CRITICAL, CREATIVE, REFLECTIVE AND LOGICAL THINKING IN THE NEMP ASSESSMENTS

A National Education Monitoring Project
Probe Study Report

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1. INTRODUCTION

1.1 BACKGROUND

In 2002, the researcher conducted a probe study concerning student performance across the curriculum in items in the NEMP assessments which tested the essential skills (Knight, 2002). In the section on problem-solving skills (pp 21-22), an attempt was made to classify those items of a problem solving nature according to the kind of thinking required for their successful completion.

The classification of thinking used was that of the New Zealand Curriculum Framework document (Ministry of Education, 1993, p17) which states, among other attributes, that:

Students will:

- *think critically, creatively, reflectively and logically.*

The focus of the study was on student performance and, in particular, on differences in performance between year 4 and year 8 students, and on changes in performance between assessment cycles. Consequently only those tasks which were attempted by both year groups and the trend tasks which were used in two cycles of assessment were considered.

In this study the focus is changed from being purely on student performance to the consideration of the nature of the tasks themselves and also the nature of the marking criteria used to assess student performance on these tasks.

All tasks in the 1996 – 2003 assessments are considered and those which seem to have significant potential for assessing different kinds of thinking are identified. The marking criteria for some of these tasks are then examined to determine the extent to which this potential was realised in the assessment.

It was also hoped that it would be possible to identify some particular items, presented in a one-to-one interview task approach with video tape, which might be used in subsequent studies to explore the nature of the thinking which was actually used by a sample of students in completing the tasks.

1.2 RESEARCH QUESTIONS

1. What is the nature of the tasks in the NEMP assessments which seem to have significant potential to assess students':
    - critical thinking skills?
    - creative thinking skills?
    - reflective thinking skills?
    - logical thinking skills?

2. To what extent is the potential for assessing these skills realised in the marking criteria for the tasks?

3. What are the similarities and differences between curriculum areas in this regard?

4. Is it possible to identify particular tasks, presented in a one-to-one interview format, the video tapes from which would be likely to enable a researcher, in a subsequent study, to explore the nature of the thinking which was actually used by students?

1.3 THINKING

Many books have been written concerning thinking from philosophical, psychological, and educational points of view and it is not necessary, or appropriate, to consider the concept in too much depth in a report such as this. However, it is important to establish in a broad sense how the researcher is interpreting the concepts of critical thinking, creative thinking, reflective thinking, and logical thinking in this research.

Halpern (2003, page 356) expresses this kind of approach as giving a 'working definition'. She writes:

"When an abstract concept, like critical thinking, is operationalized, the researcher or evaluator provides a 'working definition' or, perhaps more accurately, a 'definition that works' so that observers can reliably identify the construct."

It is clear to the researcher that in an educational context we are interested in thinking which is directed to a purpose. Ruggerio (2004, page 4) provides a useful working definition of such thinking:

"Thinking is any mental activity that helps formulate or solve a problem, make a decision, or fulfil a desire to understand."

With such a definition it is not difficult to see why thinking is at the very core of education.

When it comes to identifying different kinds of educational thinking, the literature includes many different classifications, and the terms critical, creative, reflective and logical are used in a number of ways. Halpern (2003, Page 357), for example, writes:

"For the purposes of this chapter, critical thinking skills (or strategies) are those that increase the probability of a desirable outcome (e.g. making a good decision, reaching a sound conclusion, successfully solving a problem)."

This is, of course, very similar to Ruggerio's definition of thinking in general and would, it seems, include creative, reflective and logical thinking. It is reasonable to assume that this was not the intention of the New Zealand Curriculum Framework and that, for this research, we need a working definition of each kind of thinking which will enable us to distinguish between them.

Briefly, in this research:

Critical thinking is thinking which involves evaluation and, perhaps, challenge.

Creative thinking is directed towards solving a problem in one's own way. It often involves imagination and initiative.

Reflective thinking involves looking back on one's previous thinking, knowledge and understanding.

Logical thinking is directed towards making deductions or presenting arguments.

These, of course, are not entirely independent. A given task may well involve more than one kind of thinking. In fact it seems likely that all thinking tasks begin with reflective thinking. However, the researcher did not find it difficult to identify tasks for which seemed to involve each of the kinds of thinking in a relatively major way. All the tasks which were classified are reported in later sections of this report.

1.4 ASSESSING THINKING

Assessing thinking is obviously problematic since we do not have access to the thinking itself but only to the result of that thinking and, perhaps, to the student's report of the processes used. However, it does seem that the NEMP assessments, particularly those which involve video taped interviews, have the potential to assess thinking.

This view is supported by Halpern (2003, page 361) who writes:

"My own preference for test format, when the goal is to assess critical thinking, is to use an ecologically valid example with an open-ended response format, followed by specific questions that probe the reasoning behind an answer."

This format is entirely possible in the NEMP assessments in those tasks which use the one-to-one interview task format in which the student works individually with a teacher, with the whole session recorded on videotape. Halpern's criteria for test format are used later in this report.

1.5 MARKING CRITERIA

The nature of the presentation of the results of the assessments in the NEMP content area reports means that the marking criteria can reasonably be inferred from the published results. Consequently, it was not considered necessary to examine the marking criteria of all tasks. A sample of marking criteria was considered and, apart from a very few examples where some of the information obtained through the marking criteria was not published, the marking criteria categories closely matched the reporting categories.

2. METHODOLOGY

2.1 INTRODUCTION

All of the 711 tasks in the NEMP assessments from 1995 to 2003 were examined to identify tasks, or sub-tasks, which seemed to involve critical, creative, reflective, or logical thinking. 159 tasks were identified.

The marking criteria used to assess student performance on 52 of these tasks were then considered to evaluate the extent to which any potential to evaluate these kinds of thinking was realised in the assessment. The choice of tasks for this part of the research was made to ensure a spread across curriculum areas and thinking types. The relationship between the marking criteria for the tasks and the reporting of student performance was then considered.

Each of the kinds of thinking were then considered in turn, looking for similarities and differences in the tasks, and the assessment, across the curriculum.

The tasks which were presented in a format corresponding to that suggested by Halpern and, consequently having greater potential for assessing thinking were then identified.

Finally consideration was given to the possibility of future research using the video tapes of student responses.

2.2 INTENDED OUTCOME

A better understanding of the place of critical, creative, reflective and logical thinking both in the NEMP assessments and in the classroom.

2.3 USE EXPECTED TO BE MADE OF THE OUTCOMES

(a) The findings may be useful to:
- NEMP in designing further tasks to assess thinking skills.
- Teachers who wish to encourage and assess thinking skills in their classrooms.

(b) It is hoped that the report will be followed by further research looking at the video evidence of students attempting some of the tasks.

2.4 ASSESSMENT RESULTS FOR MAORI STUDENTS

The assessments of Maori students reported from 1999 – 2002 used a selection of tasks taken from the general assessments. Consequently, no separate analysis of tasks was necessary. However, the thinking tasks which were in the Maori assessments were recorded and a comparison with the general assessments made.

3. THINKING TASKS IN THE NEMP ASSESSMENTS

3.1 THE DISTRIBUTION OF THINKING TASKS IN THE ASSESSMENTS

3.1.1 General assessments

All of the tasks, except the link tasks, in the 1995 – 2003 general assessments were considered to identify those which had potential to assess the nature of student thinking. The number of tasks within each assessment and the number of tasks identified as requiring each type of thinking are given below.

