NEXT STEPS

Using the Assessment Resource Banks for Formative Assessment

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Assessment Resource Banks
English, Mathematics, and Science

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Introduction

The Assessment Resource Banks (ARBs) have come a long way.

The ARBs have been available to teachers since the 1990s. Since then our understanding of assessment has broadened, and the focus today is much more on the ARBs as a powerful tool for **assessment for formative purposes**. This booklet is intended to help you, the teachers, to use the ARBs to support formative assessment in classrooms.

The New Zealand Council for Educational Research (NZCER) has delivered the ARBs to New Zealand schools from the start, under contract to the Ministry of Education. The ARBs:

- are an on-line assessment resource
- cover three curriculum areas – mathematics, science, and English
- cater for Levels 2–5
- are provided free to New Zealand schools
- are trialled in New Zealand schools
- are constantly updated and added to (their relevance to the new curriculum is considered during this process)
- include over 3500 resources.

In the early days the resources were mainly either multiple-choice or brief constructed-response questions. Teachers' information consisted of the correct answers, a suggested mark, and, later, a difficulty level abstracted from the trial data. Gradually, however, the focus has moved more to classroom tasks rather than "test" items. This was formalised in 2003, when the Ministry of Education contract stipulated that the focus should be on formative assessment.

Many of the older resources still remain on the ARBs. This booklet focuses on resources developed from 2003.

Additional copies of this booklet can be downloaded from the ARB website's Home page:
http://arb.nzcer.org.nz/

What do we mean by formative assessment?

The term *formative assessment* has been around for some time and will be familiar to most of you. Much useful material about formative assessment is available to New Zealand teachers. However, because this booklet is specifically about using the ARBs for formative assessment, we think it is important to clarify what underpins the design of these resources.

> An assessment activity can help learning if it provides information to be used as feedback, by teachers, and by their pupils … to modify the teaching and learning activities in which they are engaged. Such assessment becomes formative assessment when the evidence is actually used to adapt the teaching work to meet learning needs.
>
> (Black, Harrison, Lee, Marshall, and Wiliam, 2002)

The purpose of formative assessment is to promote student learning. Formative assessment is sometimes referred to as assessment for learning. Any task performed by a learner, ranging from a formal standardised test to an informal discussion between teacher and learner, or between learners, has the potential to be formative *if the information gained is used to inform what happens next in the classroom.* The assessment tasks may be planned, or the teacher may "seize the teaching moment" as it occurs during interactions with students.

The word *assessment* comes from the Latin *assidere*, meaning "to sit beside or with" (Wiggins, 1993). This conjures an image of a teacher (or peer or parent) sitting and talking with students about their learning in an attempt to really understand what is happening as they are learning. It is something that good teachers have always done, but is often not seen as assessment. It informs teachers' professional judgement about their students.

This view of assessment *during learning* underpins the ARB resources. The ARB assessment tasks have been designed to be carried out as part of normal classroom activities. They help you to make sense of what students are saying, doing, and thinking, and to make decisions about what to do next. They can also be used to help students to reflect on their learning *as* they are learning.

Making a difference with formative assessment

Formative assessment has been under the research spotlight both in New Zealand and internationally. Many studies show that the following characteristics are likely to promote or inhibit learning.

Factors that promote learning:

- constructive and timely feedback to students that focuses on not only what they need to do to improve, but also how to go about doing so
- active involvement of students in their learning
- the use of students as a learning resource for one another, including having them work collaboratively on learning tasks that have a shared group goal
- the information gained from carrying out the task results in deliberate adjustments to teaching and learning
- the assessment impacts positively on student motivation – involving students in self-assessment is beneficial for motivation and learning.

Factors that inhibit learning:

- assigning marks, as opposed to providing feedback aimed at improving learning
- comparing students to each other, instead of focusing on their own progress
- emphasising recall of isolated facts rather than understanding the "big picture"
- over-emphasising quantity and presentation rather than the quality of the learning.

Effective formative assessment is dependent on three teacher-related factors:

- engaging with students as they talk about their learning
- the ability to analyse what student responses could mean in terms of their understanding
- knowing what action to take next.

What skills and knowledge do teachers need?

Cowie and Bell (1999) have documented three facets of formative assessment involving different skills and knowledge that teachers require.

Eliciting

Recognising what is important to assess

Knowing the best way to get the information

Interpreting

Recognising when students don't "get it"

Understanding why they are having difficulty

Acting

Having strategies for helping students to learn

Formative assessment, then, is complex. The ARBs can provide a starting place for extending your ability to interact with students in specific contexts.

Where do the ARBs fit in your assessment toolbox?

Standardised tests such as asTTle and PAT generally give some indication of student achievement over a range of concepts or skills. ARB tasks and teacher-developed tasks, on the other hand, have the potential to investigate a narrow focus at greater depth.

Standardised tests (e.g., asTTle, PAT):

- provide a picture of students' strengths and weaknesses
- identify areas for further investigation
- can be used to monitor progress over time.

Classroom tasks
(e.g., ARB tasks):

- drill down to find out more about a specific aspect of learning (fine-grained assessment).

It is important to have a balance between day-to-day assessments that focus on in-depth understandings and keeping learning on track, and less frequent, more formal assessments that provide information about general progress (Wiliam, 2006). The ARBs are best suited to the first category.

