Inservice Units to Support the Implementation of the Primary Reform Curriculum

Unit 4: Learning Areas: Mathematics and Science

Module 2: Learning outcomes, indictors and elaborations

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.....(insert name)

Assessor: ..... Date: .....

Module 2: Learning outcomes, indicators and elaborations

Module Introduction

Welcome to *Module 2: Learning outcomes, indicators and elaborations.*

This module focuses on the Mathematics and Science/Environmental Studies syllabuses and teacher guides and outcomes charts for lower and upper primary years.

Mathematics, Lower Primary Syllabus, 2004
Mathematics, Upper Primary Syllabus, 2003
Environmental Studies, Lower Primary Syllabus, 2004
Science, Upper Primary Syllabus,2003
Upper Primary Learning Outcomes for Grade 6, 7 and 8
Mathematics Teacher Guide, Lower Primary, 2004
Mathematics Teacher Guide, Upper Primary, 2003
Environmental Studies Teacher Guide, Lower Primary, 2003
Science Teachers Guide, Upper Primary, 2003
Lower Primary Learning Outcomes for Grade 3, 4 and 5

In this module we examine how the learning outcomes are expanded by looking at indicators in the syllabuses and elaborations in the teacher guides.

To do this module you will need access to all documents listed above. These are shown on pages 4-7 of the *Unit Introduction*. All activities in this module are based on these documents.

If you are seeking academic credit, make sure you do the *self-assessment* in the *Accreditation and Certification* section before you start this module. As you do this module, keep a running record of sections, parts and pages of the module where you can identify evidence for particular unit outcomes. You may wish to record such information in your *Learning Contract*.

Module learning outcomes

When you have worked through this module, you, the learner, can (are able to):

1. discuss the nature and purposes of indicators and elaborations

2. identify ways progress from grade 3 to grade 8 is indicated in these sections of the syllabuses and teacher guides

3. write additional indicators for outcomes

4. make judgements about the linkages between particular outcomes

Section 1: Learning outcomes and indicators

To complete this section you will need copies of both lower primary and upper primary Mathematics and Science/Environmental Studies syllabuses. The best way to approach the activities in this section is to have the documents open in front of you at the same section so you can quickly scan the information provided.

Part 2.1: Learning outcomes and indicators

Turn to page 12 of the *Environmental Studies, Lower Primary Syllabus* which lists the Learning Outcomes by strands and grades. You'll notice that there are three outcomes for the first strand for each grade and two outcomes for the second strand for each grade.

To help you understand the learning outcomes, imagine they have the words

- 'Students can….' or
- 'students are able to ….' or
- 'students ….'

in front of the statements. For example, read outcome 3.1.1 as 'Students can (or are able to) identify different species of plants and animals found in the environment' or as 'Students identify different species of plants and animals found in the environment'.

You are, by now, familiar with the numbering system for the outcomes.

Pages 13-17 give further information for the teacher.
Page 13 is about the strand: What's in my environment? The sub-strand here is Plants and Animals (see top of first column). Looking across the top of columns 2, 3 and 4, you will notice that for each grade there is an outcome for this sub-strand – 3.1.1, 4.1.1 and 5.1.1.

Further down the page, indicators are provided for each of the outcomes. *Indicators are examples of the kind of things students should be able to do, know and understand if they have achieved an outcome.* (page 10)

The key idea in the above definition of an indicator is that *indicators are examples only*. They show ways the achievement of an outcome can be demonstrated and help you, the teacher, decide whether your students have achieved an outcome.

Indicators are *not* necessarily learning or teaching or assessment activities.

An outcome can be interpreted and understood in different ways by different people; the indicators serve to *set the standard* expected for a particular grade.

Pay attention to the details you see on pages 13-17. Part of page 13 is shown below.

Learning outcomes and indicators

Strand : What's in my environment?

