

Teaching the Values of



Teaching about coins can be a frustrating experience for many primary teachers. Teaching the names of the coins is *not* the problem. Instead, teaching about the *values* of coins is difficult.

Many teachers try to use memorization techniques for teaching monetary objectives related to values. Memorization, however, is a poor method of teaching or learning. The *Curriculum and Evaluation Standards for School Mathematics* (NCTM 1989) recommends a de-emphasis on rote memory as a teaching and learning technique.

For teaching measurement objectives, including those related to monetary value, the *Curriculum and Evaluation Standards* endorses the use of manipulative materials and the development of concepts. These criteria, however, emphasize an even more crucial problem with teaching about coins at the primary level: the coins, although concrete models of themselves, are nonproportional in relation to their values. This situation means that the coins are abstract models when they are used to teach their values.

Using coin models that are proportionately sized according to the value of each coin becomes the solution to the problems that teachers have had with teaching about money. Proportionate models simplify instruction related to monetary values by presenting it on a concrete level. Pic-

tures of the values represented by the coins are created in the minds of the students. For example, the true relationship between the value of a dime and the value of a penny is visually represented, since the dime-value model is ten times the size of the value model for a penny. Furthermore, the model for the value of a quarter is the same size as the combined models for the values of two dimes and a nickel or any other combination of coins that has the same value as a quarter. These and other value relationships involving coins and sets of coins are much more easily understood when they are shown with the value models.

Creating Proportionate Models to Represent the Values of Coins

The values of coins are measured in cents. Therefore, a proportionate model representing the unit value of a cent, as well as models for the values of each coin, is needed when teaching about money. **Figures 1–5**, which can be enlarged and used as blackline masters, are the basic models needed. The models are based on a square shape. The actual size of the basic square is not important; I find that a 20-cm-by-20-cm square is easy to create and use with students.

Note the shape of the regions representing the quarter (see **fig. 5**). Each comprises two and one-half columns out of the ten within the basic square. This shape is essential to ensure that the models can be used to teach objectives that involve establishing relationships among values.

The *Professional Standards for Teaching Mathematics* (NCTM 1991) recommends that the mathematical concepts emphasized should be connected to daily living. Because the half-dollar coin is not commonly circulated today, I do not find it necessary to teach about it. A proportional model for the half-dollar coin could be produced easily.

Randell L. Drum and Wesley G. Petty Jr.

Randell Drum, rdrum@falcon.tamucc.edu, and Wesley Petty, wpetty@falcon.tamucc.edu, both teach at Texas A & M University—Corpus Christi, Corpus Christi, TX 78412. They share an interest in developing an understanding of mathematics through the use of manipulatives.



Teaching the Values of Coins and Their Relative Values

Teachers should use normal coin models, such as the coins themselves or plastic versions of them, to introduce each coin by name. The proportionately sized value models of the coins should then be substituted as manipulatives representing the coins as the instruction progresses to objectives related to values.

Teaching the values of coins requires showing the worth of each coin in cents. This instruction is done by placing cutouts representing the values of each coin on top of the cent model. The number of cent units covered by a coin model represents the value of the coin. See **figure 6** as an example representing the placement of the nickel model over the cent model. The nickel model covers five of the cent models, so the nickel has a value of five cents.

Learning the relative values of the coins involves determining how many of one coin are needed to have the same value as a different coin. This method is shown by laying multiple models of a coin over the model of another coin. See **figure 7** as an example representing the placement of nickel models over a quarter model until it is completely covered. Five nickel models are needed to cover the quarter model, so five nickels have the same value as one quarter.

Teaching the Value of a Set of Coins

Teachers should use normal coin models to introduce each set of coins then switch to the value models for teaching the objective. The value of the set is shown by laying the value models for the coins within the set over the cent model. See **figure 8** as an example representing the placement of a set of models, including a quarter, a nickel, and two pennies, on the cent model. They cover thirty-two of the cent units, so the value of the set of coins is thirty-two cents.

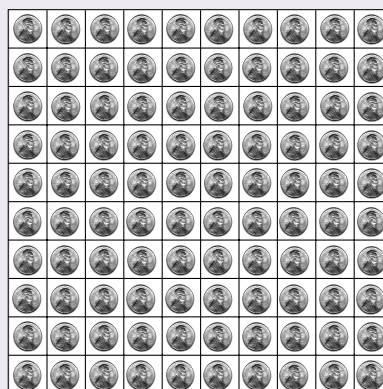
FIGURE 1

The model for cents

1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢

FIGURE 2

The value model for pennies



The value models should be placed on the cent model beginning with the largest pieces and ending with the smallest pieces. This method corresponds to the counting-on procedure that will be taught later as the abstract process for determining the value of a set of coins. For the set modeled in **figure 8**, the student would eventually count “25, 30, 31, 32 cents” while looking at the coins.

