

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 fractional parts. 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.

Transformational Change

Making Mathematics Accessible to Students With Special Needs subscribes to the fundamental premises supported by mathematicians and mathematics educators in both the direct instruction and inquiry learning communities. These premises include the following:

- Students must be able to formulate and solve problems, including understanding the problem, translating the problem into a precise mathematical question, identifying and using appropriate methods to solve the problem, interpreting and evaluating the solution, and recognising problems that cannot be solved mathematically.
- Mathematical reasoning, justifying mathematical statements, and using mathematical terms and notation with degrees of precision appropriate to particular year levels are fundamental.
- Basic skills are vitally important for everyday uses, and serve as a critical foundation for higher-level mathematics. Students need both computational fluency and an understanding of the underlying mathematical ideas and principles (Ball et al., 2005, p. 2).
- Teachers' ability to help students understand and succeed with maths depends on their ability to hear and understand what students are thinking and to explain or show ideas in ways that are accessible to the students (Serwach, 2005).

Making Mathematics Accessible to Students With Special Needs is designed to increase teachers' capacity in making mathematics accessible to *all* students and supports changes in the delivery and support of special education services.

Here are three recommendations for reform to those services:

1. Focus on results—not on process.
2. Embrace a model of prevention—not a model of failure.
3. Consider children with disabilities as general education children first (President's Commission on Excellence in Special Education, 2001).

These recommendations are reflected in educational policies that have as their purpose to produce better outcomes for all children and to apply procedures with strong scientific bases to a wide range of decisions,

The 5E Instructional Model

Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.

—National Council of Teachers of Mathematics

If I have seen farther, it is by standing on the shoulders of giants.

—Isaac Newton

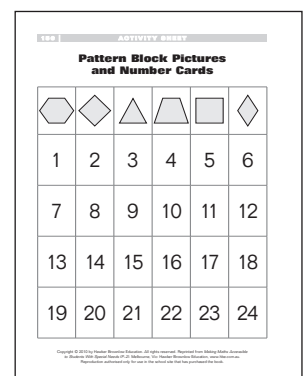
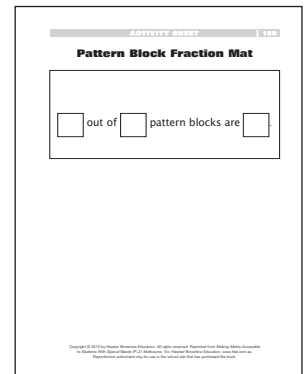
An effective lesson that provides the most impact on student achievement ensures that students are actively engaged in learning as well as reflecting on their learning to make sense of the activities. Learning something new or understanding something familiar in greater depth involves making sense of both our prior experiences and firsthand knowledge gained from new explorations. An effective lesson provides opportunities to use, extend and apply what is learned.

The Five E (5E) instructional model is a research-based lesson cycle that has been shown to increase student achievement. The 5E model was originally developed as a framework for developing inquiry-based lessons for science educators. However, because mathematics educators are embracing an inquiry approach to mathematics instruction, the 5E model can be used to implement high-quality, effective instruction for mathematics as well.

The 5E instructional model developed by Roger W. Bybee, past executive director of the National Research Council and the Center for Science,

Explore Phase

1. Arrange the students in pairs, and give each pair a set of pattern blocks and Pattern Block Pictures and Number Cards.
2. Prompt one student in each pair to grab a handful of pattern blocks and place them on the Pattern Block Fraction Mat. Ask the student to make sure that there are twelve or fewer pattern block pieces on the mat.
3. Prompt the other student to select one shape from the shapes on the mat. The student should place the Number Cards and appropriate Pattern Block Picture on the Pattern Block Fraction Mat to describe the relationship of that shape to all of the blocks on the mat.
4. Prompt the students to repeat the process numerous times to create several different sets of pattern blocks.
5. As the students are creating the sets, use the Teacher Anecdotal Record to observe the students' understanding of fractional parts of a set.



