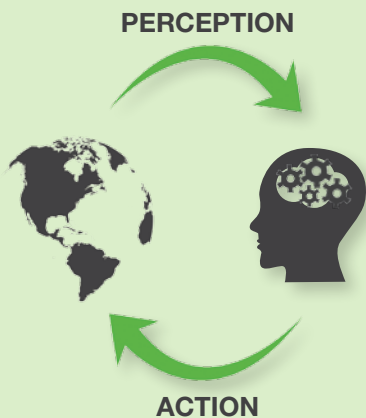# ST MATH AND THE LEARNING PATH

Neuroscience offers great insight into how humans, from infants to adults, absorb information and build frameworks to understand the world around them. The neuroscientists who create the ST Math® software program call the process by which all children learn The Learning Path. Here's how it works:

The Learning Path

EXPERIENCE

By interacting in a hands-on environment, students build internal frameworks, or schemas, that describe how things work. This leads to deep conceptual understanding that supports high-level problem solving.

CONNECT

Students, often with the aid of teachers, build bridges between related concepts and between new and previously mastered material.

PRACTICE

Long the backbone of math education, practice allows students to strengthen connections and hone skills through repetition.

APPLY

Out in the real world, students take what they learned in class and use it to solve problems in novel contexts.

Perception-Action Cycle

Neuroscientists describe human learning through the perception-action cycle. Our brain makes sense of the world around us by creating and testing hypotheses about the way the world works. When presented with new situations, our brain makes predictions based on past experiences, takes **action** based on those hypotheses, **perceives** the results and adjusts its hypotheses.

PERCEPTION

ACTION

MIND
Research Institute
A neuroscience and education social benefit organization

MS-GN-129-140916

What is ST Math? Created by MIND Research Institute, Spatial-Temporal (ST) Math® is game-based instructional software designed to boost math comprehension and proficiency through visual learning. Designed to be integrated with classroom instruction, ST Math incorporates the latest research in neuroscience and promotes mastery-based learning and mathematical understanding. Aligned to state and Common Core standards, ST Math takes students to the highest level of thinking and applying math: the ability to creatively problem-solve and develop a deep conceptual understanding. Watch a 3-minute video describing the ST Math approach: *http://bit.ly/T5SMn4.*

Math education traditionally starts and ends with practice. We tell students how someone else figured out the way to add fractions, then send them off to "drill and kill" until it's memorized. They never learn for themselves how and why the concept works, so they never understand it deeply. When it's time to apply it in the real world, these students are at a loss.

**ST Math changes that.**

Experience

Through interactive puzzles and online manipulatives, ST Math provides a self-paced, hands-on **experience** with math concepts.
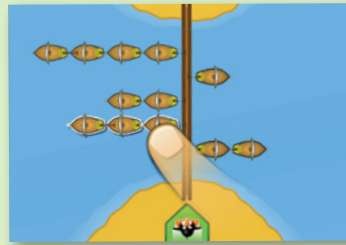
In the game Tug Boat, students move boats to balance each side of the bridge with an equal number of boats. With touch-enabled ST Math, they literally touch the screen to manipulate what they see.

Connect

ST Math helps students **connect** previously mastered concepts into current objectives. The teacher training component of the ST Math program prepares instructors to facilitate this process for students.
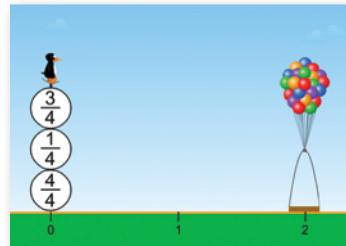
In the game JiJi Cycle, students first encounter visual representations of fractions as pie shapes and must move the balloon platform to the correct place on the number line. Once mastered, students move to the "Language Integration" JiJi Cycle Game, connecting the visual puzzle to the written fractions they'll see in class.

Practice

Students **practice** what they've learned in ST Math by completing more than 4,000 online puzzles in each grade level. Animations provide **informative feedback** for each puzzle – not only telling them if they answered correctly, but showing exactly why.
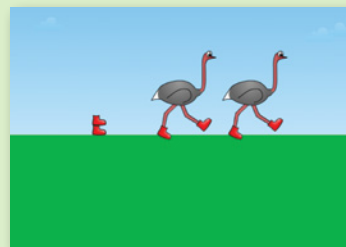
Students explore multiplication concepts in the game How Many Legs by selecting the correct number of shoes to outfit groups of creatures. Extra shoes or bare feet visually demonstrate incorrect answers.

Apply

Students **apply** what they've learned with ST Math in several ways. For example, schools using ST Math experience double or triple growth in math proficiency on state tests. For students who have completed their grade's curriculum, "challenge games" go beyond what's been learned. Teachers report that ST Math students demonstrate **greater persistence and problem solving** across the board.
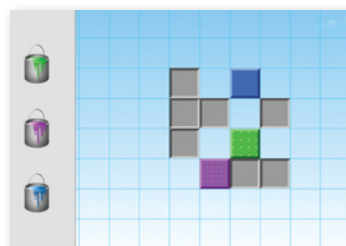
The popular Big Seed challenge game uses symmetrically unfolding patterns that mimic how certain enzymes act on DNA. Difficult even for adults, completing each level brings students a tremendous sense of accomplishment and confidence.