		Type of thinking		
Report	**No of tasks**	**Critical**	**Creative**	**Reflective**
Logical				
Science 95	30	0	1	4
5				
Art 95	10	1	4	2
0				
GTM 95	27	0	0	1
1				
Music 96	16	0	4	0
0				
Tech 96	15	3	1	3
3				
Read/Speak 96	24	0	1	5
2				
Info Skills 97	20	0	0	3
1				
Soc Studies 97	18	0	0	3
0				
Maths 97	44	0	0	0
5				
Listen/View 98	17	1	1	1
1				
Health/PE 98	39	0	0	5
0				
Writing 98	22	0	8	4
0				
Science 99	49	2	0	1
1				
Art 99	9	1	3	1
0				
GTM 99	33	1	0	1
0				
Music 00	19	0	4	1
0				
Asp of Tech 00	19	2	0	0
3				
Read/Speak 00	25	0	5	1
0				
Info skills 01	23	0	0	3
1				
Soc Studies 01	31	0	0	3
1				
Maths 01	66	0	0	0
5				

Listen/View 02 2	22	4	0	3
Health/PE 02 0	38	1	0	9
Writing 02 2	21	2	5	0
Science 03 8	37	0	0	0
Visual Arts 03 0	9	3	3	1
GTM 03 2	28	0	0	0
Total (%) 43(6%)	711	21(3%)	40(6%)	55(8%)

Thinking task total(%) 159(22%)

3.1.2 Assessments of Maori students

The 1999 – 2002 assessments of Maori students used a selection of tasks from the general assessments. The overall distribution of thinking tasks within these assessments is given below.

		Type of thinking			
	No of tasks	**Critical**	**Creative**	**Reflective**	**Logical**
Total(%)	164	8(5%)	5(3%)	11(7%)	7(4%)

Thinking task total(%) 31(19%)

3.2 COMMENTS

The tables indicate that there is a good distribution of thinking tasks across the NEMP assessments. As expected, some curriculum areas have a greater focus on a particular thinking skill than others. For example, creative thinking is more evident in Art, Music, and Writing, and logical thinking in Mathematics and Science. Reflective thinking occurs widely across the curriculum.

The distribution of thinking skills in the Maori student assessments is not very different from that of the general assessments.

4. CRITICAL THINKING

4.1 INTRODUCTION

In this section the tasks which were identified as requiring critical thinking and, consequently having the potential to assess this skill, are presented and discussed. The working definition of critical thinking in this research is that it is:

Thinking which involves evaluation and, perhaps, challenge

4.2 THE CRITICAL THINKING TASKS

In the table below the tasks the task judged to require critical thinking skills are identified. The information given is:

- The assessment report
- The location of the item
- If the marking criteria for the item were considered. Indicated by *
- The title of the item
- The year group assessed
- The task approach
- If the item appeared in the assessment of Maori students
- A brief description of the thinking aspect of the item

Art 1995

Page 43*	*Two sculptures*	Y4/8	1 - 1
	What do you think these sculptures are about? How do they make you feel?		

Technology 1996

Page 27*	*Space game*	Y4/8	Team
	Play a game and think about ways to improve it. Think of ideas for making it more fun.		
Page 28	*Coloured sheep*	Y4	Team
Page 29	*Green sheep*	Y8	Team
	Think up good points, bad points and interesting points about an idea. Discuss.		

Listening and Viewing 1998

Page 26*	*Looking around*	Y4/8	1 – 1
	Choose a sign or poster which you think is very good and another which is not very good. Explain why. What could be done to improve the poor one?		

Science 1999

Page 53*	*Environmental issues*	Y4/8	1 – 1
	Judge the relative importance of seven environmental threats and justify your decisions.		
Page 56 Maori	*Vege peelings*	Y4/8	1 – 1
	Evaluate and justify different approaches to organic waste disposal.		

Art 1999

Page 38*	*Two paintings*	Y4/8	1 – 1

Describe and interpret two paintings. Explain differences. Give preference and explain choice.

Graphs, Tables and Maps 1999

Page 19* *Best value* Y8 1 – 1
Choose a brand of battery using a complex table of information. Justify the choice.

Aspects of Technology 2000

Page 22 *Nut cracker* Y4/8 1 – 1
Maori
Describe the features of two different nut crackers and evaluate them. Which is the best? Why?

Page 42* *Timber factory* Y8 1 – 1
Maori
State the good and bad things about building a factory. Give reasons.

Listening and Viewing 2002

Page 27* *It's good to read* Y4/8 1 – 1
Maori
Choose two pictures from 9 to put on a poster. Justify your choice.

Page 35 *Sweet stall* Y4/8 1 – 1
Maori
Find good points and not so good point about a video. What needs to be improved? How could it be improved?

Page 36 *Weet-bix card* Y4/8 1 – 1
Maori
Think critically about an advert. What are the messages? Do you think they are true? Why is the advertiser giving these messages?

Page 38 *Minties moments* Y8 1 – 1
Think critically about an advert. What are they telling you? Do you agree?
Why do you say that?

Health and Physical Education 2002

Page 46* *Options* Y4/8 1 – 1
Maori
Think about problems and ways of solving them. Indicate good idea, bad idea, not sure, to a number of possible solutions. Explain your choice.

Writing 2002

Page 29* *Kids these days…* Y4/8 Independent
Maori
Listen to two viewpoints about teenagers. Which do you agree with? Why?

Page 55 *Really good writing* Y4/8 Team
Think of all the things you can which make a really well written story. Identify them in a given story.

Visual Arts 2003

Page 38 *Portrait pairs* Y4/8 1 - 1
Identify and explain similarities and differences in styles of painting.

Page 40 *Wearable arts* Y4/8 1 – 1
Form and explain a personal response to artists work.

Page 41 *George Street* Y4/8 1 – 1
Identify and evaluate relative merits of two artistic depictions of a scene.

4.3 MARKING CRITERIA FOR CRITICAL THINKING TASKS

In this section the marking criteria used in the NEMP assessments are considered for a number of the tasks which were judged to involve critical thinking. The intention is to examine the extent to which the criteria capture the critical thinking aspect of the tasks.
In the table below the tasks selected are given together with those parts of the marking criteria which relate to the critical thinking aspects of the tasks. The coding categories for the responses are also given.

4.3.1 Science

1999
Task:
Page 53 *Environmental issues* Y4/8 1 – 1
Judge the relative importance of seven environmental threats and justify your decisions.
Marking Criteria:
R15 Global rating of judgements
very strong
strong
moderate
weak
very weak
Comment:

The other 14 marking criteria are directed to providing an overall view of students' views on environmental issues. The results of the global rating of students' judgements were not reported in the assessment report, but do, to some extent, reflect the students' critical thinking.