What is in each ARB resource?

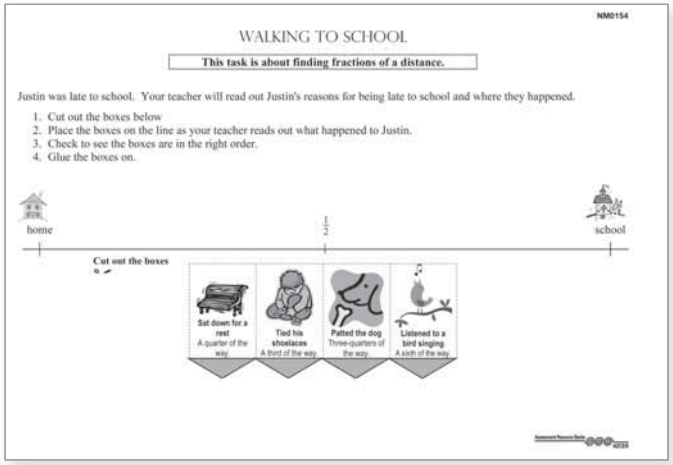
There are two parts to each ARB resource: the student task and *Teacher information*. Each resource focuses on a specific concept or skill.

The tasks are designed to reveal students' thinking, what strategies they might be using to get to an answer, and possible barriers to learning. There is less emphasis on correct answers. The tasks also model a variety of strategies that are useful for formative assessment, which you can adapt to use when you are designing your own classroom tasks.

The *Teacher information* pages provide support for making sense of students' responses, providing feedback, and making decisions about what to do next.

Both the design of the tasks and the teacher information are based on New Zealand and international research, and trialling the resources in schools. In some cases significant research has been summarised or organised to provide further support material. Where relevant, links are made between this material and the resources themselves.

➜ Student tasks



NM0154

WALKING TO SCHOOL

This task is about finding fractions of a distance.

Justin was late to school. Your teacher will read out Justin's reasons for being late to school and where they happened.

1. Cut out the boxes below
2. Place the boxes on the line as your teacher reads out what happened to Justin.
3. Check to see the boxes are in the right order.
4. Glue the boxes on.

home — school

Cut out the boxes

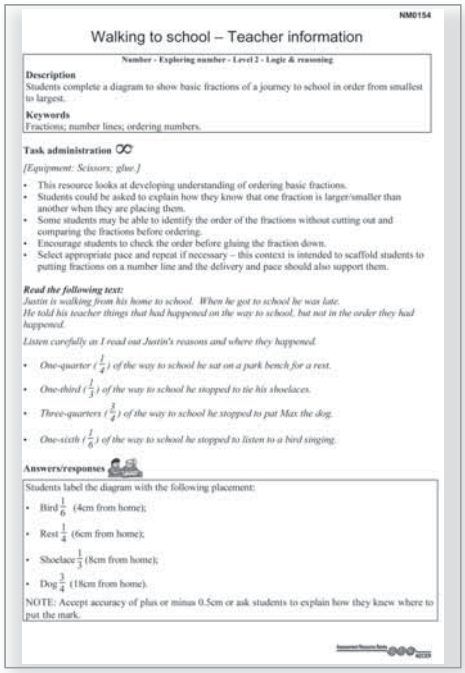
Sat down for a rest — A quarter of the way

Tied his shoelaces — A third of the way

Patted the dog — Three-quarters of the way

Listened to a bird singing — A sixth of the way

➜ Teacher information



NM0154

Walking to school – Teacher information

Number - Exploring number - Level 2 - Logic & reasoning

Description
Students complete a diagram to show basic fractions of a journey to school in order from smallest to largest.

Keywords
Fractions; number lines; ordering numbers.

Task administration

[Equipment: Scissors; glue.]

- This resource looks at developing understanding of ordering basic fractions.
- Students could be asked to explain how they know that one fraction is larger/smaller than another when they are placing them.
- Some students may be able to identify the order of the fractions without cutting out and comparing the fractions before ordering.
- Encourage students to check the order before gluing the fraction down.
- Select appropriate pace and repeat if necessary – this context is intended to scaffold students to putting fractions on a number line and the delivery and pace should also support them.

Read the following text:
Justin is walking from his home to school. When he got to school he was late.
He told his teacher things that had happened on the way to school, but not in the order they had happened.

Listen carefully as I read out Justin's reasons and where they happened.

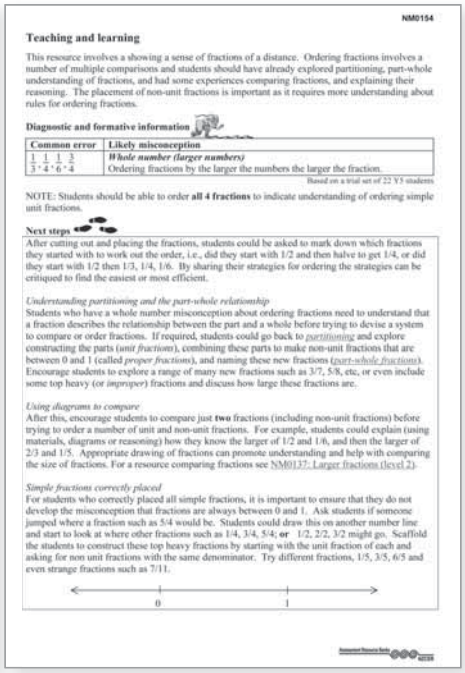
- *One-quarter ($\frac{1}{4}$) of the way to school he sat on a park bench for a rest.*
- *One-third ($\frac{1}{3}$) of the way to school he stopped to tie his shoelaces.*
- *Three-quarters ($\frac{3}{4}$) of the way to school he stopped to pat Max the dog.*
- *One-sixth ($\frac{1}{6}$) of the way to school he stopped to listen to a bird singing.*

