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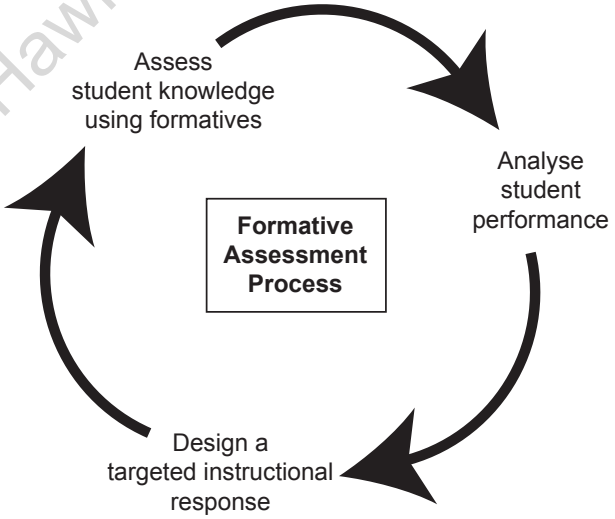
What Is Formative Assessment?

Formative assessment drives mathematics instruction and is a key component in *Response to Intervention*. It is the process in which evidence of students' understanding is used by teachers to adjust instructional practice (Popham, 2008). As practitioners, we routinely monitor student performance on specific outcomes and learning goals. Formative assessments are employed to measure student performance so as to provide a targeted instructional response. Monitoring student learning through formative assessments provides a gauge, pinpointing where students are on the pathway of acquiring new knowledge. Their performance on these assessments provides work samples to analyse. The samples enable us to see where students are in comparison to where they need to be to meet the learning goal. Only through this process, are we equipped to provide an effective and meaningful instructional response. Without formative assessment, lesson planning is focused solely on curriculum with little regard for students' explicit academic needs.

How Does Formative Assessment Impact Student Achievement?

Effective formative assessment occurs simultaneously with instruction for the purpose of improving students' knowledge and performance in mathematics. When formative assessment is implemented properly, students learn what is being taught to a substantially greater degree (Black & Wiliam, 1998). When we provide feedback to students as a result of formative assessment, it is the most powerful factor in enhancing student achievement (Hattie & Jaeger, 1998). The National Mathematics Advisory Panel (2008) recommends regular use of formative assessment so that instruction can be adapted based on student progress. "Teachers' regular use of formative assessment improves their students' learning, especially if teachers have additional guidance on using the assessment to design and individualize instruction" (2008, p. xxiii). This book provides such guidance for teachers through a three-phase format of assessment, analysis and response as illustrated below.



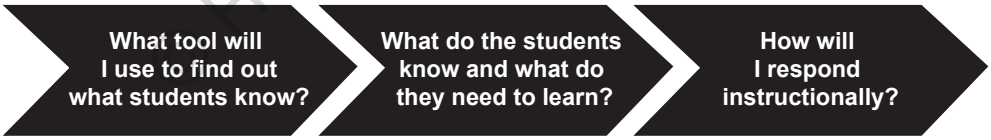
As practitioners, we experience tremendous pressure to "cover" the curriculum in a timely manner. Unfortunately, this sometimes translates to a practice of teaching *curriculum* rather than teaching *children*. Teaching and learning form a dynamic alliance that is reliant on the interactions between teachers and students. These interactions serve as feedback to teachers and inform next steps for instruction designed to advance learning. In order to efficiently and effectively teach children, we must understand what they already know in order to plan meaningful next steps.

We have heard teachers lament about this process and become overwhelmed at the prospect of providing differentiated instruction for individual students. Advocating an individualised instructional program is neither realistic nor appropriate for most classroom teachers. All students are entitled to instruction designed to meet their identified needs, but this does not have to translate into a one-on-one instructional setting. Students can be grouped according to similar instructional needs. When analysing student understanding of a maths concept for an entire class, patterns and trends emerge and students' needs are often revealed in clusters. There may be times when we need to work with an individual student to reteach a concept or clear up a misconception; however, often there is a small group of students for whom the data show similar academic needs.

How Is This Book Organised?

Using Formative Assessment to Drive Mathematics Instruction in Years 3–5 contains seven chapters. The first chapter identifies the purpose and intentions of this book by describing formative assessment and highlighting the impact of the process on student performance. Chapters 2 to 6 outline a process for the use of formative assessment to inform instruction. Each of these chapters addresses one of five content areas in mathematics: number and operations; algebraic thinking; geometry; measurement; and data analysis and probability. Within each content area, key mathematics concepts are highlighted. Chapter 7 is a brief conclusion with final comments of the formative assessment process.