4.3.2 Art

1995
Task:
Page 43 *Two sculptures* Y4/8 1 - 1
What do you think these sculptures are about? How do they make you feel?

Marking Criteria:
Interpretation (naming, why painted this way, similarities / differences,…)
accounting for detail
narrative – tells a story
relevant use of art vocabulary
fluency of ideas
backing opinions with reasons
use of metaphor

	slightly	*moderately*	*highly*
undeveloped	*developed*	*developed*	*developed*

1999
Task:
Page 38 *Two paintings* Y4/8 1 – 1
Describe and interpret two paintings. Explain differences. Give preference and explain choice.
Marking Criteria:
R3 Interpretation
accounting for detail
narrative – tells a story
relevant use of art vocabulary
fluency of ideas
backing opinions with reasons
use of metaphor

	slightly	*moderately*	*highly*
undeveloped	*developed*	*developed*	*developed*

Comment:
These two tasks are very similar although the task presentation was not the same. The evaluative nature of critical thinking is captured in the marking criteria.

4.3.3

Graphs, Tables and Maps

1999

Task:

Page 19 *Best value* Y8 1 – 1

Choose a brand of battery using a complex table of information. Justify the choice.

Marking Criteria:

R2 Explanation of choice

Indicates consideration of ranking batteries for all 4 appliances
Has used battery data but less thoroughly
Any other response

Comment:

The marking criteria are too prescriptive to capture the critical thinking behind the student response particularly well.

4.3.4 Technology

1996

Task:

Page 27 *Space game* Y4/8 Team

Play a game and think about ways to improve it. Think of ideas for making it more fun.

Marking Criteria:

1. Quality of ideas selected for making the game more fun.

Weak *Moderate* *Strong*

Comment:

It was felt that the critical thinking aspect of the task came from the need to evaluate the game as it was played originally. This was not captured in the marking criteria.

2000

Task:

Page 42 *Timber factory* Y8 1 – 1

Maori

State the good and bad things about building a factory. Give reasons.

Marking Criteria:

The marking criteria are directed towards providing an overall picture of student thinking on the issue rather than evaluating the thinking of individual students. The criteria consisted of 18 possible responses to the questions. For example:

Q1 and Q3: Good things about having a new factory:

R1 Creates employment, (directly)

R3 Makes town more lively, interesting

Comment:

The assessment report gives the percentage of students who gave a particular response and the marking criteria do not capture the critical thinking of individual students.

4.3.5 Listening and Viewing

1998

Task:

Page 26 *Looking around* Y4/8 1 – 1

Choose a sign or poster which you think is very good and another which is not very good. Explain why. What could be done to improve the poor one?

Marking Criteria:

R2 Explanation of features of picture chosen (Q2)
Ability to pick out features, colour, images, symbolism
Clear with multiple ideas
Relevant but not fully developed
On right track but vague
Any other response

R4 Explanation of features of picture chosen (Q4)
Ability to pick out features for comment, and justify why picture is not very good
Clear with multiple ideas
Relevant but not fully developed
On right track but vague
Any other response

2002

Task:

Page 27 *It's good to read* Y4/8 1 – 1
Maori

Choose two pictures from 9 to put on a poster. Justify your choice.

Marking Criteria:

R3 Strength of justification for choosing first picture
Strong
Moderate
Weak

R4 Strength of justification for choosing second picture
Strong
Moderate
Weak

R6 Strength of justification for not choosing the picture you would not use
Strong
Moderate
Weak

Comment:

The marking criteria of both tasks seem to capture the critical thinking of the students very well.

4.3.6 Health and Physical Education

2002

Task:

Page 46 *Options* Y4/8 1 – 1
Maori

Think about problems and ways of solving them. Indicate good idea, bad idea, not sure, to a number of possible solutions. Explain your choice.

Marking Criteria:
For each of the 4 problems presented:
Strength of explanation given
Strong
Moderate
Weak

Comment:
Again, asking students to explain their choices is likely to capture the nature of their critical thinking.

4.3.7 Writing

2002
Task:
Page 29 *Kids these days…* Y4/8 Independent
Maori
Listen to two viewpoints about teenagers. Which do you agree with?
Why?

Marking Criteria:
R5 Overall, how persuasive are the reasons for the position chosen?
Strongly persuasive
Quite strongly persuasive
Moderately persuasive
Weakly or not persuasive

Comment:
The criteria are likely to capture the students' critical thinking.

4.4 COMMENTS

- Tasks involving critical thinking skills were found in 7 of the 12 curriculum assessment areas.

- Art, Technology, and Listening and Viewing contributed the most tasks.

- All of the tasks are evaluative.

- Most of the tasks require students to explain, justify, or discuss their responses and, consequently, have the potential to assess the critical thinking of the students. It was felt that this potential was realised very well in some, but not all, of the marking criteria for the tasks.

- 16(76%) of the 21 tasks used the 1 – 1 interview task approach in which the student works individually with a teacher, the whole session being recorded on videotape. It seems likely that further examination of the videotapes, looking particularly for evidence of critical thinking, would be worthwhile.

- The contexts of the tasks were quite varied. Students were asked to make judgements about:
paintings, sculptures
posters

games
environmental issues
products
advertisements
social problems
stories

- It seems that a list of tasks of this nature would be a useful teacher resource.

5. CREATIVE THINKING

5.1 INTRODUCTION

In this section the tasks which were identified as requiring creative thinking and, consequently, having the potential to assess this skill are presented and discussed. The working definition of creative thinking in this research is that it is:

Thinking which is directed towards solving a problem in one's own way. It often involves imagination and initiative.

5.2 THE CREATIVE THINKING TASKS

In the table below the tasks the task judged to require creative thinking skills are identified. The information given is:

- The assessment report
- The location of the item
- If the marking criteria for the item were considered. Indicated by *
- The title of the item
- The year group assessed
- The task approach
- If the item appeared in the assessment of Maori students
- A brief description of the thinking aspect of the item

Science 1995

Page 35*	*Float or sink*	Y4/8	1 – 1
	Q9. Here is a lump of plasticine. See it sinks. Do you think you can make it float? Show me.		

Art 1995

Page 17*	*Imaginary forest painting*	Y4/8	Independent
	Paint you own imaginary forest after watching a video.		
Page 23	*Firebird pastel and crayon drawing*	Y4/8	Independent
	Draw a make-believe creature called a firebird. Think about your own ideas and use your imagination.		
Page 29	*Insect collage*	Y4	Independent
Page 35	*Insect head collage*	Y8	Independent

Make a make-believe or fantasy collage of an insect. Try to use your papers in interesting ways.

Music 1996

Page 13*	*Animal parade*	Y4	Team
	New Zealand tourism video	Y8	Team
	Watch the video and make up some music to go with it.		
Page 14	*Phone jingles*	Y4	1 – 1
Page 15	*Answer phone*	Y8	1 – 1
	Watch the video and make up some music to go with the phone message.		
Page 24	*Team machine*	Y4/8	Team
	Listen to some music. Make up movements to go with it.		

Technology 1996

Page 27*	*Space game*	Y4/8	Team
	Play a game and think up ways of making it more fun.		

Reading and Speaking 1996

Page 50*	*Nils and Nelli*	Y4/8	Team
	Put cards in order to tell a story which is funny or sad or interesting in some way. Tell the story to others.		

Listening and Viewing 1998

Page 30*	*Robbers in the night*	Y4/8	1 – 1
	Put pictures from a comic into order to make a story. The pictures do not show an end. Try to think of 3 funny or unusual endings.		