FIGURE 3

The value model for nickels

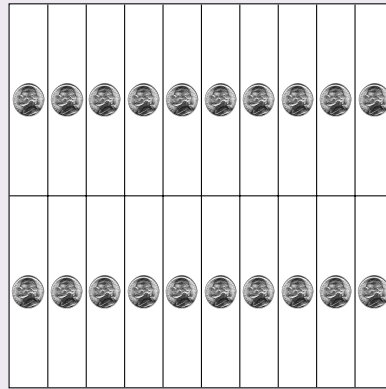


FIGURE 4

The value model for dimes

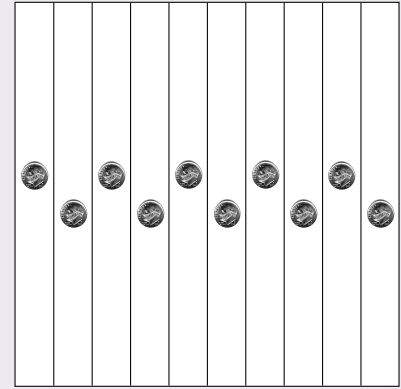


FIGURE 5

The value model for quarters

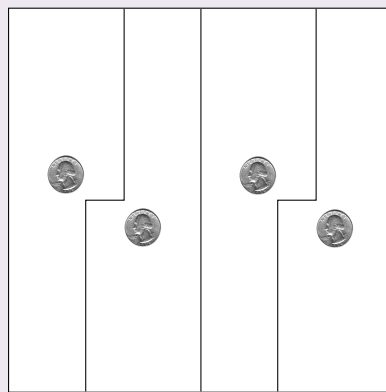



FIGURE 6

The value of a nickel

	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢
	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢	1¢

Comparing the Values of Sets of Coins

It should not be necessary to model this comparison concretely. Once the students have been taught the value of a set of coins, the teacher should be able to relate it to the previously learned objective for comparing numbers.

The teacher should use models, however, to show that a set with fewer coins can have the greater value. **Figure 9** shows the set of coins used in the previous activity—colored blue and involving only four coins—overlaid by a set consisting of a dime, three nickels, and four pennies, which are colored red. Even though the red model has four more coins than the blue model, it has less value—only twenty-nine cents versus thirty-two cents.

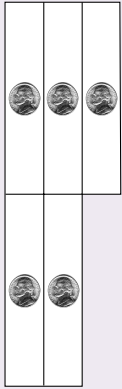
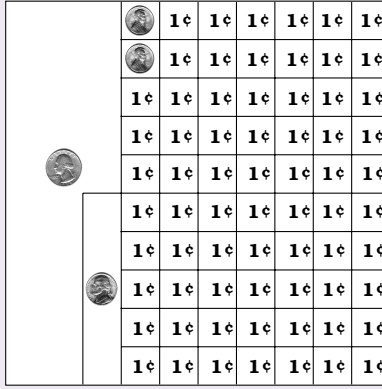
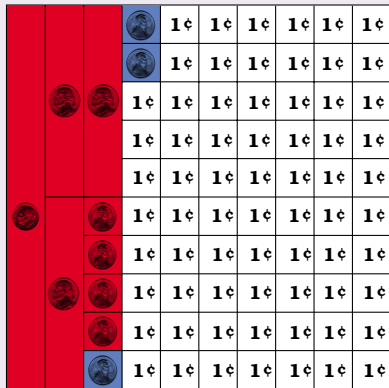
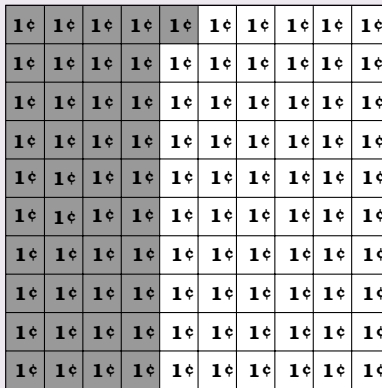
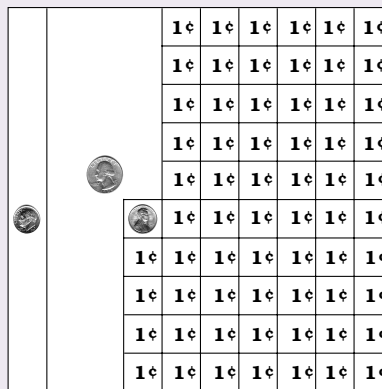
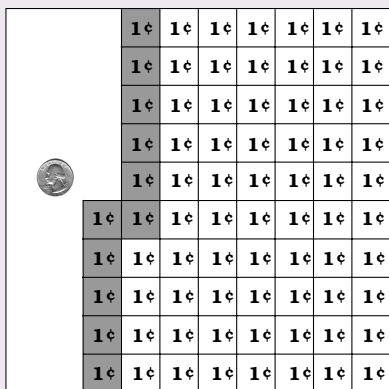
The difference in values between two sets of coins is another concept that should not require concrete modeling. Instead, teachers should relate it to the previously taught objective in which students learned to subtract to find differences in amounts. The models can easily be used to justify subtracting, though. The teacher can overlay mod-

