The Dollar Game:

A Tool for Promoting Number Sense among Kindergartners

When my oldest grandson, Dusty, started kindergarten, I attended an orientation in an effort to familiarize myself with his school and become acquainted with school personnel. After introducing her faculty and staff, the principal announced that she and the classroom teachers encouraged parents and grandparents to get involved. As a college mathematics instructor, I have shared several ideas for classroom activities with my colleagues and students taking my Mathematics for Elementary Teachers course. Among them is a game that introduces base-ten grouping and trading.

This article describes the Dollar Game and what happened when I brought the game to my grandson's classroom.

The Game

The Dollar Game gives children an opportunity to make and trade groups of ten. To play the game, children need the following materials:

- an 8½" × 11" game mat for each player, on which three columns are labeled Dollars, Dimes, and Pennies;
- one number cube per group or table of players;
- enough pennies to allow several players simultaneously to reach a count of ten;
- one dollar per player; and
- one "banker" per group of players (groups of four players worked best for us).

Game mats can be made out of unlined paper and covered with clear contact paper for an inexpensive protective coating, and children can use real or play money for counting and exchanging. The "bankers" could be parents or grandparents of some of the players, college students completing a practicum, or high school or upper elementary students who have volunteered to be teachers' aides.

The Dollar Game works best with groups of three to five players, not including the banker. One player tosses the number cube, then counts out pennies according to the number on the number cube. The same player then places the pennies in the Pennies column of his or her game chart. Each

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player continues to take a turn. When a player obtains ten pennies, the banker exchanges the pennies for one dime. The player places the dime in the Dimes column of the game mat and leaves the remaining pennies in the Pennies column. This process continues until a player obtains ten dimes in the Dimes column. The player exchanges the ten dimes for a dollar and is proclaimed the winner of the game.

Our Experience

Our game mats were made out of colored construction paper and covered with clear contact paper. Each group had a mat of a different color and a pencil-box bank containing $5 in pennies, $4 in dimes, and five, one-dollar bills. (I used real money to stimulate interest in the game.) Four college students, who had completed Mathematics for Elementary Teachers I and II and a mathematics methods course, acted as the bankers and supervised the exchanges to keep a sharp eye on the money.

Sixteen students were in the kindergarten class that day, so each group consisted of four players. The classroom had no desks, only tables, so each group had its own table. I briefly explained the rules of the game and how to win. Then the bankers went to work. The classroom teacher and I moved from group to group, observing and helping.

After Dusty's second or third toss, he said, "Hey, Grandma, I have seven pennies. Now I only need three more and I can trade for a dime!" He had decomposed 10 into 7 and 3. I went over to his table so I could watch him take his next turn. I was curious to see whether he could make the trade correctly if he tossed a large enough number. On his next toss, he got a 4. He knew he had enough to trade because "four is more than three, and I only need three," but he carefully counted out ten pennies and gave them to his banker. He then took the dime, placed it in the Dimes column, and left the remaining penny in the Pennies column. I could not believe how much Dusty had learned. Two months earlier, when I first exposed him to the game, he could neither compose nor decompose 10 nor make exchanges correctly.

Just after Dusty made his first trade, I heard one of the bankers remind another player to breathe while taking his turn. This student had a habit of tossing the number cube, counting out the correct number of pennies, figuring out whether he had enough pennies to make an exchange, and trying to make that exchange—all in a single breath. After watching this player take his turn and successfully make a trade, I heard something that focused my attention on yet another group. The classroom teacher was asking the members of this group how much money each child had in total. After the teacher carefully posed a couple of questions, she directed the children to skip-count by tens and then add on the number of pennies. This method was motivating for the students because it was a faster way to find the amount of money they had accumulated. As the teacher moved from group to group, asking the same questions, other players not only found their total but also successfully figured out how many more pennies and dimes they needed before they could trade for a dollar. Students who felt that they were close to making a dollar requested that the game continue.

About forty-five minutes passed between the first player tossing a number cube and the first player yelling, "I have enough to make a dollar!" I brought a "store" with candy, stickers, pencils, erasers, and other small trinkets to class. The follow-up to the game was to let each player "buy" one piece of candy, one sticker, and two other items for whatever amount of money they had accumulated throughout the game. The winner was allowed first choice of the items. After spending their money, the players went with their teacher to the reading corner, and the college students and I quietly exited the room. When I returned to pick up Dusty after school that day, the classroom teacher asked if I and my assistants could return the following semester. We were wondering the same thing.

Conclusion

Principles and Standards for School Mathematics (NCTM 2000) states, "It is absolutely essential that students develop a solid understanding of the base-ten numeration system and place-value concepts by the end of grade 2" (p. 81). It also advises that "concrete models can help students represent numbers and develop number sense; they can also help bring meaning to students' use of written symbols

and can be useful in building place-value concepts" (p. 80).

The Dollar Game uses everyday objects to introduce one aspect of our base-ten numeration system. Counting pennies and exchanging them for dimes actively engaged kindergarten students in the process of making and exchanging groups of ten, a skill that is necessary to learn the concept of place value. After a couple of tosses, most of the students knew the number of dots on the face of the number cube without counting them. Developing this skill is important for children as they develop their number sense (Reys et al. 2001). The Dollar Game gave kindergartners an opportunity to practice counting objects, finding the total number of objects when different groups are combined, and counting on from a specific number. The game also allowed the teacher to introduce the process of skip-counting by tens.

Proportional models are more concrete; students should use and understand them before moving on to non-proportional models (Reys et al. 2001). The Dollar Game uses a non-proportional model: ten pennies are bigger than one dime, but both have the same worth in our monetary system. That ten pennies make one dime and ten dimes make one dollar was immediately clear to the kindergarten students, but they did not necessarily recognize that ten pennies have the same worth as one dime. Therefore, teachers should not use the Dollar Game to teach equivalence relationships within our monetary system or as a method of introducing the concept of place value. In the proper setting, the Dollar Game is an informal opportunity for kindergartners to experience an important idea underlying our base-ten numeration system, namely, counting and making groups. Teachers also could use the Dollar Game, in combination with other activities, to lay a foundation for mental composition and decomposition of numbers and the later learning of addition facts and the written numeration system.

References

National Council of Teachers of Mathematics (NCTM). *Principles and Standards for School Mathematics*. Reston, Va.: NCTM, 2000.

Reys, Robert E., Mary M. Lindquist, Diana V. Lambdin, Nancy L. Smith, and Marilyn N. Suydam. *Helping Children Learn Mathematics*. New York: John Wiley & Sons, 2001. ▲