The formative assessment process in Chapters 2 to 6 is presented in a three-page format for each highlighted skill or concept. Each of the three pages is designed to answer the following questions regarding student performance and mathematics instruction:



The formative assessments, student work samples and suggested activities are provided for each mathematics concept to help teachers respond to these questions when planning instruction. Each is a deliberate step towards implementing effective mathematics instruction.

The **first** page in the three-page design illustrates a common sample of a *Traditional Formative Assessment* that one might find in a textbook or teacher resource (see Figure 1). Just below the assessment item is a *Limitations* note cautioning potential shortcomings of the traditional

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Number & Operations: Place Value

Traditional Formative Assessment

What is the value of 7 in 470,853?

- ○ 700,000
- ○ 70,000
- ○ 7000
- ○ 700

Limitations: A correct response could simply be a lucky guess. In addition, students choosing the same incorrect answer may have different instructional needs.

Enhanced Formative Assessment

Record two numbers greater than **470,853** using exactly the same digits. Explain how you know your numbers have a greater value.

Number & Operations: Place Value

Adam Record two numbers greater than **470,853** using exactly the same digits. Explain how you know your numbers have a greater value. 999,999 888,888 These are the biggest numbers you can make.	Bianca Record two numbers greater than **470,853** using exactly the same digits. Explain how you know your numbers have a greater value. 4,708,530 47,085,300 Longer numbers are bigger.
Adam's numbers are in fact larger than the number provided. However, by not using the digits provided, it is difficult to evaluate his understanding of place value. Instructional Focus: **Rebuild**	Bianca simply adds zeros to the original number in order to get a larger number, using too many digits rather than rearranging the digits to manipulate the place value. Instructional Focus: **Core 1**
Colin Record two numbers greater than **470,853** using exactly the same digits. Explain how you know your numbers have a greater value. 875,430 First, I put the digits in order from biggest to smallest so I would have the biggest number.	Diandre Record two numbers greater than **470,853** using exactly the same digits. Explain how you know your numbers have a greater value. 740,853 704,853 I just switched the first 2 numbers because 700,000 > 400,000. Then I switched the 10,000 and 1000 digit for the second number for the same reason.
Colin uses the digits to create a single new number with a greater value. Instructional Focus: **Core 2**	Diandre correctly rearranges the digits to create two values larger than the original. Instructional Focus: **Challenge**

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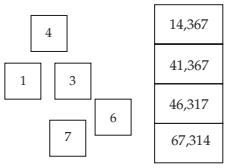
Number & Operations: Place Value

	Rebuild Focus	Core 1 Focus	Core 2 Focus	Challenge Focus
	Digit Switch	**Same Digits, Different Value**	**Number Sandwich**	**Target Difference**
Goal	Represent different values using the same digits	Sequence numbers according to value	Identify values between 2 numbers	Find the difference between 2 numbers
Materials	♦ Place value manipulatives such as Base Ten or Digi-Blocks ♦ Numeral cards 0–9 (see page 103)	♦ Numeral tiles (0–9) in a cup ♦ Sticky notes	♦ Six decahedron dice or 0–9 spinner (see page 103)	♦ Deck of playing cards (Ace through 9)
Suggested Activity Directions	Provide students with place value manipulatives. Shuffle numeral cards (0–9) and ask students to flip 4 cards over to make a 4-digit number. Ask students to represent the value using the place value manipulatives. Students switch the placement of 2 of the cards and discuss how the blocks must change to match the value of the new quantity. **1234** **2134**	Ask students to randomly draw 5 numeral tiles from a cup (containing tiles 0–9). Use the tiles to make a number and record on a sticky note. Rearrange the same tiles to create a different number. Record on a sticky note. Continue until 4 different numbers are made. Arrange the sticky notes in order from the least to the greatest value. 	Ask students to roll 6 decahedron dice (0–9) and create a numeral. Repeat. Then ask students to identify 3 values that fall between the 2 values rolled. Prompt students to discuss how to generate potential numbers sandwiched between the numbers rolled.  **435,907** 436,000 501,654 543,210 **605,301**	Flip several playing cards over to generate a 6-digit number. Explore with students the difference between the original number and a new number created by switching 2 cards. Discuss how the difference changes when switching cards. Provide students with a target difference and ask them to decide which switch would result in the number closest to the target difference. **435,907** Which two digits should be switched to create a difference of about 200?
Questions to Assess	♦ How will the blocks change? Why? ♦ How did the switch in digits affect the value?	♦ What do you have to think about to put the values in order from least to greatest? ♦ What if the first 2 digits are the same?	♦ What 3 values can be sandwiched between the values rolled? ♦ How would you justify that they fit in the middle?	♦ How did you decide which 2 digits to switch? ♦ Which 2 digits would you switch to get the greatest difference? The least difference?