Numbers Must Make Sense: A Kindergarten Math Intervention

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Do you have students who do not recognize their numbers or cannot count to ten? We did at College Park Elementary School in the Metropolitan School District of Pike Township, located in northwest Indianapolis, Indiana. This became important because the Indiana Academic Standards: Kindergarten Mathematics, adopted by the Indiana State Board of Education 2000–2001, states:

> *In this technological age,* mathematics is more important than ever. When students leave school, they are more and more likely to use mathematics in their work and everyday lives operating computer equipment, planning timelines and schedules, reading and interpreting data, comparing prices, managing personal finances, and completing other problem-solving tasks. What they learn in mathematics and how they learn it will provide an excellent preparation for a challenging and ever-changing future. (Indiana Department of Education, p. 1)

If these children couldn't recognize or name these basic numbers, how were they ever going to be ready for the future? What could we do to boost their knowledge level to prepare them for first grade and beyond?

Our school is a kindergarten through fifth grade school with approximately 500 students. Sixty-eight percent of our students receive free or reduced-price lunches and book rental fees. The English as a New Language (ENL) program has a fulltime teacher and two instructional assistants since 34% of our school population does not speak English at home. In January, several kindergarten children were still struggling with number recognition and number sense with the numerals 0–10. Number sense "describes a cluster of ideas, such as the meaning of a number, ways of representing numbers, relationships among numbers, the relative magnitude of numbers, and skill in working with them." (Trafton and Thiessen, 1999, p. 50.) Even though a standards-based curriculum and materials were being used in the regular classrooms, these young children were missing an important concept for mathematics; they were going to struggle because they didn't have strong number sense. As the Title I teacher, I decided it was important that we help these students.

Learning from the Indiana Mathematics Initiative

Before accepting the position of Title I teacher two years ago, I became involved in the Indiana Mathematics Initiative (IMI) as a kindergarten teacher who piloted a standards-based curriculum, which has helped me become a better mathematician and teacher. IMI is a collaboration of nine school districts in Indiana with Indiana University. The teachers in IMI met approximately every three months for a Saturday session, where we learned from the instructional coaches and from each other. From talking with other teachers from different school districts, I believe that we all joined IMI because we felt our math teaching could be improved. Many of us didn't even like

math. Through participating in this project, I deepened my understanding of the mathematics in the curriculum and also of my knowledge of how to work with children to increase their mathematical understanding.

Collaboration with other teachers was another important part of this project. I learned from the coaches and other participants and received numerous ideas and activities. We spent several sessions at our IMI meetings not only looking at the standards for our specific grade but also at the standards for all grade levels. This allowed the IMI participants opportunities to discuss what was important to the students we taught and also to know what was expected at every grade level.

For the past several years, I have also been an IMI mentor. Through this part of the program, I would meet with my mentee every month. I have learned as much from the mentees as they have learned from me. I have learned that it is extremely important to build relationships with other teachers. Sometimes it is difficult to take the time out of our busy schedules, but in doing so everyone benefits — especially the children. And so it was that the Indiana Mathematics Initiative gave us the gifts of time for collaboration and learning and the tools to learn from experts who taught mathematics proficiently. As a result, I gained confidence in my own teaching of math.

Developing the Kindergarten Number Intervention Program

When faced with this new challenge of working with the kindergarten students to deepen their number knowledge, I used my IMI training and materials, but knew that I was also going to need the help of the kindergarten classroom teachers. The kindergarten teachers assessed the students to determine who needed to be in small math groups. The first semester had just ended, and the kindergarten teachers gathered classroom data to identify the students who did not recognize their numbers and were struggling with basic number concepts. Once the children were identified, we needed to decide what we would do to assist them. What was to be the nature of the intervention? My schedule had a thirty-minute time slot in the afternoon that would allow me to work with the afternoon kindergarten students. In brainstorming with our ENL staff, the two instructional assistants were able to assist with this schedule for a thirty-minute session in the morning. We worked with these children Monday through Thursday.

I was looking for an explicit and systematic intervention for helping children with gaining a better understanding of numbers and number sense. The programs published by companies were either too expensive or didn't seem to meet the goals required for this task. The Indiana State Standard K.1.6 suggests that kindergarten children should be able to "Count, recognize, represent, name, and order a number of objects (up to 10). Example: Count a group of seven pennies. Recognize that 7 is the number for this set" (Indiana Department of Education, p. 3).