Sub-strand	Grade 3	Grade 4	Grade 5
Plants and Animals	**3.1.1** identify different species of plants and animals found in the environment	**4.1.1** Describe features of plants and animals that live in the environment	**5.1.1** Investigate and apply ways of using, protecting and conserving certain plants and animals
	Indicators Students will be achieving the above learning outcomes in vernacular and/or English, when they, for example:		
All indicators are listed as bullet points after each outcome. The list of indicators always begin with the following statement: 'Students will be achieving the above outcomes in vernacular and/or English, when they, for example.	Record different species of plants and animals they observe during visits to sites such as beaches, gardens	Record types of features of plants and animals found in selected environments such as grasslands, forests, rivers, the ocean	Gather information about certain plants and animals from a range of sources such as natural environment, library or from people

For Outcome 3.1.1, six indicators are provided to get you started (page 13). In time, you'll be able to add to these. For Outcome 4.1.1 and 5.1.1 also six indicators are provided.

Some indicators deal with only particular aspects of an outcome. For example, the first indicator for Outcome 3.1.1 is about students recording different species, the second indicator is about talking about similarities and difference, and the third indicator is about discussing how to identify different species of animals and plants. These are important steps to achieving the outcome but none of them by themselves is sufficient to satisfy a teacher. So the demonstration of one or two of these indicators is not enough to indicate the achievement of an outcome. It is the demonstration of a range of them over a period of time that gives the teacher a sense of a student's achievement.

Since indicators are examples only, there are other ways to find out and judge whether a student has achieved the outcome.

The outcome and its indicators together provide the standard at which that outcome is to be understood, taught and assessed.

At this point let us review what you know about the nature and function of indicators.

- Read the following statements and tick the ones with which you agree and correct those you think are incorrect. Explain your reasons.

Statements	Agree/do not agree
Indicators are learning and teaching activities	
Indicators are examples only	
Indicators help teachers to understand an outcome as a standard	
As a teacher I can write more indicators for an outcome, provided the standard is maintained	
A student achieves an outcome when he or she can demonstrate all the indicators	
A student achieves an outcome when he or she can demonstrate the kinds of things described in the indicators	

Now let us explore the idea of progression.

When we are looking for words that indicate progress, firstly, we look at the action words. In the above example of outcomes 3.1.1, 4.1.1 and 5.1.1, they are *identify, describe* and *investigate and apply. Investigate and apply* are seen as a higher order process than *identify* and *describe*, according to Bloom's taxonomy or six thinking levels (for information about Bloom's Taxonomy, refer to *Primary In-service Unit 6: Learning and Teaching for Outcomes*).

However, these words by themselves are not enough to understand and identify progress.

Secondly, we look at the concepts of each outcome.

What are students expected to be able to identify? *Different species of plants and animals*
What are students expected to describe? *Features of plants and animals*
What are they expected to investigate and apply? *Ways of using, protecting and conserving certain plants and animals*

Here you can see that investigating and applying ways of using, protecting and conserving certain plants and animals is more demanding of student time and effort than describing features of plants and animals or identifying different species of plants and animals.

Thirdly, we look at the context. The contexts for the three outcomes appear to be the same – the environment.

This way you can understand intended progress, facilitate student learning and identify it when students demonstrate aspects of it. This is particularly important if you teach in a multi-grade school.

Indicators also help you to understand progress.

Let us turn our attention to the indicators, on page 13 of the Environmental Studies Syllabus, for each of the outcomes.

- What are some words that indicate progress? List them here.

- Make a comment about what you see.

The *Mathematics, Upper Primary Syllabus* and the *Science, Upper Primary Syllabus* make clear that 'the outcomes are written to show a progression from one grade to the next'. (page 1)

At this point let us explore one more set of outcomes from a different subject, Mathematics.

- Take outcomes 6.1.8, 7.1.8 and 8.1.8. (page 12 and page 24). These are copied below.

Strand: Number and Application

Sub-strand	Grade 3	Grade 4	Grade 5
Indices	**6.1.8** Use indices to the power of 2 and 3	**7.1.8** Use positive indices greater than the power of 1	**8.1.8** Use integer indices and fractional indices where the answers are rational
All indicators are listed as bullet points after each outcome. The list of indicators always begin with the following statement: 'Students will be achieving the above outcomes in vernacular and/or English, when they, for example.	Students will be achieving this when they, for example • Calculate solutions to numbers such as 3^2, 4^2	Students will be achieving this when they, for example • Calculate numbers such as 2^5, 3^4	Students will be achieving this when they, for example, use whole number indices positive, negative and zero ……

The action words here are *use* for all three outcomes. So this word does not provide a sense of progress.

