

An Instructional Implementation Sequence for Attaining the CCSS Student Practices in Mathematics

From *Visible Thinking in the K – 8 Mathematics Classroom* (Hull, Balka, and Harbin Miles, 2011 pg 86)

This document is used in conjunction with our “Standards of Student Practice in Mathematics Proficiency Matrix” that is based on the CCSS student practices in mathematics. Our matrix states the student practice, and then provides three degrees of proficiency: Initial (I), Intermediate (IN), and Advanced (A). In this way, each cell has a unique identifier. For instance, practice 1a is “Students make sense of problems.” The corresponding cells for this practice (row 1a) are 1a I, 1a IN, and 1a A. Using this system, each degree of proficiency is listed below as it relates to the instructional strategy. As teachers work to incorporate each strategy in a sequence, they are also successfully achieving proficiency of the student practices.

In working with this implementation sequence, mathematics teachers and leaders must understand that the strategies are cumulative. Each prior strategy supports the next one. Strategies are not used, and then forgotten. The strategies are enhanced and expanded with each successive strategy. In addition to the cumulative nature of these strategies, there is also a major shift in pedagogy and belief. This shift is described as moving from engagement to empowerment.

Engagement Strategies

Initiating pair-share (or think-pair-share)

(PS) Pair – share, or think – pair – share, is a strategy easy to implement in any classroom at any grade level or subject. This strategy does not require any other change in pedagogy or materials. For pair – share, teachers merely ask a question or assign a problem and allow students to think and work with a partner for one to three minutes before requesting an answer to the question or problem. In think – pair – share students are given a brief period of time to think independently before working with a partner. While easy to implement and effective in results, this strategy is a significant first step in engaging all students in classroom instructional activities.

[1a I, 3b I]

Showing thinking in classrooms

(ST) Teachers need to work toward higher degrees of student involvement in classroom activities. Once pair – share is incorporated into classroom routines, teachers need to incorporate additional strategies that promote “every pupil response” (EPR). EPR strategies include such responses as “thumbs up/thumbs down,” or use of individual white boards for noting answers. Students are also pressed to be more aware of their thinking and express their thinking in more detail.

Students are routinely asked to share their thinking in mathematics classrooms. However, what is routinely accepted as thinking is actually process description. Students merely provide the steps they used to solve the problem, not their reasoning and thinking about how they knew which processes to use. In order to reveal student thinking, more challenging, open-ended problems are needed.

[3a I, 6 I]

Questioning and wait time

(QW) As thinking is increased in mathematics classroom, better questioning and wait time are required. Teachers need to provide thought provoking questions to students, then allow the students time to think and work toward an answer.

[1a IN, 1b I, 3a IN, 3b IN]

Empowerment Strategies

Grouping and engaging problems

(GE) The strategy of “providing grouping and engaging problems” is a significant shift in pedagogy and materials. Students are given challenging problems to work, and allowed to work on the problem in a group of two, three, or four. Challenging mathematics problems take time, effort, reasoning, and thinking to solve.

[1a A, 1b IN, 2 I, 2 IN, 3a A, 3b A, 4 I, 5 I, 5 IN, 8 I]

Using questions and prompts with groups

(QP) Once students are provided with opportunities to solve challenging problems in groups, teachers need to increase their ability to ask supporting questions that encourage students to continue working, provide hints or cues without giving students the answers, and ask probing questions to better assess student thinking and current understanding.

[4 IN, 7 I]

Allowing students to struggle

(SS) Students learn to persevere in solving challenging mathematics problems by being allowed to struggle with challenging problems. Students need to understand that mathematical problems do not usually have a quick, easy solution. Effective effort is a life-skill and should be learned interdependently and independently. Appropriate degree of difficulty is foremost on teachers' minds. If the problem is too easy, students do not need to struggle. If the problem is far too difficult, students are not capable of solving the problem. Teachers need to balance working in groups and working independently, and be able to quickly adjust grouping strategies as the need arises.

[1b A, 4 A, 5 A, 6 IN, 7 IN, 8 IN]

Encouraging reasoning

(ER) Students need to be encouraged to carefully think about mathematics, and to understand their level of knowledge. They also need to be able to accurately communicate their thinking. Reasoning, in this context, is used to convey having students stretch their understanding and knowledge to solve challenging problems. Reasoning requires students to pull together patterns, connections, and understandings about the rules of mathematics, and then apply their insight into finding a solution to a difficult, challenging problem.

[2 A, 6 A, 7 A, 8 A]