Writing 1998

Page 15	*My place*	Y4/8	Independent
	Write about a place which is special to you.		
Page 18	*Me*	Y4/8	Station
	Make up a short poem called ‘Me”.		
Page 20*	*The wishing ring*	Y4/8	Independent
	Make up an ending for an incomplete story.		
Page 22	*Santa*	Y4/8	Station
	Picture of Santa thinking of something funny. Write in the speech bubble what he could be thinking.		
Page 24	*Birthday story*	Y4	Station

Page 26 *A tale of two donkeys* Y8 Station
Put 4 pictures in order to make a story. Write the story under the pictures.

Page 28 *The conversation* Y8 Team
Photo of policeman and fireman at a fire. Write a really interesting conversation between them.

Page 34 *Baby giraffe* Y4/8 Independent
Video of television news report on the birth of a baby giraffe. Write a short newspaper story to go with a picture of the giraffe.

Art 1999

Page 14 *Rainy day – Monotype print* Y4/8 Independent
Create and depict an expressive image.

Page 19 *Clay model* Y4/8 Independent
Create a person and a creature from clay which interact expressively with each other.

Page 31* *Cave creature* Y4/8 Independent Maori
Draw a picture of a make-believe cave creature from your own ideas and imagination.

Music 2000

Page 15 *Line music* Y4/8 Team
Using voice and instruments, create music to follow a line chart.

Page 16* *Radical rhyme* Y4/8 Team
Compose and perform a rap to fit a rhyme.

Page 18 *Boom Laka Laka Ting* Y4/8 Team
Compose and perform some music to match some words

Page 30 *Musical sticks* Y4/8 Team
Make up movements with a stick to match some music.

Reading and Speaking 2000

Page 53 *The sandwich* Y4/8 1 – 1 Maori
Retell a story from a picture book without words. Make it as interesting as possible.

Page 54 *Puppet play* Y4/8 Team
Plan and present plays using hand puppets.

Page 55	*Talk time*	Y4	Team
Page 56	*Talk topics*	Y8	Team
	Give the most interesting talk you can on a topic presented to you.		
Page 58*	*Wishing ring*	Y4/8	Team
	Make up a good ending to an incomplete story.		

Writing 2002

Page 14* Maori	*Imagination*	Y4/8	Independent
	Choose a picture and write a short story about it. Use your imagination and your own interesting ideas.		
Page 18	*Spots*	Y4/8	Station
	Invent appropriate dialogue to fit a picture. What do you think everyone in this picture is saying or doing?		
Page 23* Maori	*Te Potiki*	Y4/8	Station
	Put 4 pictures in order and tell a story about them.		
Page 26 Maori	*A better story*	Y4/8	Station
	Write a more exciting start to a story.		
Page 28	*Please…!*	Y4/8	Station
	Write down what you would say to your parents to persuade them to buy you some thing special for your birthday.		

Visual Arts 2003

Page 14	*Underwater garden*	Y4/8	Independent
	Paint a beautiful, magical underwater garden.		
Page 20	*Bird battle*	Y4/8	Independent
	Make a picture by cutting, tearing, arranging paper. Show two birds fighting.		
Page 25	*Dog walk*	Y4/8	Independent
	Make a picture about taking a dog for a walk. Draw it so that it really shows what it would be like to be dragged along by this very excited dog.		

5.3 MARKING CRITERIA FOR CREATIVE THINKING TASKS

In this section the marking criteria used in the NEMP assessments are considered for a number of the tasks which were judged to involve creative thinking. The intention is to examine the extent to which the criteria capture the creative thinking aspect of the tasks.
In the table below the tasks selected are given together with those parts of the marking criteria which relate to the creative thinking aspects of the tasks. The coding categories for the responses are also given.

5.3.1 Science

1995
Task:
Page 35 *Float or sink* Y4/8 1 – 1
Q9. Here is a lump of plasticine. See it sinks. Do you think you can make it float? Show me.
Marking Criteria:
20 *Didn't float*
Boat/bowl, open upwards
Boat/bowl, open downwards (trapping air)
Other
Comment:
The marking criteria relate only to the final result without assessing any creative approach to the problem.

5.3.2 Art

1995
Task:
Page 17 *Imaginary forest painting* Y4/8 Independent
Paint you own imaginary forest after watching a video.
Marking Criteria:
Expressiveness
image relevant to task
development of mood
sense of movement, where appropriate (e.g. water)
originality, avoidance of cliché

	slightly	*moderately*	*highly*
undeveloped	*developed*	*developed*	*developed*

1999
Task:
Page 31 *Cave creature* Y4/8 Independent
Maori
Draw a picture of a make-believe cave creature from your own ideas and imagination.
Marking Criteria:
R1 Expressiveness
image appropriate to task (ie cave creature)
strength, vitality and colour

movement / dynamism
imagination / avoidance of cliché

highly developed
moderately developed
slightly developed
under developed

Comment:
The criteria certainly seek to capture the creative nature of the tasks.

5.3.3 Music

1996
Task:

Page 13	*Animal parade*	Y4	Team
	New Zealand tourism video	Y8	Team
	Watch the video and make up some music to go with it.		

Marking Criteria:
Planned instrumental presentation (last presentation only)
1. Inventiveness: appropriate range / choice of sounds are demonstrated
2. Interpretation: sequence and choice of sounds gives a meaningful representation of the scene (pitch, tempo, volume)

Weak *Moderate* *Strong*

2000
Task:

Page 16	*Radical rhyme*	Y4/8	Team
	Compose and perform a rap to fit a rhyme.		

Marking Criteria:
Mark the final performance, where each student in turn says their part of the rap.
R1 Beat and rhythm
R2 Expressive performance
strong
moderate
weak
Mark the final performance, with the group singing the rap.
R15 Expressiveness of group performance
strong
moderate
weak

Comment:
The criteria seek to assess the creativity of the group as a whole, but not the creative thinking of the individual students

5.3.4 Technology

1996
Task:

Page 27 *Space game* Y4/8 Team
Play a game and think up ways of making it more fun.

Marking Criteria:

1. Quality of ideas selected for making the game more fun
   Weak *Moderate* *Strong*

Comment:

There is no indication in these criteria of the extent to which creativity was valued in the ideas selected.

5.3.5 Reading and Speaking

1996

Task:

Page 50 *Nils and Nelli* Y4/8 Team
Put cards in order to tell a story which is funny or sad or interesting in some way. Tell the story to others.

Marking Criteria:

2. Story is imaginative
3. Story is entertaining
   Weak *Moderate* *Strong*

2000

Task:

Page 58 *Wishing ring* Y4/8 Team
Make up a good ending to an incomplete story.

Marking Criteria:

R1 Creativity and originality
very creative / original
moderately creative / original
little or no creativity / originality

Comment:

The criteria include aspects which relate directly to creativity but it is the product not the process which is assessed.

5.3.6 Listening and Viewing

1998

Task:

Page 30 *Robbers in the night* Y4/8 1 – 1
Put pictures from a comic into order to make a story. The pictures do not show an end. Try to think of 3 funny or unusual endings.

Marking Criteria:

R4 Story – creativity (Q2)
Looking for X factor element
Creative
Little – no creativity

R6 Evidence of creativity in endings (Q3)
High
Quite high
Moderate
Limited

Comment:
The marking criteria specifically identify creativity.