So we now look at the concepts of each outcome. The concepts are the same also: *indices.*

Thirdly, we look at the context. The context is different for each of the outcomes. From indices to the power of 2 and 3, the context progresses to indices greater that the power of 1 and then on to integer indices and fractional indices where the answers are rational.

Here you can see that the third context is more demanding in terms of student time and effort than the other two contexts and built on the achievement of 6.1.8. and 7.1.8.

Thus indicators also help you to understand progress.

Look at the action words, the concepts, the contexts of the indicators found on page 24 of the Upper Primary Mathematics Teachers Guide to understand and reflect on progress.

- What are some indicators of progress? List them here.

- Make a comment about what you see.

Look at outcomes 6.1.3, 7.1.3 and 8.1.3 on pages 12 and 19 of the Mathematics Syllabus. All of them begin with the action word 'convert'.

- So identify the words that indicate progress in both the outcomes and the indicators.

- Look at outcomes 6.2.5, 7.2.5 and 8.2.5 on pages 13 and 29 of the Mathematics Syllabus. What are the indicators of progress here in both the outcomes and the indicators?

- Is the progress indicated by the outcomes and the corresponding indicators consistent with each other? Comment.

Now let us turn our attention to the Science Syllabus and teach guide.

Pages 11-13 of the *Science, Upper Primary Syllabus* present the *Learning Outcomes* in a format with which you are now familiar.

In addition to the content strands and sub-strands, a process strand has been identified– Working scientifically–on page 11. Go back and study the information about this strand on page 8.

- Read carefully the indicators of this strand for each of grades 6, 7 and 8.
- Now go to pages 34-38.

Look at 6.2.1 from the Living things Strand (page 15). Then look at 6.1.1 from the Working Scientifically Strand (page 14).

Remember the indicators will assist you to understand the learning outcomes.

- Plan a teaching and learning activity that will engage students with these two outcomes**.**

Activity:

- Plan another teaching and learning activity that will link Outcome 8.3.5 (a content outcome) with Outcome 8.1.1 (a process outcome).

Activity:

Hint: The question here is how you will address a content strand through a process strand or a process strand through a content strand.

Present this to another teacher in your school as a way of explaining to them how this syllabus is to be considered.

- Write down some comments about your colleague's response.

Record your comments here:

On pages 14-23 are the outcomes, once again presented in the three stands, but subdivided into the sub-stands with suggested indicators.

Using pages 14-23 of Science Syllabus as a model, prepare a presentation to your staff about how to understand this part of the syllabus.

- Use the content of these pages of the *Science, Upper Primary Syllabus* to illustrate the format.
- Alternatively, use the chart: *Upper Primary Learning Outcomes for grades 6, 7 and 8*, to prepare the presentation.
- Show the plan for your presentation here.

Some learning outcomes are simple and direct, but often they are quite complex with two or more verbs and contexts.

Take, for example, 7.3.2 (Science). The components of this are:

Action word(s) or verbs	Concept	Context
compare	the properties of …… before and after physical and chemical changes	materials
and identify	patterns in the type of changes that take place in the ……. used	materials

A learning outcome may include a number of such components that must all be considered in planning, programming, teaching and learning, and assessing before a student can be said to have achieved the outcome.

Read and analyse the following learning outcomes (from Science) carefully to determine the complexity of the outcome. This will help you plan your teaching activities and assessment methods.

- Draw up a table as above or another structure for your analyses.

- Learning outcome 6.3.2

- Learning outcome 8.3.2

- Learning outcome 8.1.1

As you are aware by now, indicators have been prepared to assist teachers understand the learning outcomes and to identify some contexts in which the achievement of the outcomes may be demonstrated by students.