I began looking through my Indiana Math Initiative materials for ideas. Through IMI I had gathered binders full of innovative ideas and activities, but they were not organized. Last summer, I had taken all of those and sorted them by strand. I wanted a resource that I could use if a student or group of students needed help in a specific strand of math. This binder provided that resource. By having all of the activities and games grouped by strand, I was able to look in the number sense category for ideas.

Having also learned the value of working with my IMI mentees, I talked with my current mentee, who happened to be a kindergarten teacher, about this project. She was able to explain some of the struggles the children were experiencing in the regular classroom. We talked about

this problem and some possible intervention ideas. While working to create the thirty-minute routine, I asked her if she would add to or take away any of the lesson parts. This collaboration became crucial to developing the math intervention by communicating the students' needs and sharing the ideas.

After looking through my IMI materials, talking with my mentee teacher, and thinking about this intervention time, I knew that these children needed to "see it, say it, hear it and do it." At almost every IMI session, instructional coaches or other kindergarten teachers discussed the activities and games from the standards-based curriculum or ideas that were used in their kindergarten classrooms. At one session we shared music and songs that related to math. We discussed ways to make the lessons applicable to children of all learning styles. With my IMI mentee, I borrowed materials from her kindergarten classroom. I didn't have a budget to go buy materials for the activities, so I used or made materials that I had on hand from the IMI binder of activities, games, and ideas, from the adopted standards-based kindergarten curriculum, or that I had previously purchased. The following routine was started with our identified kindergarten children.

Sample Kindergarten Math Routine

1. Read Numbers (2 minutes)
The teacher makes sure that each student in the group has a laminated strip of paper with numbers from 1-10. As the teacher and students say the numbers aloud slowly, each child points to the number being said. The teacher monitors to be sure that each student points to the correct number. This part of the routine was put into practice because my IMI Mentee had noticed that students were having difficulty touching and saying the specific number. Some of the students could do rote counting but did not have the concept that each time they said a number it should match a printed numeral.

2. Match Numbers on Number Strip (5 minutes)
Each student receives a number strip with the numbers 1-10 on it in order. (See Figure 1.) A set of numbers or number tiles are also given to each child to match the numbers on the strip. While the students are working, the teacher asks individual students to say and point to the numbers. In my IMI binder, I found several examples of number cards. I made copies of the number cards (as seen in Figure 1) that were originally part of a 100-number chart. I knew that we needed to start with a smaller set of numbers. Our first number strips were from 1 to 10. I made a second copy of the number strips and cut them apart. We used these single number cards to match the numbers on the strip. In the picture I had a set of plastic numbers that could also be used. To start our routines I used cards that matched the strip.

Figure 1

3. Count Orally to 9 (2 minutes)
The students and teacher say the numbers together. Sometimes we would include movement like steps, hops or stomps while we counted. Because kindergarten children are active, I included movement anytime it worked into the routine. This activity is an adaptation of the "Simon says" activity in the *Everyday Mathematics Teacher's Guide to Activities* (p. 20, SRA/McGraw-Hill, 2004). Instead of saying "Simon says" and having the children perform an action a given number of times, we chose a movement, like jumping, and did that one time for each number, as we counted together.

4. Count Number of Beats on Drum (3 minutes)
This part of the routine requires the students to listen to and count the number of beats, as they hear them, and then raise their hands when the beats stop to share how many they counted. (See the drum pictured in Figure 2.) This is an adaptation of the "Listen and Count" lesson in the *Everyday Mathematics Teacher's Guide to Activities* (p. 21, SRA/McGraw-Hill, 2004).

Figure 2

5. Show a Number with Fingers (3 minutes)
A number would be said aloud by the teacher or students (0–9 in the beginning of our intervention), then the children would hold up that many fingers. The teacher observes the number of fingers held in the air to monitor for accuracy. The "Review Numbers 0–10" lesson in the *Everyday Mathematics Teacher's Guide to Activities* suggests holding up a number card, then the children hold up that number of fingers (p. 35, SRA/McGraw-Hill, 2004). I adapted this lesson, so that children just said the number aloud instead of using the number cards.