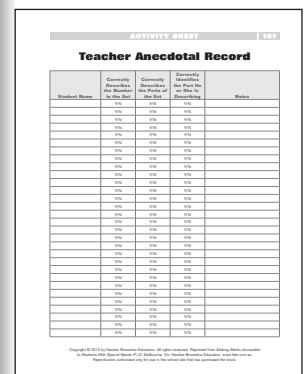
Facilitation Questions

How did you determine which number to put in the first box?
Possible average student response: I counted the number of shapes I was describing.
Possible struggling student response: I counted all of the shapes.

Tell me more about why you chose to put that number first.

How did you determine which number to put in the second box?
Possible average student response: This number was the total number of pattern blocks that were on the mat.
Possible struggling student response: I counted all of the triangles.

What makes you say that it should be _____ in the second box?



Reflection 5.3

Please respond to the following question. Write from your heart, your beliefs and your past experience. Then compare your response to that on page 150.

What are some additional activities you could use in this phase of the lesson to assist students in understanding the relationship of the concrete representation to the number sentence?

Evaluate Phase

1. Provide each student with a copy of the performance assessment called Fractional Set of Objects. You may also wish to distribute the Problem Solver from appendix C (page 198) to each student.
2. Prompt the students to cut out the pictures in order to create a fractional set of objects. The students do not have to use all of the pictures.
3. Prompt the student to use words and the fractional representation to describe the set of objects (see fig. 5.7).
4. A student rubric is included in appendix C (page 197) to use when evaluating student work.

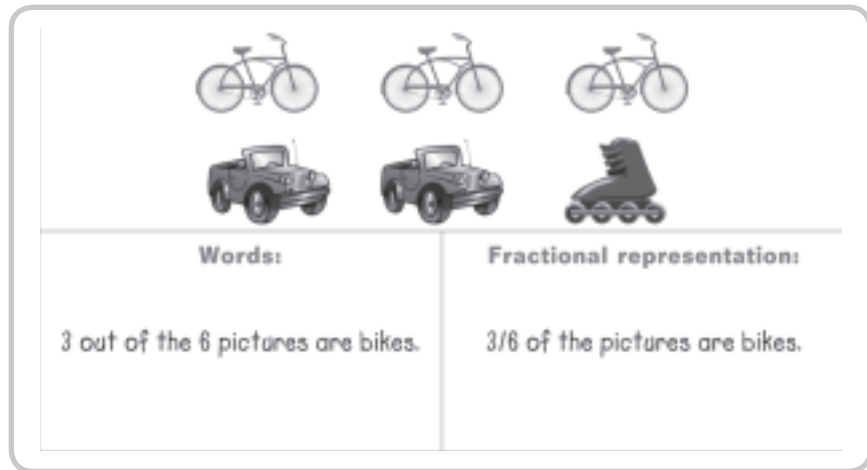
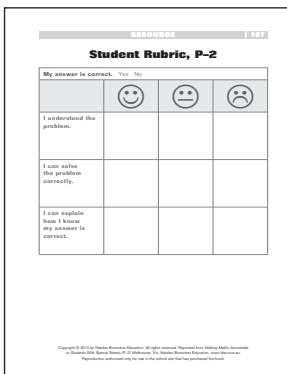
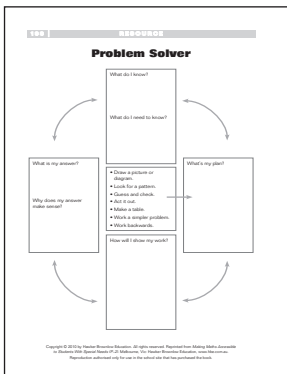
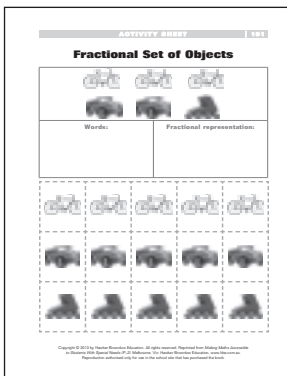


Figure 5.7: Sample completed performance assessment.