Remember, indicators provided in the syllabus:

- are examples only
- are not the only way to demonstrate achievement
- illustrate the depth and breadth (ie. the standard) of an outcome
- are for the purpose of making judgements about student achievement of outcomes.

Turn to the Working scientifically outcomes, on page 14 of Science Syllabus.

- Make a list of the different verbs used to introduce the indicators in this section of the syllabus.

1	2	3
4	5	6
7	8	9
10	11	12
13	14	

- Turn to Strand: Caring for my environment, Sub-strand: Managing wastes, on page 17 of Environmental Studies Syllabus.

  - Make a list of the different verbs used to introduce the indicators in this section of the syllabus.

1	2	3
4	5	6
7	8	9
10	11	12

- Comment on why it is important to have a variety and range of indicators.

Pages 14-23 give examples of the contexts in which each outcome may be demonstrated through two to seven indicators. Let us look at Learning Outcome 6.1.1 for Working scientifically and its five indicators on page 14. The first four indicators are – formulate questions to guide investigation, conduct investigation, draw conclusions, suggest improvements. None of them by itself satisfies the achievement of the outcome. The fifth indicator is also important because it is part of 'organising their experiences'. So the five indicators together can indicate the achievement of this outcome.

- Examine the indicators for Learning Outcome 7.1.1. What do you see here?

- Examine the indicators for Learning Outcome 8.1.1. What do you see here?

- Now look at the third indicator for each of the outcomes (page 14 of syllabus). The indicators are copied here.

Indentify patterns and grouping in information to draw conclusions	→ Argue conclusions on the basis of collected information and personal expriences	→ Draw conclusions linked to the information gathered and the purpose of investigation

Do you see any words or phrases that indicate progress from grades 6 to 8 consistent with the outcomes 6.1.1, 7.1.1 and 8.1.1? The indicator in the right hand box is more consistent with 'scientific method' than the other two indicators thereby showing progress. A student demonstrating the ability to '*draw conclusions linked to the information gathered and the purpose of the investigation*' is seen to be able to draw conclusions free of personal views and feelings (ie. show some detachment from personal views and feelings). This is how a scientist is expected to work.

Now look at the five indicators for each outcome and think about what they represent together. Then think about the progress students will be making from grade 6 to grade 8.

- Read pages 14-23.

Think about ways outcomes and indicators describe progress in concepts as well as skills and attitudes.

- Write down two examples each of ways progress is described in concepts, skills and attitudes.

- Write an additional indicator for the following outcomes:

Outcomes	Additional Indicator
3.1.1	
5.1.1	
7.3.2	
6.3.1	

Hint: In thinking through this activity, look at the action words (active verbs), the concepts and the contexts of outcomes and indicators.

Part 2.2 Summary

Meet with a colleague who is unfamiliar with outcomes-based education.

- Explain to the colleague the concepts of 'learning outcomes' and 'indicators'.

In your explanation, you will need to mention the following:
- what an outcome is
- what an indicator is
- how outcomes are organised into strands and sub-strands
- how the development of outcomes can be viewed across the grades
- the numbering code for outcomes
- purpose of outcomes and indicators

- After the discussion write down how well you think your colleague understood your explanation.

Hint: If there was confusion and worry, don't be fearful about noting it down. Note also any positive matters. Be honest in your appraisal.

You have looked through the ' Learning outcomes and indicators' section of Mathematics and Science/Environmental Studies syllabuses. You are now in a position to compare and contrast the syllabuses and understand how they are similar and different in this regard.

One way of doing this is to look at the '*Lower Primary Learning Outcomes for Grade 3, 4 and 5'* and '*Upper Primary Learning Outcomes for Grade 6, 7 and 8*' Charts. Here you see an overview of the learning areas, subjects, strands and outcomes at a glance. Notice that some subjects have more outcomes than others. Some have outcomes that are very specific, others have outcomes that are quite general. In some subjects the concepts and skills overlap with those of others. This provides opportunities for integration.

Reflect on the following:

- ways you may be able to use the charts with other teachers, students and the community

- ways the charts may contribute to integrating across subjects.