5.3.7 Writing

1998
Task:
Page 20 *The wishing ring* Y4/8 Independent
Make up an ending for an incomplete story.

Marking Criteria:
R3 Creativity (ideas, originality)
Highly creative, variety of ideas
Good level of creativity
Some creative effort made
Low level of creativity, originality

2002
Task:
Page 14 *Imagination* Y4/8 Independent
Maori
Choose a picture and write a short story about it. Use your imagination and your own interesting ideas.

Marking Criteria:
R1 Interest and originality – impact, humour, ability to capture and hold reader's attention
Very high level
Good level
Some attempts made
Little or none

Task:
Page 23 *Te Potiki* Y4/8 Station
Maori
Put 4 pictures in order and tell a story about them.

Marking Criteria:
R2 How detailed is the story?
Rich in detail
Moderate in detail
Minimal in detail
R3 Overall effectiveness *in telling* a story (entertaining, coherent, satisfactory completion, not simply picture captioning*)*
High
Quite high
Moderate
Weak

Comment:
The marking criteria for the first two tasks contained specific reference to creativity / imagination but not the third.

5.4 COMMENTS

- Tasks involving creative thinking skills were found in 7 of the 12 curriculum assessment areas.

- Art, Music, Reading and Speaking, and Writing contributed the most tasks.

- All of the tasks involve producing something which is the result of creative thinking. It is the quality of the product which is assessed in the marking criteria.

- None of the tasks require students to explain or discuss the processes used.

- Only 5(13%) of the 40 tasks use a 1 – 1 interview task approach and this will limit the potential for exploring the nature of the thinking involved.

- The contexts of the tasks were quite varied. Students were asked to create:
  art works
  music
  games
  stories
  plays

- Again, it seems that a list of tasks of this nature would be a useful teacher resource.

6. REFLECTIVE THINKING

6.1 INTRODUCTION

In this section the tasks which were identified as requiring reflective thinking and, consequently, having the potential to assess this skill are presented and discussed. The working definition of reflective thinking in this research is that it is:

Thinking which involves looking back on one's previous thinking, knowledge, and understanding.

6.2 THE REFLECTIVE THINKING TASKS

In the table below the tasks the task judged to require reflective thinking skills are identified. The information given is:

- The assessment report

- The location of the item
- If the marking criteria for the item were considered. Indicated by *
- The title of the item
- The year group assessed
- The task approach
- If the item appeared in the assessment of Maori students
- A brief description of the thinking aspect of the item

Science 1995

Page 9*	*Separating mixtures*	Y4/8	Team
Page 10	*Parachutes*	Y4/8	Team
	Plan an experiment. Talk and think about it		
Page 15	*Estuary ecology*	Y4/8	1 – 1
	What is your opinion? If you had to explain your reasons what would you say?		
Page 25	*Reflections*	Y4/8	1 – 1
	Think about how you are able to see with your eyes.		

Art 1995

Page 43*	*Two sculptures*	Y4/8	1 - 1
	What do you think these sculptures are about? How do they make you feel?		
Page 46	*Choosing a picture*	Y4/8	Team
	Choose a picture and give your reasons.		

Graphs, Tables and Maps 1995

Page 10*	*Car race*	Y4/8	Station
	What do you notice about the weight of each car and the distance each travelled?		

Technology 1996

Page 22	*Flag*	Y4	Station
	What could you do to make the flag better?		
Page 23*	*Sports bag*	Y8	Station
	Write down all the things you would need to think about when designing the sports bag.		
Page 24	*Planning a class event*	Y8	Team
	Plan a lunch. Think about all the things you will need to do.		

Reading and Speaking 1996

Page 38 *Choosing a book* Y4/8 Team
Choose a book for the library. Argue your case for the book.

Page 52 *Question time* Y4/8 Group
Think of interesting questions you could ask two visiting police officers.

Page 53 *Telling an anecdote* Y4/8 Team
Think about something that happened to you. Tell others about it.

Page 54 *Chit chat* Y4/8 1 – 1
Tell me about yourself.

Page 56* *Agree to disagree* Y4/8 Team
Try to talk others into agreeing with your opinion.

Information Skills 1997

Page 14* *Mary Borg* Y4/8 1 – 1
Try to think of 3 important things you would want to know about a visitor's country.

Page 16 *Fire fighters project* Y4/8 Station
Choose three questions from a list to ask fire fighters to find out about their work.

Page 17 *Project questions* Y4/8 Station
Write three questions to ask for a project on Samoa.

Social Studies 1997

Page 14 *Legends* Y4/8 1 – 1
Think about the important messages in stories told on video.

Page 19* *Drinking Fountain* Y8 1 – 1
Think about what you could do to persuade the school to put in a drinking fountain.

Page 23 *Roller blades* Y8 Team
Think of ways to solve a roller blade problem.

Listening and Viewing 1998

Page 27* *Coca Cola* Y4/8 1 – 1
Two TV commercials. Why are there two? Who would like to watch each? Why might the commercials make them want to buy Coke? Why didn't the advertisers tell us more about Coke? Which is the best?

Health and Physical Education 1998

Page 15*	*Being healthy*	Y4/8	1 – 1
	What is the most important thing on your list of what a person needs to do to be healthy? Why?		
Page 16	*It's great to be fit*	Y4/8	1 – 1
	Choose the most important thing about keeping fit. Why?		
Page 23	*Smoke free*	Y8	1 – 1
	Think about smoking.		
Page 28	*A really good friend*	Y4/8	Team
	Think about what makes a really good friend.		
Page 52	*Keeping safe*	Y4/8	Team
	Think about keeping safe on school trips.		

Writing 1998

Page 35*	*Bike for Sale*	(advertisement)	Y4/8	Station
Page 36	*Party time*	(invitation)	Y4/8	Station
Page 38	*Fax message*	(reply)	Y4/8	Station
Page 40	*Pen pal*	(letter)	Y4/8	Station
	In each case think about the information you would need to give. Write the response.			

Science 1999

Page 44*	*Emptying rate*	Y4/8	Team
	Plan and conduct an investigation. Discuss the results		

Art 1999

Page 42*	*Landscapes*	Y4/8	1 – 1
	Match paintings. Explain.		

Graphs, Tables and Maps 1999

Page 33*	*North Island / South Island*	Y8	1 – 1
	Why do you think the North Island grows faster?		

Music 2000

Page 32*	*Two pieces*	Y4/8	1 – 1
Maori			
	Tell me some things about the music which you thought were specially interesting.		

Reading and Speaking 2000

Page 57* *Special visitor* Y4/8 Team
See how many short answer / long answer questions you can think of to ask a visitor.

Information Skills 2001

Page 15 *Clown show* Y4/8 1 – 1
Maori
Think of five important pieces of information to put on a poster.

Page 16 *Kiwi questions* Y4/8 1 – 1
Maori
Think of useful questions to ask an expert.

Page 18* *Funny taste* Y4/8 Team
The water tastes funny. Select four people to help. Think of questions to ask them.

Social Studies 2001

Page 18 *Tree troubles* Y8 Team
Think about a problem. Argue a position.

Page 20 *Group leaders* Y4/8 1 – 1
Maori
What are some of the things a leader should / shouldn't do to be a good leader?

Page 21* *A good team member* Y4/8 1 – 1
Think about the qualities of good team members.

Listening and Viewing 2002

Page 18* *The wind and the sun* Y4/8 1 – 1
Maori
What does the message in the fable mean?