Answers/responses

Students label the diagram with the following placement:

- Bird $\frac{1}{6}$ (4cm from home);
- Rest $\frac{1}{4}$ (6cm from home);
- Shoelace $\frac{1}{3}$ (8cm from home);
- Dog $\frac{3}{4}$ (18cm from home).

NOTE: Accept accuracy of plus or minus 0.5cm or ask students to explain how they knew where to put the mark.



NM0154

Teaching and learning

This resource involves a showing a sense of fractions of a distance. Ordering fractions involves a number of multiple comparisons and students should have already explored partitioning, part-whole understanding of fractions, and had some experiences comparing fractions, and explaining their reasoning. The placement of non-unit fractions is important as it requires more understanding about rules for ordering fractions.

Diagnostic and formative information

Common error	Likely misconception
$\frac{1}{3}$ * $\frac{1}{4}$ * $\frac{1}{6}$ * $\frac{1}{4}$	***Whole number (larger numbers)*** Ordering fractions by the larger the numbers the larger the fraction.

Based on a trial set of 22 Y5 students

NOTE: Students should be able to order **all 4 fractions** to indicate understanding of ordering simple unit fractions.

Next steps

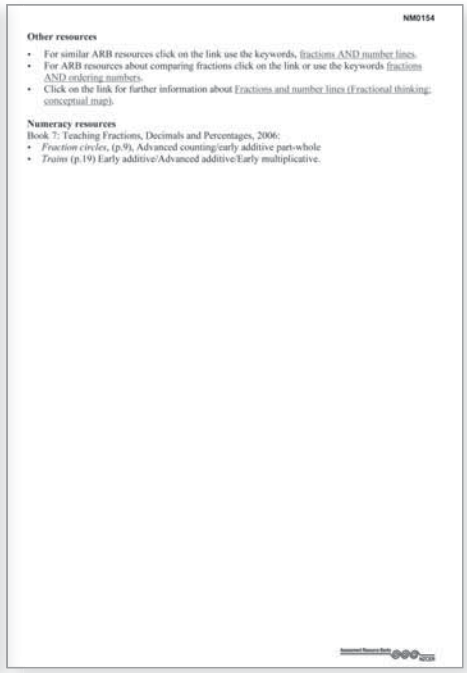
After cutting out and placing the fractions, students could be asked to mark down which fractions they started with to work out the order, i.e., did they start with 1/2 and then halve to get 1/4, or did they start with 1/2 then 1/3, 1/4, 1/6. By sharing their strategies for ordering the strategies can be critiqued to find the easiest or most efficient.

Understanding partitioning and the part-whole relationship
Students who have a whole number misconception about ordering fractions need to understand that a fraction describes the relationship between the part and a whole before trying to devise a system to compare or order fractions. If required, students could go back to *partitioning* and explore constructing the parts (*unit fractions*), combining these parts to make non-unit fractions that are between 0 and 1 (called *proper fractions*), and naming these new fractions (*part-whole fractions*). Encourage students to explore a range of many new fractions such as 3/7, 5/8, etc, or even include some top heavy (or *improper*) fractions and discuss how large these fractions are.

Using diagrams to compare
After this, encourage students to compare just **two** fractions (including non-unit fractions) before trying to order a number of unit and non-unit fractions. For example, students could explain (using materials, diagrams or reasoning) how they know the larger of 1/2 and 1/6, and then the larger of 2/3 and 1/5. Appropriate drawing of fractions can promote understanding and help with comparing the size of fractions. For a resource comparing fractions see NM0137: Larger fractions (level 2).

Simple fractions correctly placed
For students who correctly placed all simple fractions, it is important to ensure that they do not develop the misconception that fractions are always between 0 and 1. Ask students if someone jumped where a fraction such as 5/4 would be. Students could draw this on another number line and start to look at where other fractions such as 1/4, 3/4, 5/4; **or** 1/2, 2/2, 3/2 might go. Scaffold the students to construct these top heavy fractions by starting with the unit fraction of each and asking for non unit fractions with the same denominator. Try different fractions, 1/5, 3/5, 6/5 and even strange fractions such as 7/11.

0 — 1



NM0154

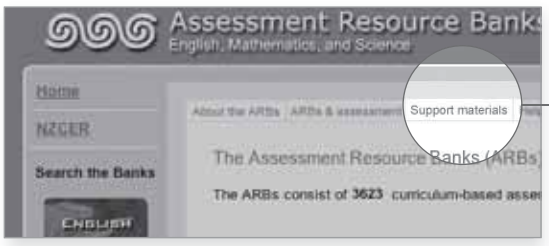
Other resources

- For similar ARB resources click on the link use the keywords, fractions AND number lines.
- For ARB resources about comparing fractions click on the link or use the keywords fractions AND ordering numbers.
- Click on the link for further information about Fractions and number lines (Fractional thinking: conceptual map).

