WHITE PAPER

About This Paper

Dr. Nicki Newton is an

I am currently working with a great group of fifth-grade kids who hate math. We are exploring the concept of dividing whole numbers by fractions. I carefully plan for our guided math session. These kids already think they can't do it, so I start with a story. Their eyes widen . . . they are all in. After all, it's just a story about a bakery they have all been to once. As I share the story, they learn that the baker has a dilemma. She wants to figure out how to sell her amazing cakes. People love them, but they don't want to buy a whole cake. What should the baker do? What tools could help us think about this problem as we consider some options? Listening carefully, I wait, probe, prompt, and question deeply. The students puzzle, talk, discuss, and even argue about their ideas.

The idea emerges that the baker might divide the cake into pieces. What kind of pieces? What are the options? What seems too small? What seems too large? Choosing to work with the fraction

The role of the teacher is not to “show and tell” students how to do math in a guided math session; rather, it is “responsive guidance” in developing pupils’ own thinking. This guidance requires a range of support for pupils’ thought constructions, in a way that develops individual thinking as well as leading to the generation of mathematically valid understandings (Anghileri, 2006). Usually, the teacher meets with one or two groups a day, with three to five students in a group, between 10 and 15 min, depending on the students’ needs. The guided math structure is flexible; some teachers meet with groups every day, while others meet on designated days. Oftentimes, students who are struggling with a topic will meet more often. The following six components are important considerations when implementing the guided math structure:

- Assessment
- Differentiation
- Standards-based
- Academically rigorous
- Scaffolded
- Engagement

Assessment

Actionable data are the key to successful guided math groups. All guided math groups should be formed based on both formative and summative data. At the beginning of the year, assessments of the previous year’s priority standards are essential to see if and where there are any gaps. Research has found that every summer many students lose about 2–3 months or more of math knowledge (Shafer, 2016). The summer slide is real. Therefore, at the beginning of the year, we must know what gaps exist around the priority standards so that we can close them during routines, guided math, and workstations. Throughout the year, exit slips, chapter quizzes and tests, math conferences, anecdotal notes, and student work should all inform which students we will pull and what we do in guided math groups.

Differentiation

Based on the information gained from assessments, teachers are empowered to form small, temporary groups based on the current instructional needs of the students.

numbers that round to 50." If we were doing elapsed time, I might be using an elapsed time ruler to scaffold students into the more abstract number line diagram, I wouldn't only give problems like "Sue went to the store at 1:45 and came back at 2:25. How long was she gone?" I would also ask, "Sue went to the store. She was gone for 40 minutes. When could she have left and when could she have come back?" These are open questions. They make students think. They require them to understand at a depth of knowledge (DOK) Level 1 (recall) but then to stretch and think into a DOK Level 2 (application of skills) or possibly DOK Level 3 (strategic thinking; Webb, 1999, 2002).

Scaffolded

Scaffolding in Hattie's (2017) work suggests high effect .82. We can scaffold in different ways in the guided math groups. Be careful not to over-scaffold though. Also, Dixon (2018b) warns us not to scaffold "just in case" but to scaffold "just in time." Scaffolding, when used wisely, can help students access the mathematics. When thinking about scaffolding, there are a few things to consider. First, scaffold the language. Math is a language and if students don't know the words, they can't speak it. At some point during the lesson, the vocabulary and language frames should be presented so that students can connect it to the math they are learning. Sometimes, if students know the words and have been working with them, this can be done at the beginning of the lesson. However, at other times, the vocabulary can be discussed at the end of the lesson, to tie it to the math that was being done. Dixon (2018c) makes a good argument about how sometimes the language can interfere with students' attempts to communicate the math that they are doing. They can hide behind the words. Having to explain the actual concepts allows students to delve deeper into the math.

Second, provide a variety of manipulatives and tools for students to choose as they work. Remember that manipulatives don't teach students math. They can help them to explore concepts. The practices/processes say that students will be able to choose the tools they need to do the math they are doing (Koestler, 2013). National Council of Supervisors of Mathematics (2013) stated that "[I]n order to develop every student's mathematical proficiency, leaders and teachers must systematically integrate the use of concrete and virtual manipulatives into classroom instruction at all grade levels." They said this in light of the resounding research that manipulatives have a powerful potential to help students explore, play with, figure out, wonder, and know mathematics (National Research Council, 2001; Van de Walle, 2013). Oftentimes, teachers will think because students can get the answer, that they are doing ok. There is a big difference between "getting the answer" and "getting the math." Manipulatives can help students to "get the math." For example, I was working with some fifth graders who knew how to multiply fractions and, in this case, even

draw a model (for this operation, both of these things are relatively easy to do). However, they couldn't verbalize or contextualize the math that they were doing. So, I used tools (in this case, play clay) and a story about sharing gum to get them to see what a "piece of a piece" actually means. Manipulatives are for everybody, not just "the struggling learners."

We have to focus on getting students to model their thinking and use tools when helpful, but we have to make sure we use the tools in the best way possible and that we connect them through a cycle of concrete, pictorial, and abstract learning. For example, if I am using a rekenrek/number rack to work on doubles, I would want students to build it, draw it on the rekenrek paper, then write the equation. Another example is teaching fractions with pattern blocks. I might facilitate a discussion where we are working with pattern blocks to explore comparing fractions. I could also then sketch it on pattern block paper or have the students do a sketch and write observational statements.

Third, the teacher should use questioning as a scaffold. Throughout the lesson, the teacher should be listening, questioning, prompting, cueing, and probing to help students delve deeper into the math that they are learning (Anghileri, 2006; Fosnot, 2005; Reinhart, 2000). The goal of the teacher is to use questions to get students to "look, touch and verbalize what they see, think and feel" (Coltman et al., 2002). The teacher is trying to create an environment where students are questioning, explaining, defending, proving, justifying, and thinking about their work (Cobb et al., 1991; Small, 2009; Webb, 2002).

Engagement

Students must be actively engaged in doing mathematics (Dewey, 1938). Engagement is necessary but not sufficient. The lesson should be "hard fun" as Papert (n.d.) pointed out. Students enjoy working on the edge of learning. They want a challenge. They like to be pushed into higher level thinking as long as it is in the productive struggle zone (Hiebert & Grouws, 2007; Jackson & Lambert, 2010). Guided math is another opportunity in the math workshop structure to take a calculated and a safe risk and thrive in a productive struggle–type environment that gives equitable access to every student to expand their thinking and learning of mathematics.

Conclusion

Guided math is an additional opportunity in the math workshop structure for students to move forward on the math continuum toward mathematical proficiency. This means that in guided math sessions, students are *doing* math. They are building conceptual understanding, working on procedural fluency, developing strategic competence, reasoning with each other about the math they are learning, and growing into strong, competent, and confident mathematicians (National Research Council, 2001). Guided math sessions allow students to gather together in small, focused groups to explore big mathematical ideas and grow together one day at a time.

References

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