

Widening the Circle

Celebrating Neurodiversity in Faith Based Schools

Focus Strategy:

The Neuroscience of Math

The Neuroscience

The human brain has an innate ability to perceive and process numbers, a skill deeply rooted in our evolutionary history. Neuroscientific research suggests that our number sense is supported by two primary systems: the approximate number system (ANS) and the object-tracking system (OTS). The ANS allows us to estimate and compare quantities without direct counting, while the OTS helps us keep track of small, distinct objects. These systems work together to form our foundational understanding of numbers, enabling us to develop mathematical reasoning over time. Before students can grasp numerical concepts symbolically, they must first engage in meaningful, visual experiences that build their number sense.

Subitizing and Groupitizing

A crucial component of early numerical understanding is the ability to subitize and groupitize. Subitizing refers to instantly recognizing small quantities (typically up to four) without counting, while groupitizing involves seeing patterns within larger sets to determine quantity more efficiently. These skills allow students to move beyond rote counting and develop a deeper understanding of number relationships. When children engage with materials that encourage visualizing sets of numbers, they strengthen neural pathways associated with mathematical thinking. Without this foundational ability, abstract concepts like addition and multiplication become significantly more challenging to master.

To support this essential learning process, teachers can help students build their number sense through visualization and pattern recognition. Structured activities that enhance subitizing and groupitizing skills foster a strong foundation for future mathematical success.

Decomposing and Recomposing

One aspect of subitizing and groupitizing is focusing on decomposing and recomposing numbers, the act of taking apart and putting numbers back together. We want to start with decomposing first because we naturally see the WHOLE and move to the parts. Picture a bicycle in your mind. Now picture the bicycle without 2 wheels. Alternatively, picture a bicycle wheel. Now picture what you would need to create the bicycle. Which was easier? This is why we prefer to have directions in pictures. Think of the last IKEA item you built! Could you imagine having all the parts but not a picture of the whole? When you see the whole, the parts come more easily.



In the area of math instruction, the “part” is counting, the “whole” is subitizing! We build pictures first, then we count. We want to move students from overreliance on counting to the ability to “see” numbers and generalize them.

More than likely, when you were sitting in math class at six years old, you weren’t saying decomposing and recomposing. We would say adding and subtracting. And when we couldn’t subtract 9 from 23, we had to “borrow”. But we aren’t borrowing – we are decomposing and recomposing. The 23 is decomposed from 2 tens and 3 ones into 13 ones. But the value is the same, thus we didn’t “borrow” or take anything from the tens place. We can teach students at a very early age to decompose and recompose. You might know this as “making 10”. Since we live in a base 10 world, the ability to make 10 visually, then symbolically, is the foundation for all other math learning.

Make Subitizing Fun!

A great way to teach students how to subitize and decompose is through math games. Using dot cards or playing cards, students can play Number War or Go Fish. They can race the teacher to see who can subitize faster. Students can Make 10 with playing cards. You can set up learning centers with games that are aligned with Neuroscience, such as Shut the Box or the Tiny Polka Dot game. Learning math should be fun and engaging so all students feel confident with numeracy.

Resources:

[Lord Math](#) - download free dot cards and subitizing games

Parent Connection:

Many parents were taught math in the “borrowing” ages. These concepts will be new to them as well. Invite them to see you teach math using subitizing and groupitizing. Encourage them to play math games at home. Host a family math night at your school where the students become the teachers for their parents, and they can show off how their brain learns!

