Helping Third Grade Students with Addition Facts

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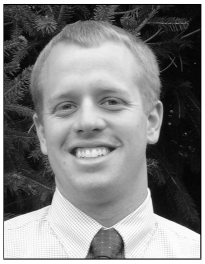

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In the typical elementary classroom, students are expected to learn and master their addition facts through countless practice problems and rote memorization. Yet for many teachers, the biggest mathematical frustration is students not knowing their basic facts. For students, this creates a problem as the mathematical concepts build on each other and become more difficult. Students work with applications of new ideas, yet without a firm grasp of basic mathematics they become bogged down in the "simple" computations. The longer students go without knowing their facts, the longer they struggle through the related mathematical topics.

The students who successfully master their basic mathematics facts quickly are able to create mental schemes each time they encounter a fact [1]. Although students as well as adults may not consciously think of it, when we see a problem like $8 + 5 = 13$ we think of some strategy (for example, we might add 2 to 8 to obtain 10, and then add 3 to 10 to get the final result). As adults, we have mastered these "strategies" to a point that we know the solution to a problem instantly because the strategies are automatic for us.

During my student teaching, I presented a method described by John Van de Walle to help students develop strategies for mastering their addition facts [1]. I implemented the strategies with seventeen third graders in a rural elementary school.

Before teaching the strategies, I learned through preliminary assessments that a few students in the classroom did already use some strategies in their addition work. The majority of the students had no strategies at all. In fact, most students simply counted on their fingers to find the answer to the problems with no apparent pattern.

Using Van de Wall's classification system as a guide, I introduced a strategy for each of the seven fact categories. The categories I presented were one-more-

than facts, two-more-than facts, facts with zero, doubles facts, near-doubles facts, make-ten facts, and the last six facts [1].

With each strategy, I followed a standard plan (see Figure 1). First, I started a discussion of number relationships that were important for a particular fact strategy. Next, I presented the students with a story problem involving some sort of addition fact. I wanted the students to experience each new strategy in a real-world story problem. As a class, the students converted the story problem into its appropriate mathematical symbols. After converting the problem into symbols, we spent five to ten minutes discussing possible strategies to use to increase the speed in obtaining the solution to the problem. During the discussions, the students usually suggested the strategy I was planning to teach. If not, I led the students to the desired strategy by working out more examples. Allowing the students to discover the strategies on their own was much more beneficial than simply telling them a specific strategy to use. I continued to follow this approach with every new fact strategy. Generally, I spent a day introducing a new strategy and up to a week continuing to drill and practice the facts.

Fact Category

Number Relationships: The essential number relationships needed by the students for the fact category

Problem: A real-world problem involving an addition fact in the category

Share Solutions: The time to convert the problem into symbols and for the students to share their possible strategies and solutions to the problem

Strategy: The time to present the strategy suggested by Van de Walle

Additional Problem: An additional real-world problem to allow the students to use their newly learned strategy

Figure 1: Standard plan

Working with the students every day, I could easily see that they were improving in their ability to solve their mathematical facts. Over the course of the semester, I witnessed students gaining more confidence in their abilities to answer problems on the board. As I was teaching the mathematics lesson one day, a student responded to a question I had posed about the solution to a problem. Even though we had not talked about facts that day, the student named the solution and the related fact category. At that point, I knew my teaching of strategies was starting to gain meaning for the students. They no longer looked at the facts as isolated examples, but instead they saw the broader picture on how what they learned had applications in many of their other mathematical experiences.

Although I could easily tell the progress in the classroom, I wanted clear documentation that the program had in fact been a success for all of the students. To help document my results, I gave the students the initial assessment (see Figure 2) at two other times after they had learned all of the fact strategies.

The results of the benchmarks were as expected. For the second time through, every student was able to answer every problem with very few mistakes. This was a nice improvement from the first test when some students were not sure of the solutions quickly. As mentioned, I gave the test one additional time approximately three weeks later. The third time, I again timed each student to show their progress. Out of the seventeen students in the classroom, sixteen improved their time from the second to the third assessment. The results clearly confirmed what I had seen happening in the classroom throughout the semester.

The exciting part was that the class not only improved, but they improved nearly 10% (comparing the total time for the class for each test) since the time they took the test just three weeks prior. Another exciting outcome was that the students who were very successful the second time through may have only improved 5 to 10 seconds, while the students who may have struggled the second time through, improved as much as a minute from the previous test. These students were the ones who truly benefited from the program.

After the completion of the entire program, I sat down with the students one-on-one with their assessments and asked them to reflect on the learning of the strategies. Overall, the students were very glad that they learned these strategies. The majority of the students commented that they thought the strategies helped them master their mathematics facts and gave them confidence for when they might encounter the facts in the future. One student said,"Learning these new strategies really helped me a lot. It was fun learning what others had to say."

The most common thoughts from the students dealt with their improvement in speed and accuracy from learning the strategies. One student described the program in saying, "I think it helped me because in first and second grade I was slower, I improved." Still another student commented, "It helped me because some facts I did not know I now have a strategy for." From their thoughts, it was clear that the students enjoyed learning the strategies.

As I was beginning to establish the details of my implementation of the strategies in the classroom, I was intimidated by the thought of taking the research of a highly respected educator and making it work in my classroom. I had numerous questions about how it would be possible to teach the strategies to the students and more importantly how they would accept my teaching. Even after deciding to teach the strategies, I was not completely confident that they would be effective.

Looking at the entire implementation of the strategies, I was pleased to see the progress that was made in the classroom. Many of the students went from having no strategies at all to having an array of possible strategies at their disposal every time they encountered an addition fact. From the documented success of the students and the unanimously positive comments, it was clear that the students did benefit from learning the strategies.

7 +1	3 +2	9 +0	6 +6	3 +4	7 +3	3 +6	5 +4
3 +0	7 +7	2 +3	1 +9	6 +1	0 +5	1 +1	6 +7
2 +8	7 +4	3 +1	5 +2	1 +0	9 +9	5 +5	1 +9
9 +5	8 +8	4 +9	8 +7	0 +6	6 +3	1 +2	6 +2
4 +0	9 +8	4 +6	7 +5	8 +1	2 +5	8 +0	2 +2
5 +6	2 +0	9 +2	2 +7	3 +4	3 +7	1 +6	2 +8
0 +7	4 +2	4 +4	8 +0	5 +1	3 +3	7 +6	1 +4
1 +6	7 +9	9 +6	8 +5	6 +5	2 +5	1 +3	7 +8

Figure 2: Initial and post assessment

References

[1] J. Van de Walle, Elementary and Middle School Mathematics: Teaching Developmentally (5th Edition), Pearson (2004).