Maths Tools

YEARS 3–12

64

WAYS TO
DIFFERENTIATE
INSTRUCTION
AND
INCREASE
STUDENT
ENGAGEMENT

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WHAT ARE LEARNING STYLES AND WHY DO THEY MATTER?

Few ideas in education have stood the test of time as well as learning styles. The history of style stretches all the way back to the work of Carl Jung (1923), one of the founding fathers of modern psychology. What Jung discovered is that the ways in which people process and evaluate information tend to develop into particular personality types. Years later, Kathleen Briggs and Isabel Myers (1962/1998) took Jung's work and expanded on it to create a comprehensive model of cognitive diversity. The fruit of Briggs and Myers' efforts is the world-renowned Myers-Briggs Type Indicator, which, according to recent estimates, some two million people take each year to better understand their strengths and liabilities as learners, workers and individuals. In the years since the development of the Myers-Briggs Type Indicator, new generations of educational researchers including Bernice McCarthy (1982), Carolyn Mamchur (1996), Edward Pajak (2003), Gayle Gregory (2005) and Harvey F. Silver, Richard Strong and Matthew Perini (2007) have adapted and refined these ideas and helped educators across the globe put learning styles to work in classrooms and schools.

In a development of special interest to teachers of mathematics, Harvey F. Silver, Ed Thomas and Matthew Perini (2003) applied the research on learning styles specifically to the study of mathematics. Out of their work came the identification of four distinct mathematical learning styles, outlined in Figure 1.1.

It goes without saying that no student falls completely into one style category. Learning styles should never be used to reduce students to a set of identifiable behaviours neatly summarised in a box. However, most of us tend to develop clear preferences for certain styles, while seeking to avoid other styles.

To get a better sense of what the four mathematical learning styles look like in the classroom and to help you discover which styles you prefer, let's look into the classrooms of four different teachers of mathematics. While students in each of these four mathematics classrooms are all studying area and perimeter, each teacher is approaching the content in a different way. William Merkel, Sandy Horowitz, Bruce Wong and Julia Lacomba all teach year six mathematics, and each teacher has developed a different activity for students to complete. Which of these classrooms would you want to be in the most? Which of these classrooms would you want to be in the least? Once you are familiar with the four classroom activities, rank them in order of preference from most preferred to least preferred.

Figure 1.1 The Four Types of Mathematics Students

The Four Types of Mathematics Students	
Mastery Maths Students . . . *Want to* . . . learn practical information and set procedures. *Like maths problems that* . . . are like problems they have solved before and that use algorithms to produce a single solution. *Approach problem solving* . . . in a step-by-step manner. *Experience difficulty when* . . . maths becomes too abstract or when faced with non-routine problems. *Want a maths teacher who* . . . models new skills, allows time for practice and builds in feedback and coaching sessions.	**Interpersonal Maths Students . . .** *Want to* . . . learn maths through dialogue, collaboration and cooperative learning. *Like maths problems that* . . . focus on real-world applications and on how maths helps people. *Approach problem solving* . . . as an open discussion among a community of problem solvers. *Experience difficulty when* . . . instruction focuses on independent seatwork or when what they are learning seems to lack real-world application. *Want a maths teacher who* . . . pays attention to their successes and struggles in maths.
Understanding Maths Students . . . *Want to* . . . understand why the maths they learn works. *Like maths problems that* . . . ask them to explain, prove or take a position. *Approach problem solving* . . . by looking for patterns and identifying hidden questions. *Experience difficulty when* . . . there is a focus on the social environment of the classroom (e.g. on collaboration and cooperative problem solving). *Want a maths teacher who* . . . challenges them to think and who lets them explain their thinking.	**Self-Expressive Maths Students . . .** *Want to* . . . use their imagination to explore mathematical ideas. *Like maths problems that* . . . are non-routine, project-like in nature and that allow them to think "outside the box". *Approach problem solving* . . . by visualising the problem, generating possible solutions and exploring among the alternatives. *Experience difficulty when* . . . maths instruction is focused on drill and practice and rote problem solving. *Want a maths teacher who* . . . invites imagination and creative problem solving into the maths classroom.

SOURCE: Silver, Thomas, Perini (2003).

Organiser 3-A Support or Refute Organiser

Name: _____ **Date:** _____

Support or Refute Organiser

Name of text/article/information:

Statement 1:

Support	Refute

Statement 2:

Support	Refute

Statement 3:

Support	Refute

Statement 4:

Support	Refute

Statement 5:

Support	Refute

Examples

Figure 4.7 MATHEMATICS Writing Frames

Make a Comparison	• What are the key similarities and differences between area and perimeter? • The Box and Whiskers plot and bar graph below show the same information. Compare the two visual models in terms of how they convey data.
Access Prior Knowledge	• Think of a time when you or someone you know used maths to settle a dispute. Tell what the problem was and how maths was used to solve it. • Before we begin the next section on the Pythagorean Theorem, think about what you already know about the topic. On the left side of the paper, write down everything you know or think you know about the Pythagorean Theorem. On the right side, write at least one question you have about it.
Think About Learning or Feelings	• What part of our unit on projectiles have you enjoyed the most? What has been especially difficult for you? What might you do to help address your difficulties? • Which icon best represents your understanding of proportions?  Explain your selection. • How would it feel to be a remainder in a long division problem?
Hypothesise	• We have learned that when you multiply a postive number by a negative number, the product is also a negative number. What do you think happens when you multiply two negative numbers together? Why do you think that? • We no longer use Roman numerals in everyday life. Why do you believe this is the case?
Explain	• A rectangle must also be a parallelogram, but a parallelogram is not necessarily a rectangle. Why? • Any line can be written in standard form but not in slope-Intercept form (e.g. vertical lines). Why?