NC COLLABORATIVE FOR MATHEMATICS LEARNING

NC²ML Research-Practice Brief # 67

SenseMaking Strategies

In order to help students become proficient in reasoning and problem solving, teachers must utilize strategies and create experiences that help students to learn how to decontextualize problems. Several instructional tools and styles can be used to support sensemaking strategies including Cognitively Guided Instruction (CGI; Carpenter, Fennema, Franke, Levi, & Empson, 2014), children's literature as a problem context, noticing and wondering, and 3-Act Tasks.

COGNITIVELY GUIDED INSTRUCTION AS A FOUNDATION FOR SENSEMAKING

Cognitively Guided Instruction (CGI) is an instructional approach that uses the knowledge base of typical student strategies for solving problems to facilitate learning and instruction through the word problem. Teachers equip young students with the different strategies and tools for solving problems, as well as to identify the different problem types they encounter. Teachers pose a problem to students and allow students to solve the problem in the manner they choose, rather than impose a particular strategy for solving. In this student-centered environment, teachers elicit student thinking to help move them forward in their learning through discussing and comparing strategies. Teachers support students as they learn to unpack contexts rather than helping them to solve. Carpenter and colleagues (2014) suggest that teachers should, "…pay special attention to making sure the students know what the story is about, because students' understanding of the story drives their strategies" (p. 135).

CHILDREN'S LITERATURE AS A CONTEXT

Children's literature provides an engaging situation that encourages students to make sense of number relationships. When a shared picture book becomes the components of the word problem, all students can relate to the context and do not have to navigate an unknown contextual base. This real-world context encourages students to think about the actions occurring within the story, as well as the question being asked versus irrelevant information. Through purposeful facilitation, teachers can help students connect those actions to the operations portrayed.

NOTICING AND WONDERING AS AN ENTRY POINT

The instructional routine of noticing and wondering gives students a place to begin accessing their schema and encouraging strategic thinking about what to do next in a problem. Noticing involves having students tell what they recognize in the math problem context, story, or image. Student noticings can be simple or complex, but give all students a chance to enter the problem. Wondering involves students asking questions they have about the math problem context, story, or image, rather than asking students what they do not understand. It encourages students to make careful observations while interpreting a problem or situation. Noticing and wondering, as opposed to using keywords, directs students' attention to the aspects that are mathematically important in the problem. Students are

encouraged to connect ideas and wonder about those ideas before going on to utilize strategies to solve.

3-ACT TASK FORMAT

Graham Fletcher uses the Noticing and Wondering routine in several of his 3-Act Tasks. 3-Act Tasks are problem based lessons that foster student curiosity. They often begin with a intriguing photo or video clip that draws students into a scenario. The first act introduces the situation and prompts students to begin noticing and wondering about what is or has happened. Act 2 gives a little more information to help make sense of the situation, while Act 3 offers an overview of what actually happened - a chance for students to reflect on their thinking to that point. Fletcher provides a bank of various 3-Act Tasks for K-5 at his website https://gfletchy.com/3-act-lessons/.

3-Act Tasks are often utilized in a three-phase lesson format (Van de Walle, Lovin, Karp & Bay-Williams, 2014). In the first phase, the Launch phase, teachers engage students, piquing their curiosity about the context of the problem and the mathematical ideas presented. During the second phase, the Explore phase, the teacher facilitates students' thinking as student groups make sense of the task, share their initial ideas and strategies, and work through exploring those plans. After sufficient time has been given for students to work, students move into the third phase, the Landing phase. During this time, the teacher pulls together the major mathematical ideas. Specific strategies and student work are analyzed, inspected, and discussed.

CONCLUSION

The state and national mathematics standards charge us with pursuing mathematics with students that encourages a productive struggle (NCTM, 2014b). Productive struggle does not mean that students experience needless frustration, but instead it asks that they think through mathematics problems in which the answers are not immediately apparent. Likewise, NCTM (2014a) charges its educators to commit to teaching practices that are equitable for all learners. This requires that educators ensure that all students have access to high-quality instruction and challenging curriculum. Teachers need to be thoughtful about implementing and discussing word problems with students in order to achieve this ambitious goal. "Problem solving is what you do when you don't know what to do" (Wheatley & Reynolds, 1999, p.49). As teachers, our ultimate goal is to equip our students with the knowledge and skills to be successful in broader contexts. This begins with allowing our students the space and support to make sense of situations. After all, a sense making strategy will *always* work (Van de Walle & Lovin, 2006).

References

Carpenter, T. P., Fennema, E., Franke, M. L., Levi, L., & Empson, S. B. (2015). *Children's mathematics: Cognitively guided instruction* (2nd ed.). Portsmouth, NH: Heinemann.

NCTM (2014a). Access and Equity in Mathematics Education: A Position of the National Council of Teachers of Mathematics. Reston, VA: The National Council of Teachers of Mathematics.

NCTM (2014b). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: The National Council of Teachers of Mathematics.

Van de Walle, J. & Lovin, L. (2006). *Foundations of student centered instruction: Teaching Student centered mathematics grades 3 - 5* (1st Ed). Upper Saddle River, NJ: Pearson.

Van de Walle, J., Lovin, L., Karp, K. Bay-Williams, J. (2014). *Teaching student centered mathematics: Developmentally appropriate instruction for grades preK-2.* (2nd Ed). Upper Saddle River, NJ: Pearson.

Wheatley, G. & Reynolds, A. (1999). *Coming to know number*. Bethany Beach, DE: Mathematics Learning.

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