Page 20 *Drummer Dylan* Y4/8 1 – 1
What did the reporter mean?

Page 31 *TV commercials* Y4/8 1 – 1
Why do you think the commercial was made in this way?

Health and Physical Education 2002

Page 14 *Camp out* Y4/8 1 – 1
Maori
What should people do to be safe.

Page 15* *Self-worth* Y4/8 1 – 1
Maori
Think about positive thinking.

Page 46 *Options* Y4/8 1 – 1
Maori
Choose options for dealing with problems.

Page 49 *Andrew's school* Y4/8 1 – 1
Think about bullying. Suggest solutions. Pick the best. Why?

Page 50 *Old bones* Y4/8 1 – 1
Bereavement. How do you think he is feeling? How could he / you help?

Page 52* *Whose friend?* (friendship) Y4/8 Station
Maori
Page 53 *Winning. A problem* (relationships)
Maori
Page 54 *Jump, Jump!* (peer pressure)
Maori
Page 55 *Marching boy* (stereotypes)
In each case identify the problem and suggest solutions.

Visual Arts 2003

Page 33 *Warriors and soldiers* Y4/8 1 - 1
What story does the sculpture tell you?

6.3 MARKING CRITERIA FOR REFLECTIVE THINKING TASKS

In this section the marking criteria used in the NEMP assessments are considered for a number of the tasks which were judged to involve reflective thinking. The intention is to examine the extent to which the criteria capture the reflective thinking aspect of the tasks.
In the table below the tasks selected are given together with those parts of the marking criteria which relate to the reflective thinking aspects of the tasks. The coding categories for the responses are also given.

6.3.1 Science

1995
Task:
Page 9 *Separating mixtures* Y4/8 Team
Plan an experiment. Talk and think about it.
Marking Criteria:
Planning – without knowledge of equipment

Consideration of useful equipment *Good Moderate Weak Absent*

Qualities of the material discussed *Good* *Moderate* *Weak* *Absent*

Planning – with knowledge of equipment

Discuss uses of equipment in relation to materials *yes / no*

Attempts to find a use for all equipment *yes / no*

Selectively chooses the pieces of equipment to be used *yes / no*

Comment:

The marking criteria do not seem to capture the reflective thinking of the students particularly well.

1999

Task:

Page 44 *Emptying rate* Y4/8 Team

Plan and conduct an investigation. Discuss the results

Marking Criteria:

R12 Discussion (related to time for tomato sauce + arguments)

Very good: – good ideas and interpretive skill demonstrated

Moderate: - some good ideas and interpretations, but inconsistent

Poor: - lacking good ideas and interpretive skills

Comment:

Again the marking criteria do not seem to capture the reflective thinking of the students very well.

6.3.2 Art

1995

Task:

Page 43 *Two sculptures* Y4/8 1 - 1

What do you think these sculptures are about? How do they make you feel?

Marking Criteria:

Responsiveness (how it makes you feel)

sense of engagement

curiosity

confidence

feelings / empathy

undeveloped *slightly developed* *moderately developed* *highly developed*

Comment:

The criteria seem to capture the reflective thinking nature of the task particularly well.

1999

Task:

Page 42 *Landscapes* Y4/8 1 – 1

Match paintings. Explain

Marking Criteria:

R7 Similarities between pic1 and pic4

R8 Differences between pics 2 / 7 and pics 9 / 11

Explains 3 features or elaborates well on 2 or more features

Explains 2 features

Explains 1 feature

Any other response

Comment:

The criteria seem to capture the reflective thinking nature of the task reasonably well.

6.3.3 Graphs, Tables and Maps

1995

Task:

Page 10 *Car race* Y4/8 Station

What do you notice about the weight of each car and the distance each travelled?

Marking Criteria:

3. □ *No appropriate comment*

□ *Greater weight further distance*

Comment:

The criteria do not seem to capture the reflective nature of the task. Only the 'correct' answer is considered appropriate.

1999

Task:

Page 33 *North Island / South Island* Y8 1 – 1

Why do you think the North Island grows faster?

Marking Criteria:

R13 Some explanation referring to jobs, weather, etc.

2 or more good ideas

1 good idea

anything else

Comment:

The criteria do not seem to capture the reflective nature of the task particularly well.

6.3.4 Music

2000

Task:

Page 32 *Two pieces* Y4/8 1 – 1

Maori

Tell me some things about the music which you thought were specially interesting.

Marking Criteria:

R4 Indication of personal response / engagement

Strong

Moderate

Weak

Absent

Comment:
The criteria do seem to capture the reflective nature of the task.

6.3.5 Technology

1996
Task:
Page 23 *Sports bag* Y8 Station
Write down all the things you would need to think about when designing the sports bag.
Marking Criteria:
1. Merit of things to consider
3. Merit of reasoning associated with choice of material(s)
4 Merit of ideas for checking whether the sports bag is going to be good
Weak *Moderate* *Strong*

Comment:
The criteria do seem to capture the reflective nature of the task.

6.3.6 Reading and Speaking

1996
Task:
Page 56 *Agree to disagree* Y4/8 Team
Try to talk others into agreeing with your opinion.
Marking Criteria:
1. Relevance of ideas to topic.
Weak *Moderate* *Strong*

Comment:
The criteria do seem to capture the reflective nature of the task.

2000
Task:
Page 57 *Special visitor* Y4/8 Team
See how many short answer / long answer questions you can think of to ask a visitor.
Marking Criteria:
For each short and long answer question: (up to five questions of each type)
Invites extended answer
Invites short answer
No question
R11 Overall appropriateness
Highly appropriate
Moderately appropriate
Slightly appropriate
Not appropriate

Comment:
The criteria do seem to capture the reflective nature of the task.

6.3.7 Information Skills

1997
Task:
Page 14 *Mary Borg* Y4/8 1 – 1
Try to think of 3 important things you would want to know about a visitor's country.
Marking Criteria:
2a Number of relevant questions
2b Look at the first three questions only and code the content (there are 6 content categories)
Comment:
Since the quality of the relevant questions is not assessed, the criteria do not capture the reflective nature of the task very well.

2001
Task:
Page 18 *Funny taste* Y4/8 Team
The water tastes funny. Select four people to help. Think of questions to ask them.
Marking Criteria:
Selecting people
R4 How many of the people chosen are good choices? (based on child's argument)
Asking questions
R3-5 Appropriateness of question
R7 Amount of useful information likely to result from set of questions
High
Moderate
Low
Comment:
The criteria do seem to capture the reflective nature of the task.

6.3.8 Social Studies

1997
Task:
Page 19 *Drinking Fountain* Y8 1 – 1
Think about what you could do to persuade the school to put in a drinking fountain.
Marking Criteria:
1 Range of distinct ideas
Several appropriate ideas
1 – 2 appropriate ideas
No appropriate ideas
No response
Not asked
Comment:

The criteria do seem to capture the reflective nature of the task.

2001
Task:
Page 21 *A good team member* Y4/8 1 – 1
Think about the qualities of good team members.
Marking Criteria:
R7 Reasons for choice of most important thing. Merit of justification.
Excellent
Good
Moderate
Poor
Comment:
The criteria do seem to capture the reflective nature of the task.

