, Kendra chose cubes (pieces) to solve the problems.

Student Strategies for Solving Mathematical Problems

I read Kendra every problem and ensured that she understood me through nods and smiles. When she achieved a solution, I complimented her with verbal praise, such as, "awesome," "good," and "excellent." I created six mathematical problems for Kendra based on the analysis of her in-class performance after speaking to her math teacher, Ms. Amelia. Ms. Amelia also looked over the problems and told me that they were suitable for Kendra. Ms. Amelia complimented that I used names Kendra was familiar with in school within the problems:

Join	Result Unknown	Leah had 5 marbles. ER gave her 8 more marbles. How many marbles does Leah have all together? **5 + 8 = ?** Kendra made a pile of five cubes and a pile of eight cubes, then she counted the cubes and solved the problem with 13 by counting all of the cubes (direct modeling). This problem had the action verb "gave" and "more," so it was easier to come to a solution with those key words.
Separate	Change Unknown	Jon bought 10 apples. He used 4 apples to bake pies. His brother used the rest of the apples, so that none were left. How many apples did Jon's brother use? **4 + ? = 10**

		Kendra made a pile of 10 cubes and a pile of four cubes. She became a little confused. She said, "oh!" and slid the four cubes back into the pile of unused cubes (self-correction), then she took four of the cubes away from the pile of 10 cubes and solved the problem with six by counting the cubes leftover (direct modeling).
Part-Part-Whole	Part Unknown	Zoey has 13 flowers. Six are roses and the rest are daisies. How many daisies does Zoey have? **6 roses + ? daisies = 13 flowers** Kendra used one long and cubes. I needed to reread the problem and stress that Zoey had two different types of flowers and we want to know how many daisies Zoey had. There was some struggle until Kendra traded the long in for 10 cubes (self-corrected based on reinforcing the story problem). Kendra counted out 13 cubes, then took six cubes away and answered seven (direct modeling).
Compare	Difference Unknown	There were 7 ducks swimming, 4 ducks flew away. How many ducks were still swimming? **7 – 4 = ?** Kendra took seven cubes and took four cubes away (direct modeling). She solved this problem quickly with a smile. This solution was easy for her because of the action verb "flew away."
Join	Change Unknown	Ms. Danny has 3 rubber ducks, how many more rubber ducks does she need to have 14 ducks altogether? **3 + ? = 14** Kendra began with three cubes and thought about the number 14. She kept saying, "fourteen" to herself. She then counted out 14 cubes and took three cubes away and solved for 11. There was a short struggle, but the words "how many more" helped her get to the solution (direct modeling).

Compare	Difference Unknown	Ms. Amelia has 12 marbles. Mr. Binder has 8 marbles. How many more marbles does Ms. Amelia have than Mr. Binder? **12 – 8 = ?** This was the most difficult problem for Kendra. She made a pile of 12 cubes and another pile of eight cubes. She began counting the piles. She asked, "Ms. Amelia has eight?" I answered, "Ms. Amelia has 12 marbles, I have eight, what you want to figure out is how many more marbles Ms. Amelia has than I do." Kendra could not figure out that she should not have two separate piles of marbles. Because this was the last question, I explained to Kendra that she should only have one pile of cubes to work with. Kendra still could not figure out what I was asking, thus not recognizing "how many more" within the problem. I repeated the problem one more time and Kendra said, "I don't know, this is kinda tricky." I found it interesting that Kendra recognized "how many more" in the Ms. Danny duck problem. Kendra became confused when another person came into the element of the problem: having two individuals in the problem made Kendra think that she should be adding. Kendra should have made a pile of 12 cubes and taken eight cubes away to solve four, however, she could not self-correct or direct model the problem appropriately.

After the math interview, I thanked Kendra for playing some math games with me and let her choose a smelly sticker for helping me out.

Conclusive Reflection

I found the math interview difficult on my part because I do not get to witness Kendra in Math class on a daily basis (I am teaching two groups of 30 students guided reading and writing). However, I did notice that Kendra enjoyed solving problems with speed and she felt it was rewarding to find the answers quickly. If speed was not an important factor to Kendra, I think she could have gotten the last solution. While observing Kendra, she could not figure out the problem at the same speed as when she solved the other story problems. Given that the Compare/Difference Unknown problem was too difficult, Kendra merely gave up on the problem.

What I'd like to discuss with Ms. Amelia and perform in the future is a series of CGI Math story problems that are Compare/Difference Unknown and Join/Change Unknown using action verbs and taking away the action verbs to better understand where Kendra's real issues are. I'd also like to have her complete the problems as a worksheet that she reads on her own; then have her complete an oral solution session where the problems are read to her. I think the answers will vary and we can begin to pinpoint Kendra's abilities further. It is very clear that Kendra takes a direct modeling strategy approach to solving mathematical problems and has not reached the developmental level of using counting strategies.