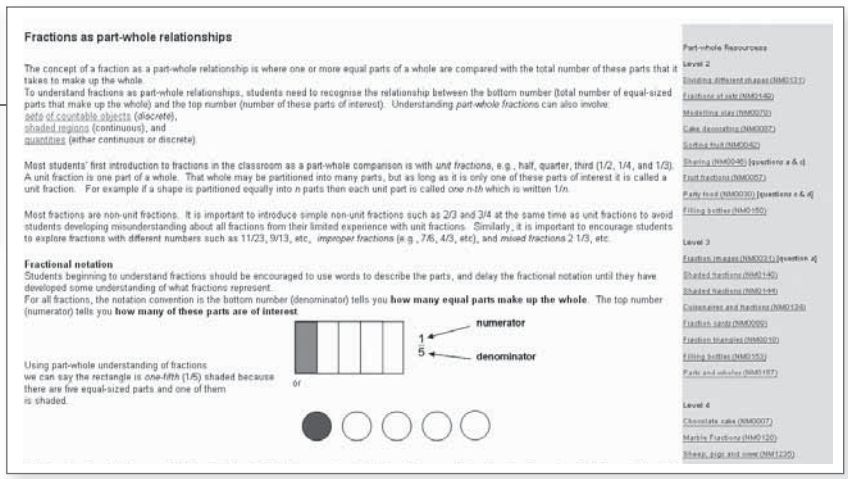
Numeracy resources
Book 7: Teaching Fractions, Decimals and Percentages, 2006:

- *Fraction circles*, (p.9), Advanced counting/early additive part-whole
- *Trains* (p.19) Early additive/Advanced additive/Early multiplicative.

➜ Support material



Support material can be accessed from the drop down menu at the top of pages.



Fractions as part-whole relationships

The concept of a fraction as a part-whole relationship is where one or more equal parts of a whole are compared with the total number of these parts that it takes to make up the whole.
To understand fractions as part-whole relationships, students need to recognise the relationship between the bottom number (total number of equal-sized parts that make up the whole) and the top number (number of these parts of interest). Understanding *part-whole fractions* can also involve:
sets of countable objects (*discrete*),
shaded regions (continuous), and
quantities (either continuous or discrete).

Most students' first introduction to fractions in the classroom as a part-whole comparison is with *unit* fractions, e.g., half, quarter, third (1/2, 1/4, and 1/3). A unit fraction is one part of a whole. That whole may be partitioned into many parts, but as long as it is only one of these parts of interest it is called a unit fraction. For example if a shape is partitioned equally into *n* parts then each unit part is called *one n-th* which is written 1/*n*.

Most fractions are non-unit fractions. It is important to introduce simple non-unit fractions such as 2/3 and 3/4 at the same time as unit fractions to avoid students developing misunderstanding about all fractions from their limited experience with unit fractions. Similarly, it is important to encourage students to explore fractions with different numbers such as 11/23, 9/13, etc, *improper* fractions (e.g., 7/6, 4/3, etc), and *mixed* fractions 2 1/3, etc.

Fractional notation
Students beginning to understand fractions should be encouraged to use words to describe the parts, and delay the fractional notation until they have developed some understanding of what fractions represent.
For all fractions, the notation convention is the bottom number (denominator) tells you **how many equal parts make up the whole**. The top number (numerator) tells you **how many of these parts are of interest**.

Using part-whole understanding of fractions we can say the rectangle is *one-fifth* (1/5) shaded because there are five equal-sized parts and one of them is shaded.

numerator
denominator
or

Part-whole Resources
Level 2
Dividing different shapes (NM0131)
Fractions of sets (NM0140)
Modelling play (NM0079)
Cake decorating (NM0007)
Sorting fruit (NM0042)
Sharing (NM0046) [questions a & c]
Fruit fractions (NM0057)
Party food (NM0030) [questions c & d]
Filling bottles (NM0150)
Level 3
Fraction images (NM0231) [question a]
Shaded hardlines (NM0140)
Shaded hardlines (NM0144)
Colouring and hardlines (NM0126)
Fraction cards (NM0090)
Fraction triangles (NM0010)
Filling bottles (NM0153)
Parts and wholes (NM0187)
Level 4
Chocolate cake (NM0007)
Marble Fractions (NM0120)
Sheep, pigs and cows (NM1235)

Making the most of formative opportunities provided by the ARB resources

ARB tasks are specifically designed to provide support for teachers to help their students with their learning. However, the tasks by themselves are not formative. It is what you, the teacher, and/or the learner do with the information gained from doing the task that makes it formative.

If, for example, a student completes an English comprehension task, this can be regarded as a performance. If the performance is analysed and indicates that the student has difficulty making inferences, then an assessment judgement has been made. If you or the student then use that judgement to decide to concentrate on using clues in the text to infer the characters' feelings, then the task has been put to formative use. This can apply not only to formal written tasks, but also to group discussions, informal interactions, and just noticing what students are doing and saying (Newton, 2007).

