

Contents

Introduction	v
Acknowledgments	xv
About the Author	xvii



Strategy 1:	Brainstorming and Discussion	1
--------------------	-------------------------------------	----------



Strategy 2:	Drawing and Artwork	8
--------------------	----------------------------	----------



Strategy 3:	Excursions	15
--------------------	-------------------	-----------



Strategy 4:	Games	19
--------------------	--------------	-----------



Strategy 5:	Graphic Organisers, Semantic Maps and Word Webs	27
--------------------	--	-----------



Strategy 6:	Humour	33
--------------------	---------------	-----------



Strategy 7:	Manipulatives, Experiments, Labs and Models	38
--------------------	--	-----------













Strategy 8:	Metaphors, Analogies and Similies	48
--------------------	--	-----------



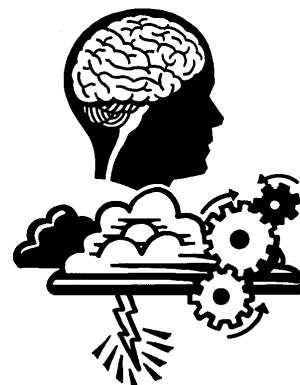
Strategy 9:	Mnemonic Devices	53
--------------------	-------------------------	-----------



Strategy 10:	Movement	58
---------------------	-----------------	-----------

	Strategy 11:	Music, Rhythm, Rhyme and Rap	65
	Strategy 12:	Project-Based and Problem-Based Instruction	74
	Strategy 13:	Reciprocal Teaching and Cooperative Learning	81
	Strategy 14:	Role Plays, Drama, Pantomimes and Charades	88
	Strategy 15:	Storytelling	93
	Strategy 16:	Technology	99
	Strategy 17:	Visualisation and Guided Imagery	104
	Strategy 18:	Visuals	108
	Strategy 19:	Work Study and Apprenticeships	114
	Strategy 20:	Writing and Journals	118
Resource : Brain-Compatible Lesson Design			122
Bibliography			128
Credit for Contributors for Activities			132
Have You Read Any Good Maths Books Lately from Hawker Brownlow Education			133
Pricelist			135

Brainstorming and Discussion



WHAT: DEFINING THE STRATEGY

The answer is 32. What is the question?

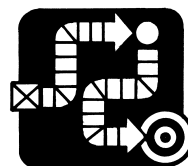
How did you get the answer to the third problem?

What was the first thing you thought about as you began to tackle this equation?

What would have happened if we had divided instead of multiplied?

According to research about how the brain behaves, the person in the classroom who is doing the most talking about the content is growing the most dendrites or brain cells. My observations in many classrooms have led me to believe that this person is the teacher. A large number of teachers grow dendrites daily since they are the only ones talking about maths. The problem is that students are not a part of the conversation. I recently observed in a classroom a teacher who was solving the calculus homework problems on the board without ever asking students a single question or engaging them in any discussion regarding the thinking processes accompanying their individual answers.

Discussion not only provides the brain with a supply of oxygen that keeps it in a more alert state during the lesson, it also facilitates memory. The open-ended questions listed above provide students with opportunities to brainstorm ideas and engage in lively classroom conversation. Whether you are instructing the whole class or having students work in small, flexible groups, learning is facilitated when instructors ask open-ended questions and acknowledge and encourage a variety of ideas as students engage in interactive discourse.





WHY: THEORETICAL FRAMEWORK

The most widely known technique for stimulating creativity in the brain is probably the act of brainstorming, where all ideas are accepted and there is a greater chance of reaching a workable solution (Gregory & Parry, 2006).

Students with special needs benefit when the class works in groups of less than six and the teacher uses directed-response questioning so that students have a chance to think aloud (Jensen, 2005).

Teachers can guide students through very difficult solutions by using a series of well-thought-out questions that address process rather than procedure (Posamentier & Jaye, 2005).

Class discussion can assist students in comprehending the properties of operations, such as the associative and communicative properties (National Council of Teachers of Mathematics, 2000).

Discussion and questioning during whole class or cooperative group learning enable the brain to clarify concepts and hook new information with the information that the brain already knows (Brooks & Brooks, 1993).

When students share their thinking about number combinations in class discussions, other students are able to develop or improve their strategies (NCTM, 2000).



HOW: INSTRUCTIONAL ACTIVITIES

WHO: Lower Primary to Lower Secondary

WHEN: Before the lesson

FOCAL POINT(S): All

- Prior to the teaching of a lesson, have students brainstorm all they know about the particular concept that will be addressed in the lesson. For example, prior to a lesson on fractions, have students brainstorm all the occasions for which fractions are used in everyday living, such as following recipes, dividing pizza into slices, and calculating sale prices. Also engage students in listing all of the questions they have about the topic of fractions.

WHO: Lower Primary to Lower Secondary

WHEN: During the lesson

FOCAL POINT(S): All

- When asking maths questions in class or creating teacher-made maths tests, provide opportunities for all students to be successful by asking both knowledge or short-answer questions as well as those that enable students to use their mathematical reasoning and critical and creative-thinking skills. Refer to Figure 2 on pages 5–6 to ensure that students have opportunities to answer questions at all levels of Bloom's Taxonomy, particularly those above the *Remembering* level.

WHO: Upper Primary to Lower Secondary

WHEN: During or after the lesson

FOCAL POINT(S): All

- During cooperative group discussions or as students create original questions for maths assessments following a unit of study, have them use the

question stems in Figure 2 on pages 5–6. These stems will help to ensure that questions are created that represent all levels of Bloom’s Taxonomy.

WHO: Lower Primary

WHEN: During the lesson

FOCAL POINT(S): Number

- When teaching the whole class, have students brainstorm answers to discussion questions, such as those that require them to use their number sense. Questions should be similar to the following:

1. How many boys (girls) are in our class?
2. If we subtract the number of boys from the number of girls, how many students are left?
3. Show me five fingers. If we take away two fingers, how many fingers are left?

Sentence starters similar to the ones listed above are particularly effective for English language learners since they enable these students to take an active part in the discussion:

- I realise that . . .
 - I agree with _____ that _____.
 - I would like to add to _____’s idea.
 - I don’t understand what _____ meant when she said . . .
- (Coggin, Kravin, Coates, & Carrol, 2007).

WHO: Lower Primary to Lower Secondary

WHEN: During the lesson

FOCAL POINT(S): All

- Use the Think, Pair, Share technique with students. Pose a question or discussion topic to the class. Have them think of an individual answer. Then have them pair with a peer and share their answer. Then call on both volunteers and non-volunteers to respond to the entire class.

WHO: Upper Primary

WHEN: During the lesson

FOCAL POINT(S): Movement, Chance and Data

- Have students discuss the numbers of brothers and sisters, if any, they have. As students give you the numbers, begin listing them in columns on the board. Discuss that some students have the same number of siblings and others have different numbers; some have more and some have less, which introduces the concept of range (difference between the greatest and the least) and the concept of mode (most common number of siblings). Other measures of central tendency that can be introduced in the discussion are the mean and median.

WHO: Lower Primary to Lower Secondary

WHEN: During the lesson

FOCAL POINT(S): All

- Engage students in a class discussion that would help them to form generalisations. Ask questions such as *How would you describe this pattern? How can this same pattern be repeated?* (NCTM, 2000).

WHO: Lower Primary to Lower Secondary

WHEN: After the lesson

FOCAL POINT(S): All