6.3.9 Listening and Viewing

1998
Task:
Page 27 *Coca Cola* Y4/8 1 – 1
Two TV commercials. Why are there two? Who would like to watch each? Why might the commercials make them want to buy Coke? Why didn't the advertisers tell us more about Coke? Which is the best?
Marking Criteria:
R1 Why two? Key concept = appealing to different markets to ensure product sales
Clearly articulates concept with appropriate examples
Good ideas but not fully expressed
On the right track but vague
Any other response
R2/3 Techniques used in the two commercials
Expresses a range of relevant ideas and gives appropriate examples
Good ideas but not fully expressed
On the right track but vague
Any other response
R4 Why the ad didn't tell us more about Coke
Well articulated good ideas
Some good ideas
Any other response
Comment:
Responses to some of the questions in the task were not coded in the marking criteria:
Who do you think would most like to watch the polar bear/pop and rock commercial?
Why do you say that one commercial is better than the other?
However, the criteria seem to capture some of the reflective thinking involved in the task.

2002
Task:

Page 18 *The wind and the sun* Y4/8 1 – 1
Maori
What does the message in the fable mean?

Marking Criteria:

R24 How well does the student's explanation of the lesson/main message fit with the words of the message: It is easier to influence people with gentleness than with force.
Very well *Moderately well* *Poorly*

Comment:

The criteria do seem to capture the reflective nature of the task.

6.3.10 Health and Physical Education

1998

Task:

Page 15 *Being healthy* Y4/8 1 – 1
What is the most important thing on your list of what a person needs to do to be healthy? Why?

Marking Criteria:

R11 Why would that be the most important?
Essential for life
Prevention
Mental – emotional wellbeing
Enhancement / Positive body images
Negative repercussions
Other

Comment:

The criteria did not evaluate the responses, only recorded them. Consequently the reflective thinking of the students was not evaluated in this item.

2002

Task:

Page 15 *Self-worth* Y4/8 1 – 1
Maori
Think about positive thinking.

Marking Criteria:

What might happen if a person thinks negatively? / positively?
R1/11 Consequences for feelings
R2/12 Consequences for behaviour
Very good insight and awareness
Some understanding
Simplistic awareness / Any other response

Comment:

The criteria seem to capture the reflective thinking nature of the task particularly well.

6.3.11 Writing

1998
Task:
Page 35 *Bike for Sale* (advertisement) Y4/8 Station
Write a short advertisement. Think about the important information you will need to give.
Marking Criteria:
R7 Ability to be persuasive
How effective is the advertisement
Highly effective
Moderately effective
Low level of persuasiveness
Not effective
Comment:
The criteria do seem to capture the reflective nature of the task.

6.4 COMMENTS

- Tasks involving reflective thinking skills were found in 11 of the 12 curriculum assessment areas.

- Health and Physical Education contributed the most tasks with the rest spread widely over the curriculum areas.

- As one might expect from the general nature of reflective thinking there are a very wide range of questions and contexts. In a large number of the tasks the student is asked to "think about …."

- The marking criteria seemed to be capturing the nature of the students' reflective thinking quite well.

- 27(49%) of the 55 tasks use a 1 – 1 interview task approach and this indicates that many of the tasks have greater potential to assess the nature of the thinking used by students.

- Again, it seems that a list of tasks of this nature would be a useful teacher resource.

7. LOGICAL THINKING

7.1 INTRODUCTION

In this section the tasks which were identified as requiring logical thinking and, consequently, having the potential to assess this skill are presented and discussed. The working definition of logical thinking in this research is that it is:

Thinking which is directed towards making deductions or presenting arguments.

7.2 THE LOGICAL THINKING TASKS

In the table below the tasks the task judged to require logical thinking skills are identified. The information given is:

- The assessment report
- The location of the item
- If the marking criteria for the item were considered. Indicated by *
- The title of the item
- The year group assessed
- The task approach
- If the item appeared in the assessment of Maori students
- A brief description of the thinking aspect of the item

Science 1995

Page 9	*Separating mixtures*	Y4/8	Team
Page 10	*Parachutes* Systematically plan an experiment.	Y4/8	Team
Page 16*	*Classification* Sort cards into groups.	Y8	1 – 1
Page 28	*Batteries* Conduct an experiment to see which batteries work.	Y4/8	1 – 1
Page 43	*Weather* Sort cards into groups	Y4	Team

Graphs, Tables and Maps 1995

Page 26*	*Tuatua School electricity* Why do you think that the consumption in that month was lowest?	Y4/8	Station

Technology 1996

Page 17*	*Crane* Tell me how it works.	Y4/8	1 - 1
Page 18	*Stapler* Explain the function of each part.	Y4	Station
Page 21	*Gift shop* Make a package for soaps	Y4/8	Station

Reading and Speaking 1996

Page 46	*Follow me* Tell others how to perform tasks without showing them.	Y4/8	Team
Page 50*	*Nils and Nelli* Put cards in a suitable order	Y4/8	Team

Information Skills 1997

Page 35*	*Chocolate factory*	Y4/8	Station
	Choose cards to show the main steps in production and put them in order.		

Mathematics 1997

Page 18*	*Numbers in squares*	Y4/8	Team
	Put numbers in squares to solve a problem.		
Page 51	*Cut it out*	Y4/8	Station
	Cut folded paper to produce a given pattern.		
Page 55	*Jumpers*	Y4/8	1 – 1
	Predict the result of number line jumps.		
Page 58*	*Algebra, statistics and logic items*	Y4/8	Independent
	Complete number patterns. Explain.		
Page 59	*Number patterns*	Y4/8	Independent
	Write missing numbers in patterns.		

Listening and Viewing 1998

Page 30*	*Robbers in the night*	Y4/8	1 - 1
	Put pictures in logical order.		

Science 1999

Page 32*	*Ball bounce*	Y8	Team
	Plan an experiment		

Aspects of Technology 2000

Page 15	*Puppet make-up*	Y4/8	1 – 1
Maori	Describe how the puppet was made.		
Page 16*	*Buzzer*	Y4/8	1 – 1
	Design an electric circuit and explain.		
Page 17	*Peg basket*	Y4/8	Independent
	Explain design features.		

Information Skills 2001

Page 37*	*Stop-Look-Think*	Y4/8	1 - 1
	Explain what might happen next.		

Social Studies 2001

Page 18	*Tree troubles*	Y8	Team
	Make a case for cutting/not cutting down a tree.		

Mathematics 2001

Page 43	*Hedgehog*	Y4/8	1 – 1
	What direction would you give me?		
Page 46	*Paper folds*	Y4/8	Station
Maori			
	Cut folded paper to produce a given pattern.		
Page 55*	*Statistics items B*	Y4/8	Independent
Maori			
	Explain to Maria why she is right or wrong.		
Page 56	*Farmyard race*	Y4	Team
Page 57*	*Photo line-up*	Y8	Team
	Arrange cards logically.		

Listening and Viewing 2002

Page 21	*Line up*	Y4/8	Station
Maori			
	Follow instruction logically.		
Page 29	*Santa gets ready*	Y4/8	1 – 1
	Order cards logically.		

Writing 2002

Page 20	*Opinions*	Y4/8	Station
Maori			
	Argue your opinion logically.		
Page 23*	*Te Potiki*	Y4/8	Station
Maori			
	Put cards in logical order.		