If we go back to Cowie and Bell's model of eliciting, interpreting, and acting, then we can see that completing an ARB task provides the opportunity to "elicit" or find out what the student knows and can do, the *Teacher information* pages help with "interpreting" the student's responses, and the "acting", when you and/or the learner decide what needs to happen next, is using the assessment information for formative purposes.

How you use the tasks, therefore, is the really important factor in whether they achieve the aim of helping students to learn. With this in mind, this section takes a look at ways to maximise formative opportunities, and how specific features of the resources can support you to do so.

Checking the assessment focus

When you are choosing a task it is important to check that it has the same assessment focus as what you want to investigate. A description of the task and what it is assessing appears at the top of the *Teacher information* page.

➜ **EXAMPLE:** English (WL2557)

Written language – Close reading – Level 2 – Thinking critically

Description

Students are assessed on their ability to identify the main idea of a narrative concerning one child's experience of White Sunday in Sāmoa.

Keywords

Main idea; visual language; narrative; recount.

Sharing the assessment with students provides cues for what they need to attend to as they complete the task. You are then more likely to gain relevant information about what they know and can do.

At the beginning of each task there is a brief description, in student-friendly terms, of what the task is assessing. For example:

This task is about looking for important information that will help you find the main idea of the text.

Our experience shows that students often don't pay much attention to this unless the teacher talks to them about it before they begin. Discuss with them what they need to focus on as they are carrying out the task.

If the assessment focus doesn't match your target, you may still be able to use or adapt the task, but you will need to change the description on the student page. Of course the *Teacher information* may now no longer be relevant.

Considering the learners

Although the resources have all been trialled with students of the appropriate age level, there may be some in your class who need support to enable them to show what they know and can do in terms of the assessment focus. By all means provide scaffolding for students who may face barriers to carrying out the task, but check that this will not compromise the integrity of the assessment.

Depending on what barriers there may be to a student completing a task, some of the ways that might be suitable for providing support are:

- completing the task co-operatively
- completing the task orally
- reading the instructions to the student
- having them dictate their answers
- rewording the language
- checking if there is a similar task at a lower level
- simplifying the task.

Working through the article on *Thinking about how language works* may help you to understand the language demands of the resources. This can be located in the *Support material*, which is accessed from the drop-down menu at the top of the website pages.

EXAMPLE: Thinking about how language works (Support material)

Compound, complex, and compound-complex sentences as a source of difficulty in comprehension

Students need to know the meaning of the conjunctions and other linking words if they are to appreciate the relationship between the ideas.

> Research indicates that many students don't fully recognize these relationships and therefore have difficulty in following the meaning of a text. It has been found for example the conditional "if" is understood by only fifty percent of children at age six; that the meaning of "unless" is often not understood well until after the age of nine; and it is generally not until around twelve years of age that many children comprehend the concessive use of "although". (Deriwianka, 2005, p.95)

Other students may benefit from being given additional or more open questions that allow them to demonstrate the full extent of their knowledge. Incorporating questions from a higher level with a similar assessment focus may be one way to do this.

Making changes to a resource is easy if you use the MSWord version (accessed from the top of the student task).

Changing a resource

There are times when you may want to make changes to a resource to make it more appropriate for your learners. This is easily done by using the MSWord feature.

At the top of the student page is a button 

Use this to download the Word version. Save this on your computer. You can then change the task to meet the needs of your learners.

Note that in the MSWord version the *Teacher information* pages are incorporated in the same document as the student task.

Hint: The MSWord version of any task is also the best looking one to print off for your students.

Providing opportunities for learning conversations

An important part of assessment for learning is talking with students about their ideas. You will learn far more about what they know and can do if you have these conversations. This can be done individually, in small groups, or with the whole class. Use the information and suggested questions on the *Teacher information* pages to guide the conversations.

➜ **EXAMPLE:** Mathematics (NM1245)

> Have students share their strategies for working out their estimates. If students say that they "just guessed", ask them how they knew it was "about 30". Encourage answers within a range – "it was more than 30 but less than 50".

Research shows that working with peers can be very powerful for students' learning, and just as relevant for helping students to think about what they need to do next as feedback from teachers. Consider at what points the students could work on tasks collaboratively, or discuss their ideas with one another. Many of the ARB resources suggest co-operative tasks, peer assessments, or discussion points, and you can include opportunities for these when you are planning how a resource will be used in your classroom.

"I don't know", "I guessed", and "It depends" type answers can provide a fruitful basis for beginning learning conversations. Some resources have provision for capturing these sorts of responses.

➜ **EXAMPLE:** Science (PE9537)

d) Which of the following changes could happen if the greenhouse effect gets bigger?
Only select "Yes" or "No" if you are certain you are right. If you are not sure, choose the "Don't know" option, so the class can discuss this idea later.

Possible enhanced greenhouse effect	Yes	No	Don't know
a) New Zealand will be sunnier overall			
b) New Zealand will have less rain overall			
c) More people will get skin cancer			
d) The air will get dirtier			
e) Sea levels will rise around our coast			
f) Violent storms will happen more often			
g) Winters will get colder in New Zealand			
h) Our glaciers will shrink			

Providing opportunities for students to make decisions about their own learning

Research also shows that encouraging students to reflect on their learning is an important part of improving learning power.

