

The Need for Number Sense

The clothesline is more than a trending activity, however. It serves a crucial, yet overlooked, purpose in mathematics education—the need to teach number sense.

Several longitudinal studies show that students who lack number sense in primary grades are nearly guaranteed to fail their high school math courses, and students who have strong number sense are nearly guaranteed to excel in their high school math courses (Jordan 2010; Duncan 2007). Number sense has a similar influence on students' success in math as reading has on their school success overall. In fact, "mathematics difficulties and disabilities have their roots in weak number sense" (Jordan 2010, 2).

So, what is number sense exactly? In essence, it is a "child's fluidity and flexibility with numbers" (Gersten and Chard 1999, 3). In other words, being fluent in math is much the same as being fluent in a language. To be fluent in a language, one must know the fundamentals of the language, but one must also have the ability to respond to a question or take part in a conversation with sentences that have not been simply memorized and regurgitated. Just as people need to be fluid and flexible with their words, students must be able to respond in the same fluid and flexible way when encountering unique math problems. Their ability to do this relies heavily on their number sense.

Number sense is acquired through exploration and play. Much of the number sense children arrive with in kindergarten is acquired informally in the home in much the same way their language skills are acquired. Students who are more engaged with words at home enter school with larger vocabularies and stronger language structures. Thus, they are better prepared to learn how to read and write. Students who are engaged with numbers and their properties at home enter school better prepared to learn math, too. However, students do not obtain language readiness by studying pre-K vocabulary lists. They informally interact with their language, usually through conversation with adults. Correspondingly, students do not obtain number sense by memorizing lists of math facts. Instead, they interact informally with numbers. Oftentimes this comes through games, such as card and board games, in which students are required to count, add, and strategize. Duncan (2007) describes that "play-based, as opposed to 'drill-and-practice,' curricula designed with the developmental needs of children in mind can foster the development of academic and attention skills in ways that are engaging and fun" (8). The clothesline straddles that boundary between developing informal play and the formal needs of classroom management. This is enormously helpful when teaching students who do not have adequate number sense to learn the content at their current grade level.

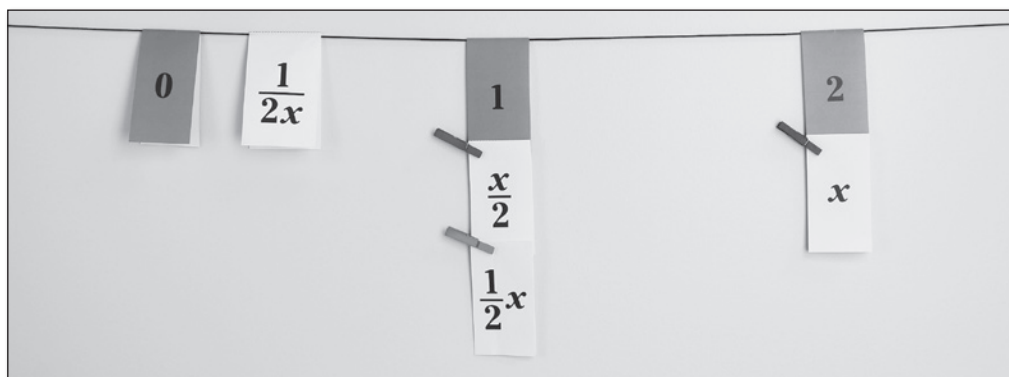
Teaching Number Sense and Prerequisite Skills

Why, then, does the building of number sense get so little attention in the mathematics classroom? There are two valid reasons. The first is the lack of time. Teachers are already hard pressed to cover current content standards. The second is the lack of resources to help teach number sense. Worksheets for procedural practice fall short of building number sense, take too much time, and often have already failed students in their prior experiences. Therefore, teachers need a simple tool that can quickly strengthen students' prior knowledge

The Clothespins

When students place equal values on the same location of the clothesline for the first time, they inevitably set one atop the other, so that one of the values is no longer visible. I joke with them at this point, “Hey, where did the other one go?” When they reveal the other value underneath, I ask, “Why did you do that?” Once they accurately claim the values are equal, I grab a clothespin and pin the values together vertically so both are visible (see Figure 2.10). The clothespins are used to show equivalency. Sometimes, there may be more than one pair or more than two values that are equivalent to one another.

Figure 2.10 Equivalent Cards Pinned



Sometimes, equivalency becomes the focal point of the lesson. That is the time to make the move to multiple clotheslines.

The Double and Triple Clothesline

A double clothesline is an effective setup when you have situations with different units of measure, like with rates, or when teaching multiple forms of a value, such as percentages and decimals. For example, a double clothesline is a terrific tool for presenting the concept of unit rate.

Consider this scenario, shown to me by Kristen Bennett of Tustin USD: Jody buys a 5-ounce serving of frozen yogurt for \$2. Her older brother, Timmy, buys the 10-ounce serving. How much does Timmy’s yogurt cost? What is the price of yogurt per ounce?

In this example, pinning a 5 and 2 together on one clothesline would be confusing and inaccurate. We are not claiming that 5 is equal to 2! We are claiming there is a relationship between ounces and dollars. As shown in Figure 2.11, the double clothesline allows us to label these units in a way that illuminates the unit rate concept of dollars per ounce.