Section 2: Elaborations of learning outcomes

To complete this section you will need copies of all the Mathematics and Science/ Environmental Studies teacher guides. The best way to approach the activities in this section is to have all the documents open in front of you at the same section so you can quickly scan for similarities and differences.

Let us recapitulate what we know about outcomes and indicators.
Learning outcomes for each subject describe specifically what students know and are able to do in each strand and grade. The outcomes are broad and can be achieved in many different contexts depending on available resources, school context and expertise of teacher.

The learning outcomes and indicators:
- give you the flexibility to write units of work and teaching programs to suit local conditions, available resources and individual student needs
- help you select appropriate assessment methods, tasks and assessment criteria
- help you plan and revise your teaching program.

Each learning outcome is numbered with three digits, such as 6.1.2. The first number refers to the Grade level, the second number to the strand and the third number to the sub-strand.

Indicators are instances or examples of how the achievement of an outcome can be demonstrated. They are elaborations of the outcomes. Indicators help set demonstrable contexts and standards for outcomes. They help develop an understanding of an outcome.

Now let us look at 'elaborations of learning outcomes'. 'Elaborations of learning outcomes' is a major section of each of the teacher guides. ***Elaborations describe possible content (knowledge, skills and attitudes) and contexts (school environment, resources) that teachers will use to develop learning experiences and assessment***. They are designed to help teachers understand the context of the outcomes.

They are there to assist you to choose suitable content and types of activities you might undertake with your students.

The elaborations describe for each learning outcome:
- recommended knowledge
- recommended processes and skills
- attitudes (in some syllabuses only)
- suggested activities.

The fact that the knowledge, processes, skills and activities are only recommendations, enables you to decide what is required for your students. You may wish to add to what you have selected from your professional experience, to suit your work context.

Page 60 of the *Environmental Studies Teacher Guide, Lower Primary* describes the purpose for providing elaborations of learning outcomes.

- Read this page carefully.

There is a reference to 'attitudes' on this page.

- Think about what it says.

Now read pages 33-34 of the *Science Teacher Guide, Upper Primary.*

Here you will find a long list of 'attitudes' to be encouraged through a science course. The 'attitudes' identified seem to relate to the ideas of 'custodianship', 'conservation', 'sustainability' as well as 'scientific habits'. These are important considerations in the Science Learning Area.

Share your understanding of the 'attitudes' on pages 33-34 with a colleague and probe what they really mean?

Reflect on the kinds of attitudes you have been actively promoting in your science classes.

- How will you make a commitment to promoting any attitudes in the list that are new to you? Write down your ideas here.

The Science Syllabus has an extensive section on the *processes and skills related to working scientifically*.

Here the process strand of Science in the upper primary is made very explicit.

Read pages 34-38.

- What are the three major headings under which 'Working scientifically' is detailed?

- Are you familiar with the various skills (19 altogether) described on pages 34-38?

Now read about the recommended processes and skills for Environmental Studies Teacher Guide (pages 61-65).

- Re-visit the Environmental Studies processes described on pages 11-12 of the teacher guide.

- Are the recommended processes and skills for Environmental Studies (pages 11-12 and 61-65) similar to those for Science?

The Mathematics syllabuses have not provided details of 'attitudes' in the *elaborations of learning outcomes* section.

However, there are references to 'attitude' on page 7 of both upper and lower primary teacher guides.

In the Upper Primary Mathematics Teacher Guide, (pages 41-47) the elaborations are provided in terms of the strands, not outcome by outcome. However, the document *Worked examples of Mathematics Outcomes* (Resource 13, *Unit Introduction*) provides numerous worked examples for teachers of upper primary.

- Get hold of a copy of this book and read page 3, *How to use this book*. Use this book in conjunction with the syllabus and the teacher guide for best advantage.

The Lower Primary Mathematics Teacher Guide, pages 42-60, provides elaborations of learning outcomes.

- Read pages 42-60 to familiarise yourself with the elaborations.

Let us now look at how Mrs Wop uses the *Science, Upper Primary Syllabus* and *Science Teachers Guide, Upper Primary* to explore two outcomes.