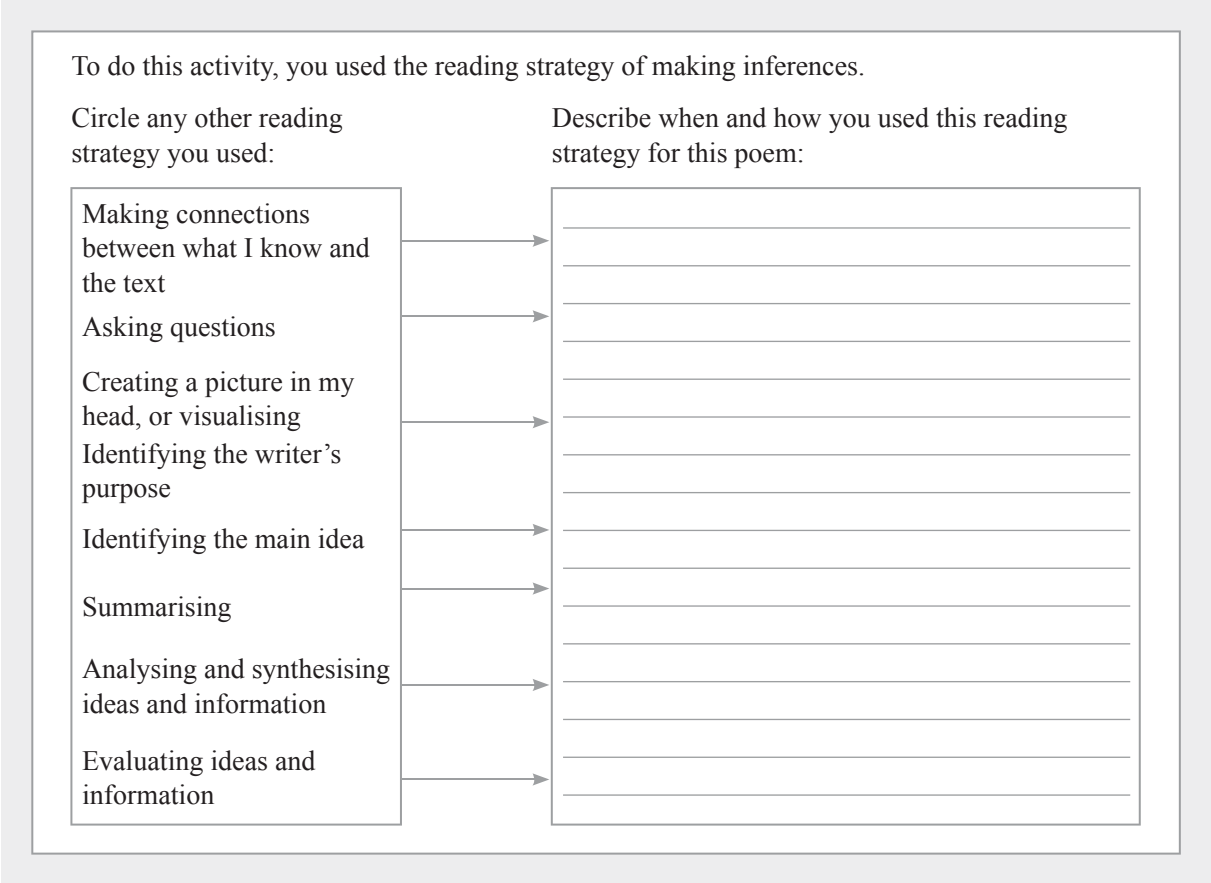
Self-assessment doesn't necessarily have to be a written task. Discussion starters that ask students to further explain their responses can be another way of encouraging students to think about their learning: for example:

- Tell me more.
- Why do you think that?
- Can you justify that?

- What was difficult about that task?
- Explain why you agree / don't agree.
- What else do you need to know?
- What do you think you need to do next?
- What did you learn from doing this task?

Many ARB resources include either specific self-assessment tasks or suggestions for students to evaluate their responses. You may also use ideas from the *Teacher information* pages to encourage students to reflect on their own learning.

➜ **EXAMPLE:** English (WL4044)



Analysing student responses

Interpreting students' responses to identify their strengths and weaknesses is challenging, for several reasons.

- One piece of evidence might not be sufficient to make a valid judgement, although it may give you some clues. An assessment task will only provide an *opportunity* for students to communicate their skills, knowledge, and understanding, and that opportunity may or may not be fully taken by them. They may also find it difficult, for a variety of reasons, to effectively communicate what they do understand. For this reason it is always best to keep an open mind about what the response is showing, and remember that talking to a student may provide additional evidence.
- You need to have a good understanding of the concept/skill yourself to identify strengths and weaknesses, and to know what questions to ask to prompt students.
- It is helpful to know where students commonly have problems, so that you can be alert for these.
- Knowing whether the answer given is "right" or "wrong" is only of limited use for formative purposes. It is more helpful to know the "degree of rightness", or where students are coming from when they make a wrong response, if you are to help them take the next learning step. In other words, you need to know how they are thinking, and why.

Obviously the more background knowledge you have, the better you will be able to analyse the student responses. The *Teacher information* pages are a good place to start. From the trials of each resource in classrooms, national trialling, and national and international research, we can provide some or all of the following features to support using assessment for learning:

- a range of responses that students may make

EXAMPLE: Mathematics: (NM1234)

(The task is about the strategies students use to calculate different heights on a building.)