6. Write Numerals Using the "Making Numerals" Song (5 minutes)
In the beginning of this part of the routine, I would teach the song, introducing only one number at a time. While singing the song, the students trace the number. I used a colored piece of paper to copy the numbers 1–5 on one side and 6–10 on the other side, and then put it down into a sheet protector. (See Figure 3.) At one of our IMI sessions, each participant brought a song or poem to share that related to math. The "Making Numerals" song was shared at this session. At another session, a presenter had shared that putting a page in a sheet protector was a way to reuse materials without laminating. So I combined these two ideas, and the students used the materials you see in Figure 3. Each child had the numbers 1 through 5 on one side. When they turned it over during the song, they saw 6 through 10.

Figure 3

The song that we used was by Dr. Maggie Allen called "Making Numerals" and sung to the tune of "The Farmer in the Dell." (Dr. Maggie's Music CD, *Moo-ving into Math,* by Dr. Margaret Allen)

Pull down, that's it — that's 1.
Pull down, that's it — that's 1.
Hi-ho for numbers, oh.
Pull down, that's it — that's 1.

Repeat with the following changes:
Half-circle, slide right — that's 2.
Half-circle, Half-circle — that's 3.
Make an L, pull down — that's 4.
Down, around, top line — that's 5.
Circle left, close the bottom — that's 6.
Slide right, slant down — that's 7.
Make S, close it up — that's 8.
Small circle, pull down — that's 9.
Make 1, add 0 — that's 10.

7. Number Puzzles (5 minutes)
At a local discount store, I found number puzzles for one dollar each. (See Figure 4.) While each student was working on his/her own puzzle, I sat in close proximity to all students, so that when each person finished, he or she could tell me the numbers in order. After practice the students could do this out of order, but during the first few weeks, I wanted them to always put the numbers in order beginning with the number 1. During our IMI sessions with other kindergarten teachers, we shared ideas about how to find bargain items at local dollar or department stores.

Figure 4

To keep the activities moving quickly and to lessen any student frustration from staying on task too long, I placed a suggested amount of time to spend next to each step in the routine. The students enjoyed the different parts of the routine because none of the parts lasted for very long before we were moving on to the next part of the lesson. The routine also had built in time for the teacher to monitor student growth and work with individual students who were still struggling. This time allowed for differentiating the instruction based on the students' needs. The times also provided a guideline for the instructional assistants using the routine with the morning kindergarten students.

Continuing to Work with the Kindergarten Students

When I began working with these children, my goals were to have them be able to recognize, read, and say all of the number from 0 to 10 and be able to count objects in amounts up to 10. After working with these children for only four weeks, they had learned these numbers and could count with one-to-one correspondence accurately. The number 11 was added next, and we went on to add new numbers in the counting sequence, one at a time, until we reached the number 20. We also continued to review 0 to 10 with our lessons, along with adding the new numbers. By building on what the children knew and adding additional activities, the routine changed weekly.

We continued through the end of the school year to add, change, and adapt our original routine, so the students could build on their successes while pushing them to gain a deeper knowledge of number sense. For example, in order to help the children expand their understanding of the different numbers and what they mean, and to help them learn to visualize these amounts, we used activities with dot cards (see Figure 5) and squares on cards (see Figure 6). When shown individual cards, children were asked to match objects to the dots or squares using counters or cubes, then to count and name the amounts of dots or squares shown. They began to recognize different pictured number patterns based on the dots or squares on the cards.

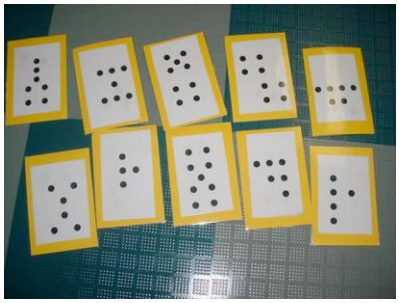

Figure 5

Figure 6

Conclusion

A more focused instruction based on the Indiana Academic Standards for Mathematics and a little bit of time made a big difference in the academic success of these children. With the help of the IMI training and tools, I had the skills and confidence to provide the instruction necessary to build a stronger mathematics base for these children. Why wouldn't other game routines based on different mathematics skills help older students? Addition, subtraction, multiplication,

division, geometry, fractions — the list of possibilities could go on and on. If an intervention helps a child become a better mathematician — which will help them throughout life — isn't it worth the extra time and energy?

References

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