BFIS TEACHING AND LEARNING

TEACHING MATH IN THE 21ST CENTURY
BY MERITXELL LUCCINI, ELEMENTARY MATH COACH

Think of the problem 8 x 24. Solve it first in your head. Now take a piece of paper and write down your calculations. How many different ways were you able to solve it?”

This is an example of a 4th grade problem. If you were a fourth grader in the past century, chances are that you stacked the numbers and performed a traditional algorithm, carrying numbers over and regrouping. If you ask a fourth grader now, they will be able to work on this problem several different ways. These are some of the ideas they may have:

The examples above are a reflection of the changes that have taken place in the classroom in recent years. There has been a shift of focus to how mathematics is taught, not just what is taught. Understanding mathematics has become more important than following memorized mathematical procedures. Van de Walle (2013) defines understanding as:

“being able to think and act flexibly with a topic or concept. It goes beyond knowing; it is more than a collection of information, facts, or data. It is more than being able to follow steps in a procedure. One hallmark of mathematical understanding is a student’s ability to justify why a given mathematical claim or answer is true or why a mathematical rule makes sense.”

For example, students may memorize all multiplication facts and procedures, but may not understand multiplication or justify their answer. Therefore, “procedural proficiency, a main focus of mathematics instruction in the past, remains important today, but conceptual understanding is an equally important goal (NCTM, 2000).

CONCEPTUAL UNDERSTANDING
How do we approach conceptual understanding at BFIS? What does a math lesson look like? We could say that our teachers are following Marilyn Burns’ idea of the 3-legged stool. She states that the three pillars of a balanced arithmetic program are computation, problem-solving, and number sense. In her stool analogy, each one of those components would be a leg of the stool. If our program misses one leg, it is not balanced and the stool falls, and what is more important, our kids fail.

At BFIS, our students work on all three components regularly. Our students compute with the use of manipulatives and with the Number Talks routines, developing their number sense along the way. They are encouraged to hone their problem solving skills by tackling both simple exercises and more complex non-routine tasks. They are asked to work on these independently first, but always with a partner or a small group afterwards. Students are expected to explain their thinking both on paper and verbally. We use the phrase “convince a sceptic” to show them that they have to find strong arguments to support their ideas. At the end of every lesson, the whole class gathers to discuss their findings and students engage in a debate. This rich interaction increases opportunities for reflective thinking about relevant mathematical ideas and develops metacognition.

DIFFERENTIATED TEACHING
When a task is presented openly, without imposing a particular method to solve it, Jo Boaler says that it has “a low floor and a high ceiling.” This means that it can be approached in a variety of ways, some more sophisticated than others, but all of them at
the student’s just right level. This is one form of differentiation. When students share their ideas with others, they learn from one another, noticing strategies that are more efficient than theirs and strengthening their understanding. In this approach, the students do the thinking. “Understanding and doing mathematics involves generating strategies for solving problems, applying those approaches, seeing if they lead to solutions, and checking to see if answers make sense.” (Van de Walle, 2013). When we approach mathematics like this, students become more engaged, can think about math flexibly, find connections that are fundamental in their learning, and develop a deeper understanding. Needless to say, they enjoy and like mathematics.

MATHEMATICAL PRACTICES

The introduction of the Mathematical Practices in the classroom has boosted a conceptual approach to mathematics. These eight practices are habits or traits that teachers strive to develop in our students. We can aim to do that in classrooms where the student is at the center and the teacher becomes a facilitator, not the keeper of all knowledge. The first practice standard says that students should “make sense of problems and persevere in solving them.” Students might be given a hard task which they do not know how to access right away. With guiding questions from their teacher, students are shown that perseverance is key and that it is necessary to experience a productive struggle for our mind to grow. Taking it a step further, we could even say that talent is nothing without hard work.

There is a lot happening in mathematics education. Students are becoming aware that the process they go through in problem solving is more important than the actual answer to a problem. They understand that our brain is constantly growing and adapting when we push ourselves, and that our attitude determines our success in mathematics. Understanding is key.

REFERENCES