For any **1** of the following explanations:: • added the 50% and the 25% to get 75%; • 100% – 25%; • 7 lots of 10% and half of 10% (5%); • other correct explanation.
For any **1** of the following explanations:: • added the 25% and the 10% to get 35%; • 3 lots of 10% and half of 10% (5%); • other correct explanation.

- an indication of how difficult trial students found the question (only for those resources trialled nationally)

EXAMPLE: English (WL2544)

(The task was about making inferences about character based on evidence.)

Student suggests any **4** beliefs of Uncle Hugh's, e.g., • Having royal families wastes money. • War wastes money and lives. • War makes profits for factory owners. • Money should go to people who need better housing. • Communists aren't the enemy/He supports communism. • The Korean war is making American millionaires richer.	Suggests: 4 beliefs – moderate; 2−-3 beliefs – easy; 1 belief – very easy

Difficulty levels provide a broad indication of areas that students might need some support with or, conversely, an area that you could expect most students can achieve. They are not aligned to the curriculum levels.

Keep in mind that the trial students were randomly selected, and might not have been familiar with the assessment focus or the context. This particularly applies to resources that explore new areas of the curriculum.

- an analysis of what particular responses may mean in terms of student understanding

EXAMPLE: Science (LW2054)

(The task was about reading a food web.)

Most students did not seem to know that the arrows on food webs (and food chains) are a shorthand way of signalling the directional flow of energy. The most common response was that arrows show "what eats what". One school was an exception to this pattern, with most students in that school able to say the arrows represented energy flow. (These students were also the most likely to mention photosynthesis in question a) and/or b).)

Although the meaning of the arrows is a small point, it encapsulates an important nature of science idea, linked to the key competency **Using Languages, Symbols and Texts**. That is, scientists agree conventions for commonly used symbols and then all use an agreed symbol in the same way. This idea is covered by AA3 of the new integrating strand of the revised draft science curriculum.

- common misconceptions or partial understandings students may hold

EXAMPLE: Mathematics (NM1246)

(The task was about doubling and halving to solve multiplication problems.)

	Error	**Likely calculation**	**Likely misconception**
d) e)	140 610	15×18 = 10×10+5×8 = 100+40 25×32 = 20×30+5×2 = 600+10	***Multiplication error – missing out factors*** Students expand (a+b)×(c+d) = a×c + b×d, but miss out a×d + b×c. Students only multiply the parts with the same place value together; i.e., multiply the *tens* and multiply the *ones*. Averaged over d) and e) about 10% of students made this error.
d) e)	120 70	15×18 = 10×8 + 5×8 = 80+40 25×32 = 20×3 + 5×2 = 60+10	***Multiplication error – missing out factors*** Students miss out some factors when multiplying two- digit numbers. This is similar to the misconception above but the factors missed out can vary.
d) e)	60 or 113 60	15×18 = **10+10** + 5×8 or 15×18 = 10×10 + **5+8** 25×32 = **20+30** + 5×2	***Substituting addition for multiplication*** Students use addition for **some numbers** instead of multiplication.
d) e)	33 57	15×18 = **10+10 + 5+8** 25×32 = **20+30 + 5+2**	Students use addition for **all numbers** instead of multiplication.

further information that fills in some aspect of teacher background knowledge (this may include a link to other support material)

EXAMPLE: Mathematics (NM1208)

Information on using *nice numbers and factors* for estimation

- *Nice numbers* is often known as compatible numbers. It involves making the numbers compatible with respect to the operation being undertaken. In division, this means making one of the two numbers a factor of the other. The relationship should be based on basic multiplication facts.
- Changing the value of at least some numbers is referred to in the literature as *reformulation*.
- *Nice numbers* division gives a reasonably accurate estimate only if the amount of rounding of one number is proportionally about the same as the amount of rounding of the other number. Both numbers need to be rounded in the same direction;, i.e., both rounded up, or both rounded down. Recognising that one number being rounded roughly balances the other one being rounded in the same direction is referred to as *intermediate compensation*.
- *Final compensation* (i.e., updating an initial estimate to a more accurate one) can be done with *nice numbers* division.

Deciding what to do next – the important part

Researchers and others working with teachers – both in New Zealand and overseas – say that making decisions about what to do next is the area of using assessment formatively that can be the most difficult. Again, the depth of your knowledge of the context, concept, and/or skill is an important factor, as is some idea of progression and knowing about how children learn about the particular context.

The first step is to provide feedback to students. This should happen as soon as possible, even while they are still working on the task, although remember to concentrate on the assessment focus. The research that underpins each ARB resource provides some support. Use *Teacher information* pages to guide conversations with students about what they are doing well, and what they need to be working on next.

EXAMPLE: Science (LW2059)

To be able to make wise decisions about our environment we need to::

- know what lives in a particular habitat;
- know what their requirements are; and
- be able to predict the impact of any changes in conditions on the whole habitat.

We found that students, even those that had been involved in Waterways projects, had varying degrees of knowledge about what lived in or around a waterway, and were more inclined to identify animals than plants. Some could identify immediate interactions such as feeding relationships. Fewer were able to take a big picture view and think about the total habitat as an interlinking system. Some who could did not have specific knowledge of the parts to make correct inferences. Both knowledge about the individual "parts" of an ecosystem and knowing how the different parts interact are important aspects for environmental decision-making.

