

The 5Es of Learning

The 5Es of Learning: Engage, Explore, Explain, Elaborate, Evaluate

The 5E instructional model is based on the idea that children learn best when they are able to work out concepts for themselves over a period of time, through various learning activities structured by the teacher. This idea is informed by a constructivist view of learning, in which students build connections between existing and new knowledge.

The way in which *Making Maths Accessible* incorporates the 5E instructional model is based upon research findings about how students learn maths. These findings indicate that students learn best when they have an opportunity to engage in explorations in a hands-on, minds-on environment in which they make and pose explanations for their discoveries.

See chapter five for an in-depth discussion of the 5E instructional model and a detailed 5E lesson plan on proportional relationships. Chapter six explains how to adapt a traditional textbook lesson to create high-quality instruction according to the 5Es of learning. Lesson plan templates are included as appendices.

Introduction

All students must have solid grounding in mathematics to function effectively in today's world. The need to improve the learning of traditionally underserved groups of students is widely recognized; efforts to do so must continue. Students in the top quartile are underserved in different ways; attention to improving the quality of their learning opportunities is equally important. Expectations for all groups of students must be raised. By the time they leave high school, a majority of students should have studied calculus. (Ball et al., 2005, p. 1056)

[Teaching mathematics requires] specialized mathematical skills . . . not the same set of math skills required to be a successful accountant, carpenter, or engineer. (Serwach, 2005)

The purpose of *Making Mathematics Accessible to Students With Special Needs* is to support everyone involved in mathematics education in becoming confident and competent with mathematics instruction and assessment so that as many students as possible will be able to access enrolled year-level mathematics. High-quality instruction and effective support for students are the most important components in making mathematics accessible for all students.

Reflection 4.6

Please respond to the following questions. Write from your heart, your beliefs and your past experience. Then compare your responses to those on page 141.

1. What accommodations for abstract reasoning difficulties do you provide in your classroom?
2. What additional accommodations might be useful for students with abstract reasoning difficulties?

Supporting Students With Organisational Deficits

Students with organisational deficits may not only be physically unorganised but also struggle with organising thoughts, ideas and information. Disorganised behaviours may be a sign of disorganised thinking. Students with organisational deficits may have difficulties recognising patterns or sequencing information. They may also struggle with management of assignments and materials. Tick the signs of organisational deficits in table 4.7 that you've seen in your classroom.

Table 4.7: Typical Signs of Organisational Deficits

Struggling to keep desk and backpack neat	
Easily distracted	
Lack of time-management skills	
Struggling to understand sequences of events	
Difficulty understanding what to do	
Struggling to classify information	
Inability to follow sequences of algorithms or other procedures	

Table 4.8 summarises ways to support students with organisational deficits. Tick those items that you use regularly in your classroom.

Table 4.8: Ways to Support Students With Organisational Deficits

Require many representations of the solution.	
Use graphic organisers.	
Minimise visual clutter on handouts and tests.	
Establish a clear routine.	
Provide examples of mathematical procedures.	
Model organised think-alouds.	

Graphic organisers are also essential. Advance organisers assist students in understanding mathematical relationships. Creating a graphic organiser

Table 5.2: Multiple Intelligences and the Phases of the 5E Lesson

	Engage	Explore	Explain	Elaborate	Evaluate
Linguistic (using words): Listening, speaking, writing, explaining					
Logical/mathematical (using numbers or logic): Problem solving, classifying, categorising, defining relationships, questioning					
Visual/spatial (using pictures): Creating charts, graphs, organisers, sketching, using manipulatives, interpreting visual images					
Musical (using music): Creating songs for mathematical procedures, using sounds, rhythms and patterns					
Intrapersonal (self-reflection): Journalling, evaluating thinking patterns, reasoning with themselves					
Interpersonal (using social experiences): Working in cooperative groups, problem solving with partners, teaching, creating mathematical problems for partner solving					
Bodily/kinesthetic (physical): Drilling using ball exercises, using manipulatives, physically creating shapes and constructs, doing physical experiments to develop mathematical relationships					
Naturalist (nature loving): Developing mathematical relationships using the natural world, classifying, categorising					

A 5E Lesson on Proportional Relationships

Figure 5.1 (page 100) summarises the objective, materials and preparation for our sample lesson on proportional relationships. See appendix B (page 147) for activity sheets to use with students for this lesson.

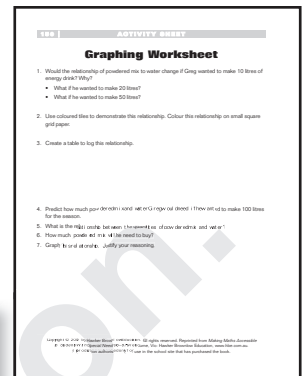
(Teacher note: Keep in mind the types of disabilities in your classroom. Using explicit instructions and scaffolding the activities, questions and features of each phase will allow your students with disabilities to successfully participate in this lesson.)

The important thing is not to stop questioning. Curiosity has its own reason for existing.

—Albert Einstein

Explore Phase

1. Distribute the Graphing Worksheet, grid paper and the Representation Template to each student.
2. Direct student groups to graph the relationship, justify their reasoning and publish their results on poster paper.



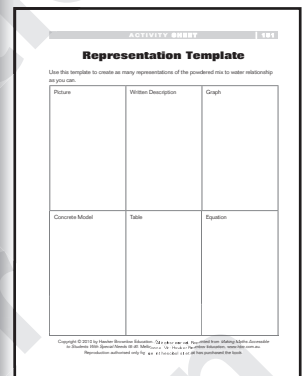
Facilitation Questions

As the powdered mix increases, does the amount of water stay the same, or does it increase?

How would you describe this relationship in words?

Possible average student response: The amount of water increases proportionally. You mix a certain amount of powdered mix for every litre of energy drink that you want to make.

Possible struggling student response: It increases, too. When you add more mix, add more water.



Task 5.2

Complete each section of table 5.4 for the Explore phase as directed. Compare your responses to those on page 142.

Table 5.4: Debriefing the Explore Phase of a 5E Lesson

Explain the Developmental Progression	Tick the Type(s) of Discourse Used	Describe the Activity	Create Questions That Would Facilitate Sense-Making
<p>What concepts does this phase explore?</p> <p>What vocabulary will students need?</p> <p>What accommodations could be included in this phase to make learning more accessible?</p>	<p>Student-Student</p> <p>Student-Teacher</p> <p>Teacher-Student</p>		