Introduction

Brain-compatible maths activities are fun and exciting! These activities are often hands-on and involve partners, group work and class movement, which many students enjoy. Students frequently say that mathematics is difficult for them. Therefore, as an educator, it is your job to choose materials that are likely to be effective in light of current research on how the brain learns mathematics. This book is filled with activities that are centred on brain research and that are structured to maximise the brain's learning potential.

The activities in this book are designed using a brain-compatible lesson plan format. There are nine components of the plan, but not all nine are necessary for every lesson. Those components that are most relevant to the learning objective should be emphasised:

1. anticipatory set
2. learning objective
3. purpose
4. input
5. modelling
6. checking for understanding
7. guided practice
8. closure and
9. independent practice

Each of the components is described in detail in the book titled *How the Brain Learns Mathematics.* Refer to this book for more brain-compatible maths research and other teaching strategies. When using the activities in this book, read through the activity first. Then begin preparations for the lesson. It is best to follow the lesson plan format to ensure maximum learning potential. However, meeting the needs of each student in your classroom is always first and foremost. Be flexible to ensure that all students are learning. Last, have fun! These activities may force you to step out of your comfort zone. Embrace the change, and watch your students' brains at work.

PUT IT INTO PRACTICE

How the brain learns is a fascinating and complex process. Advancements in research and technology are helping us understand specifically how the brain learns maths and deals with numbers and mathematical relationships. These remarkable findings are improving teaching and learning dramatically. An educator's understanding and application of instructional approaches that are compatible with what cognitive studies tell us will only aid in his or her classroom success.

Some of the recent research discoveries about the brain can and should affect teaching and learning. For example, research tells us that

- creating and using conceptual subitising patterns help young students develop the abstract number and arithmetic strategies they will need to master counting;
- just as phonemic awareness is a prerequisite to learning phonics and becoming a successful reader, developing number sense is a prerequisite for succeeding in mathematics;
- information is most likely to be stored if it makes sense and has meaning;
- too often, mathematics instruction focuses on skills, knowledge and performance but spends little time on reasoning and deep understanding; and
- mathematics can be defined simply as the science of patterns.

A much fuller explanation of these discoveries and their implications for school and the classroom can be found in my book *How the Brain Learns Mathematics,* published by Hawker Brownlow Education. This book is designed as a classroom resource to accompany that text. The activities in this book translate the research and strategies for brain-compatible maths teaching and learning into practical, successful classroom activities. Some general guidelines provide the framework for these activities:

- Writing is an important component in learning mathematics.
- Studies show that more students are motivated and succeed in classes where teachers use activities that address the various intelligences.
- The use of concrete models for representation of concepts and to help create meaning is beneficial.
- Connecting concepts to the real world creates purpose and meaning. This allows maths to seem less abstract.
- Using graphic organisers helps students organise their thinking.
- Solving problems in different ways is beneficial to students.

The activities in this book also are supported by research-based rationale for using particular instructional strategies. These strategies include cooperative learning groups, differentiated instruction, discussion, reflection, movement, manipulatives, visualisation and many others, all of which can increase student motivation and retention of learned concepts.

Scientists continue to explore the inner workings of the brain and will likely continue to discover more and more about learning mathematics. Teachers are challenged to stay current on these new findings, to ensure students are using their brains to the fullest capacity. As we learn more about how the brain learns mathematics, we can develop activities like those seen in this book, which will

- aid in teachers' presenting meaningful instruction to students in the classroom,
- ensure that students are staying focused on and remembering more of what teachers have presented, and
- make teaching and learning more effective and enjoyable experiences.

Teachers should always continue to help students recognise that the learning of mathematics will not only be helpful in their future but will also allow them to understand and appreciate the wonders of the world each day.

should be written at the top of the tree. Then ask for student volunteers to produce two addition equations and two subtraction equations for the fact family (*7 + 5 = 12, 5 + 7 = 12, 12 – 7 = 5, 12 – 5 = 7*). Write the equations on the tree trunk.

Guided Practice

Invite students to help you find three more fact families to complete the Fact Family Trees reproducible on the overhead. Pass the dice around the room, and have students roll them to find the numbers for each fact family. Have volunteers write the numbers for the fact families on the tops of the trees and the equations on the tree trunks.

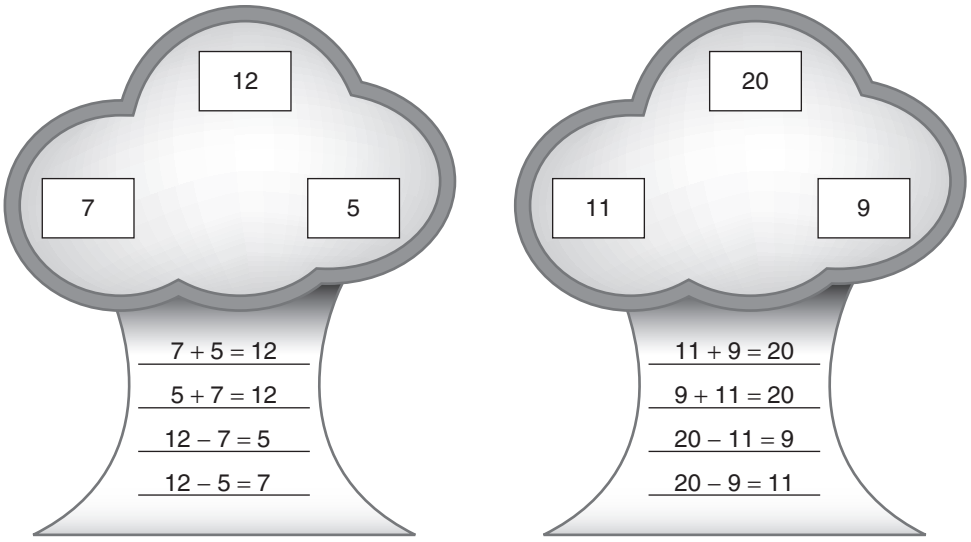
Checking for Understanding

Give each student a copy of the Fact Family Trees reproducible. Roll the dice again, and tell students which numbers you rolled. Have students work in pairs to determine a third number (based on the first two numbers) that can be used to create a fact family. Have partners work together to complete one fact family tree using the three numbers. Ask the pairs to present their fact families to the class and show the equations that they listed. If students make mistakes, help them to correct their work.

Independent Practice

Give each student a pair of polyhedron dice. Invite students to work independently to complete the three remaining fact family trees on their reproducibles.

Fact Family Trees



Closure

Tell students that they have 2 minutes to share their fact families with a partner. Then have them answer the following question in their maths journals: "How does working with fact families help you to better understand addition and subtraction?"

Name _____ Date _____

Fact Family Trees

Directions: Roll your dice. Use the numbers to create a fact family. Write the numbers for the fact family in the top of the tree. Write the equations for the fact family on the tree trunk.