els representing both sets then teach the children to count the value of the amount of the greater-value set that extends beyond the overlaid portion. In **figure 9**, for example, counting the three cent units in the blue set shows that the set with a value of thirty-two cents is worth three cents more than the set with a value of twenty-nine cents.

Creating a Set of Coins with a Given Value

It is necessary to begin with the cent model to achieve this objective. The value of the set to be created should be written at the top of a cent model. Then the number of cent regions required to represent that value should be shaded. See **figure 10**, which represents the desired value of forty-one cents.

Coin models should be used to cover completely the shaded region representing the desired value. Multiple possibilities for creating sets exist, except in the situations with a value of four cents or less. Students should be asked to count the values of the created sets of coins as previously taught.

FIGURE 7**Nickel models overlaying a quarter model****FIGURE 8****The value of a set of coins****FIGURE 9****A set of four coins (blue) overlaid by a set of eight coins (red)****FIGURE 10****Shaded region representing forty-one cents****FIGURE 11****Original arrangement and adjustment to allow placing the dime**

Creating a Set of Coins with a Given Value by Using the Fewest Coins

This objective is an extension of the previous one and is based on the same principle. Because the criterion is more specific, the modeling procedure is less flexible. Modeling this objective requires starting with the coin model with the greatest possible value and continuing downward in size only when necessary.

A quarter model, if it is not too large for representing the desired value, should be used as the first overlay. Quarter models should continue to be used until the use of another one would go beyond the shaded region. The dime model, as the second-largest coin in value, should be next. Dimes should continue to be used until another one would go beyond the shaded region.

In instances for which one quarter model or three quarter models are the greatest number of quarter models that could be used, the student may need to shift the quarter models toward the left or right to show an entire vacant column for a dime model. For instance, a desired set worth thirty-six cents would have eleven cent models vacant after a quarter model is placed (see **fig. 11**), which would require a dime model. However, the cent models

would not be arranged so that a dime model could be placed to overlay ten of them if the quarter model was placed to the far left. By shifting the quarter model to the right, a whole column of cent models would be vacant, so that a dime model could be used as an overlay.

The overlaying process should continue by using nickel models, if possible. Finally, penny models should be used, if necessary, to complete the process.

Eventually, the teacher should demonstrate an abstract counting-on process, using actual coins to create a set with a given value and the fewest possible coins. Students then place quarters while they count by twenty-fives until another quarter would cause the number to go over the desired value of the set. Dimes and then nickels should be added in the same manner. Finally, pennies should be added while students continue to count on until the desired number representing the value of the set to be created has been reached.

After this objective has been taught, students should be asked to consider why no more than two dime models, one nickel model, or four penny models would ever be used when creating a set with the fewest coins possible. The solution can be modeled by showing that if more than four pennies, one nickel, or two dimes were used, a coin with a greater value could have been substituted; therefore, this collection would not represent a set using the fewest number of coins.

Summary

The teaching of monetary concepts and processes is necessary to prepare young children for experiences that they are probably already facing in the real world. Because coins are nonproportionate models in terms of the value they represent, they are abstract models for teaching purposes. To offer concrete experiences, teachers must use proportionate models that can be associated with each coin. The models and processes illustrated in this article prescribe concrete instruction that can be translated into meaningful abstract processes like those used in the real world.

Bibliography

- Ginaitis, Stephen J. "Sense with Cents." *Arithmetic Teacher* 25 (January 1978): 43.
- National Council of Teachers of Mathematics (NCTM). *Curriculum and Evaluation Standards for School Mathematics*. Reston, Va.: NCTM, 1989.
- . *Professional Standards for Teaching Mathematics*. Reston, Va.: National Council of Teachers of Mathematics, 1991.
- Stevenson, Cathy L. "Teaching Money with Grids." *Arithmetic Teacher* 37 (April 1990): 47–49. ▲