To read more go to Inter-relationships research.

It is empowering for students if they can be involved in deciding their next learning point. Refer to *Next steps* (in the *Teacher information* pages) when making decisions about what to do next.

➜ **EXAMPLE:** English (WL2603)

a) To build awareness of when comparisons are being made

Compare two known, similar objects, for example, an apple and an orange. Brainstorm their similarities and differences. Connect some of the students' ideas and identify the words you use to connect them and therefore make a comparison, e.g., They both have pips, *but* apple pips are brown and orange pips are white. / *Rather than* peeling an apple, as you would an orange, you can eat an apple as it is. / Apples have thin skins *instead of* thick ones like oranges. / *Unlike* apples, oranges...

Photocopy the article, and give students highlighters so they can identify words in this text that indicate a comparison is being made.

b i) To clarify the concept of "endangered"

Refer students to the second paragraph on page 8 and the key words used before the terms "endangered", "very rare". Brainstorm what this might mean. Confirm by reading on to the last phrase on this page. Clarify that the term "endangered" applies to the species, not to individual frogs. See Technical language.

b ii) To build understanding of conjunctions

If students are confused by the second sentence in paragraph 3 on page 11 and misunderstand the meaning of "even if", try rewording and rearranging the order of the information. For example:

By taking 300 frogs to Motuara Island, there would still be a chance that this species of frog might survive, even if all the frogs left on Maud Island were wiped out by fire or disease.

See Conjunctions, in Thinking about how language works

A list of relevant resources that are commonly found in schools provides practical assistance.

➜ **EXAMPLE:** English (WL2603)

Other ARBs that focus on main idea:

Level 2	Level 3	Level 4	Level 5
WL2557	WL2553 WL2554 WL2600	WL2555 WL2556 WL2601 WL2551	WL2558 WL2602 WL2559 WL2552

LW1028, a Level 2 science ARB about the life cycle of frogs.

Duffy, G. (2003). *Explaining reading: A resource for teaching concepts, skills, and strategies.* New York, NY: The Guildford Press.

Ministry of Education. (2006). *Effective literacy practice in years 5 to 8*. Wellington: Learning Media Limited.

Derewianka, B. (2005). A grammar companion for primary teachers. Newtown, NSW: PETA.

Think about how your teaching plan will be adjusted to meet the needs of students, and what actions students need to take. Remember that assessment is not formative unless this step occurs.

➜ **EXAMPLE:** Science (PW3505)

The table below provides an analysis of the range of levels of responses from the trial, beginning with the least sophisticated responses.

Response	**Analysis**	**Possible action**
Because it's metal	No new information has been provided. The student may just be repeating the question, or they may be basing their response on some tacit knowledge of metals.	Ask for further explanation to obtain a better understanding of the student's ideas.
The sun is shining on it.	No new information has been provided. May not have observed carefully, or may not apply observation to more than one material at a time.	Ask: ''Has the sun been shining on the wooden part of the bench?'' Work on observation skills. Compare different materials under the same conditions.
Metal gets hot in the sun (and wood doesn't).	Observation is correct. Has made a link between sun and the temperature of the metal.	Provide further experiences for students to observe and explore. Share and discuss observations and explanations.
Metal gets hotter/ heats up faster than wood.	Observation is correct. Has **compared** a property of metal and wood.	Compare with a range of materials, including different types of metals. Share and discuss observations and explanations. Identify properties of materials that get hot (MW).

Are you making use of the ARB resources as often as you could be?

The aim of the ARBs is to provide you with support in terms of time, expertise, and professional development. The list below summarises some of the ways that you can make use of ARB resources.

- When a standardised test indicates a weakness or strength, the ARBs can be used to further investigate students' understanding. This provides further evidence to guide planning for teaching, and for students to set learning goals. Both asTTle and PAT give guidance on appropriate follow-up tasks, or you can do your own search.
- Use the ARBs prior to or during a unit of teaching to probe students' current understanding. Use the *Teacher information* pages to provide feedback to students and decide on the next learning.
- Use the *Teacher information* or specific self-assessment tasks to help students to reflect on their own learning.
- Adapt a task to suit the needs of the learners. The MSWord version enables you to make changes to a resource and save it on your computer.
- Use the annotated student work samples provided with some resources to engage students in conversations about their learning and help them to self-assess their work. The work samples have come from trial students' work.
- Use ARB tasks as models for writing teacher-designed assessment tasks.
- Much of the Support material is useful for professional development. The articles are short but significant, and they are a good starting place for discussions at staff and syndicate meetings. This includes the English Comprehension and mathematics Concept maps.

References

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Cowie, B., & Bell, B. (1999). A model of formative assessment in science education. *Assessment in Education: Policy and Practice*, 6(1), 101−116.

Newton, P. (2007). Clarifying the purposes of educational assessment. *Assessment in Education: principles, policy & practice*, 14(2), 149-170.

Wiggins, G. (1993). *Assessing student performance: Exploring the purpose and limits of testing*. San Francisco: Jossey-Bass.

Wiliam, D. (2006). *Does assessment hinder learning?* ETS Europe Breakfast Seminar, 11 July, 2006. http://www.uk.etseurope.org/home-corpo-uk/news-home/?print=1&news=136&view