Scenario

Mrs Wop opens the syllabus at page 11 and reads the learning outcomes for the strands: 'Ecology, relationships and interactions' strand and 'Working Scientifically' strand. She decides to focus on Outcome 6.1.1: Investigate the immediate environment and using scientific methods, organise their experiences and communicate their ideas and Outcome 6.2.2: Using a diagram, describe how energy moves though the living and non-living community.

She then turns to pages 14 and 16 of the syllabus where she finds the indicators for these outcomes.

On page 14, there are five sample indicators listed. She reads: students will be achieving this outcome if they formulate questions…, conduct simple tests …, identify patterns and groupings …, cooperatively suggest … improvements …, describe and demonstrate …..

On page 16, there are two sample indicators listed. She reads: students will be achieving this outcome if they observe and collect data and make some generalisations …. , construct a food chain ….

Mrs Wop's next step is to consult the *Science Teachers Guide, Upper Primary*. She finds the elaborations for Outcome 6.2.2 on page 40. The elaboration supplies her with recommended knowledge, processes, skills and suggested activities to help her plan the teaching program. She understands that the main concepts embedded in this outcome are: energy and relationships between animals and plants.

One suggested activity is to draw a poster to … and a second strategy is to observe plants and animals …. and construct a food chain.

After thinking through what she had found out, Mrs Wop decides that for a few lessons her students will work in small groups to *investigate* simple forms of energy around them including food and the

relationship between energy forms and sources and *communicate* their findings through diagrams and posters. They will then look at energy relationships such as that between plants and animals in the local environment before they identify such concepts as food chains, producers and different levels of consumers and the relationship between the living and the non-living world in this regard.

Mrs Wop remembered that she had read in a book that the idea of a food pyramid would help illustrate the energy pathway through the food web. She decided to construct one jointly with the students.

She decided to use diagrams extensively in the work the students do. This is a requirement of the outcome.

The ideas of investigating and communicating came from the elaborations of working scientifically on pages 34-38 of teacher guide. Some of the content ideas came from page 40 of the teacher guide.

Having explored the two outcomes Mrs Wop is now ready to plan a unit of work based on the two outcomes.

Now it is your turn to make use of a syllabus and teacher guide to explore two outcomes.

Select two outcomes for grade 8 from the Science Syllabus (one must be from 'working scientifically') and explore them using Mrs Wop's approach.

As an alternative, select one outcome from Environmental Studies and the Environmental studies process (pages 11-12) and explore them together using Mrs Wop's approach.

- Record your plan here.

Module Summary

Congratulations! You have come to the end of this module! In doing so you have worked your way through the Science and Mathematics syllabuses and teacher guides and done the many tasks and activities designed to make it easy for you to learn and apply your learning.

The focus in this module has been the nature and purpose of indicators and elaborators.

You should have by now developed certain knowledge, understandings, insights and skills as they relate to reform curriculum in the context of your work. All this should help you to perform well in your work.

At this point let us review your progress by assessing the extent to which you can now demonstrate each outcome.

The outcomes for the module are copied here. For each of the outcomes how do you assess yourself - Yes, No or Not sure?

Can you:		Yes/No/ Not sure
1.	discuss the nature and purposes of indicators and elaborators?	
2.	identify ways progress from grade 3 to grade 8 is indicated in these sections of the syllabuses and teacher guides?	
3.	write additional indicators for outcomes?	
4.	make judgements about the linkage between particular outcomes?	

If you answered 'Yes' to all of them, then you have done very well. Think about the kinds of evidence that will support the achievement of each of the outcomes. If you have said 'No' or 'Not sure' to some, then it may be worth your while to go over the appropriate sections of the module again and have another go at repeating the tasks, and/or reflecting on your difficulties and seeking help.

Remember these *module outcomes* help you achieve the outcomes of the unit. Refer back to the outcomes of the unit in the *Unit Introduction* and reflect on where you are in relation to those outcomes.

If you are seeking academic credit you were advised to keep a running record of any evidence you may have for particular unit outcomes. If you have not been doing this go back over the module and jot down, in your *Learning Contract*, what you might consider to be evidence for the unit outcomes for which you have agreed to provide evidence.

Additional space for your notes