Science 2003

Page 21	*Sorting*	Y4/8	1 – 1
	Classify objects, giving reasons.		
Page 22	*Plants experiment*	Y4/8	Team
	Design an experiment.		

Page 30	*Sun shine* Explain why the shadow is longer.	Y4	1 – 1
Page 31	*Swinging marbles* What happened? Why?	Y8	Station
Page 34	*Runaway* Plan an experiment.	Y4/8	Team
Page 38	*Experimenting with air and water* Explain what happened.	Y4/8	1 – 1
Page 39	*What a muddle* Classify materials.	Y4	Team
Page 40	*Soak it up* Design an experiment.	Y8	Team

Graphs, Tables and Maps 2003

Page 20	*Renting a car* Give two reasons for your choice of car.	Y8	Station
Page 30	*Blackbeard's map* Plan a route.	Y4/8	Station

7.3 MARKING CRITERIA FOR LOGICAL THINKING TASKS

In this section the marking criteria used in the NEMP assessments are considered for a number of the tasks which were judged to involve logical thinking. The intention is to examine the extent to which the criteria capture the logical thinking aspect of the tasks.
In the table below the tasks selected are given together with those parts of the marking criteria which relate to the logical thinking aspects of the tasks. The coding categories for the responses are also given.

7.3.1 Science

1995
Task:

Page 16	*Classification* Sort cards into groups.	Y8	1 – 1

Marking Criteria:

Sorted cards into piles	*Yes / No*
Provided reasons to differentiate between groups	*Yes / No*
Gave defensible reasons	*Yes / No*

Comment:
The criteria do not seem to capture the logical nature of the task very well.

1999

Task:

Page 32 *Ball bounce* Y8 Team
Plan an experiment

Marking Criteria:

R12 Predictions and discussion for 6th ball
Rating for discussion of the probable ranking of the 6th ball, the arguments presented and discussion of results if different from prediction.

Very Good: *good ideas and interpretive skills*
Moderate: *some good ideas and interpretive skills*
Poor: *lacking good ideas and interpretive skills*

Comment:

The criteria do seem to capture the logical nature of the task.

7.3.2 Graphs, Tables and Maps

1995

Task:

Page 26 *Tuatua School electricity* Y4/8 Station
Why do you think that the consumption in that month was lowest?

Marking Criteria:

3b *No reasonable answer*
Some relevant BUT some irrelevant information
Referred to graph
Appropriate response

Comment:

The criteria do not seem to capture the logical nature of the task very well.

7.3.3 Technology

1996

Task:

Page 17 *Crane* Y4/8 1 - 1
Tell me how it works.

Marking Criteria:

3 Why large cog makes the string move more quickly.
Clearly explains effect of more teeth on cog
Vague explanation – with some merit
No idea

Comment:

The criteria do seem to capture the logical nature of the task

2000

Task:

Page 16 *Buzzer* Y4/8 1 – 1
Design an electric circuit and explain.

Marking Criteria:

None of the criteria relate to the explanations which were required in the task.
Comment:
There is presumably some logical thinking behind the design, but the criteria do not seem to capture this well.

7.3.4 Reading and Speaking

1996
Task:
Page 50 *Nils and Nelli* Y4/8 Team
Put cards in a suitable order
Marking Criteria:
1 Story links pictures sensibly
Weak *Moderate* *Strong*
Comment:
The criteria do seem to capture the logical nature of the task.

7.3.5 Information Skills

1997
Task:
Page 35 *Chocolate factory* Y4/8 Station
Choose cards to show the main steps in production and put them in order.
Marking Criteria:
3 Has the student chosen the cards which are **not** part of the main steps
Yes / No
5 Order of remaining cards
Look at each letter the student has identified and count the number of places it is from the correct placement of that letter on the template. Total the score.
Comment:
There is presumably some logical thinking behind the selection, but the criteria do not seem to capture this well.

2001
Task:
Page 37 *Stop-Look-Think* Y4/8 1 - 1
Explain what might happen next.
Marking Criteria:
The section asking for an explanation of what might happen next was not marked.
Comment:
The criteria do not seem to capture the logical nature of the task.

7.3.6 Mathematics

1997
Task:
Page 18 *Numbers in squares* Y4/8 Team
Put numbers in squares to solve a problem.
Marking Criteria:
1ci Evidence of a sophisticated strategy *Yes / No*

1cii	Evidence of a systematic trial and error	*Yes / No*
1ciii	Random trial and error	*Yes / No*
3i	Did they suggest a strategy which takes into account the pattern?	*Yes / No*
3ii	Did they suggest systematically changing one of the numbers?	*Yes / No*
3iii	Did they suggest randomly changing numbers?	*Yes / No*

4 From their work and the strategies they suggest was there:
evidence of a systematic plan which took account of the numbers?
evidence of a plan which did not take account of the numbers?
no evidence of following a plan?

Comment:
The criteria seem to capture the logical nature of the task particularly well.

2001
Task:

Page 55	*Statistics items B*	Y4/8	Independent
Maori			

Explain to Maria why she is right or wrong.

Marking Criteria:
R24 Maria is right or wrong
Clear explanation that Maria is wrong with diagram
Clear explanation that Maria is wrong without a diagram
On right line but vague
Any other response

Comment:
The criteria do seem to capture the logical nature of the task.

2001
Task:

Page 57	*Photo line-up*	Y8	Team

Arrange cards logically.

Marking Criteria:
R9 Strategy group employed
Very good
Good
Moderate
Poor

Comment:
The criteria do seem to capture the logical nature of the task.

7.3.7 Listening and Viewing

1998
Task:

Page 30*	*Robbers in the night*	Y4/8	1 - 1

Put pictures in logical order.

Marking Criteria:
R2 Story – logical order / sense
All pictures in logical order
Some pictures in logical order
No pictures in logical order

Comment:
The criteria do seem to capture the logical nature of the task.

7.3.8 Writing

2002
Task:
Page 23 *Te Potiki* Y4/8 Station Maori
Put cards in logical order.
Marking Criteria:
R1 Has student created a plot / logical flow using the 4 pictures?
Every picture logically linked in sequence
One picture not logically linked
Two pictures not logically linked
Little or no linking
Comment:
The criteria do seem to capture the logical nature of the task.

7.4 COMMENTS

- Tasks involving logical thinking skills were found in 8 of the 12 curriculum assessment areas.
- Science, Mathematics, and Technology contributed the most tasks.
- Classifying, planning, and explaining were the focus of many of the tasks. The tasks tended not to be open-ended which reduced the potential for the marking criteria to capture the thinking behind the responses.
- 13(30%) of the 43 tasks use a 1 – 1 interview approach and this indicates that a number of the tasks have greater potential to assess the nature of the thinking used by students.
- Again, it seems that a list of tasks of this nature would be a useful teacher resource.

8. THE HALPERN THINKING ASSESSMENT TASKS

8.1 INTRODUCTION

In this section the tasks in the assessments which seem to have the greatest potential for assessing the four different kinds of thinking are discussed.

As stated in section 1.4 of this report, the researcher shares the view of Halpern (2003, page 361) that the type of test format most suited to the assessment of thinking uses:

- an open-ended response format
- specific questions that probe the reasoning behind an answer

There are many tasks in the NEMP assessments which clearly involve one, or more, of the categories of thinking in which we are interested, but which only examine the *results* of that thinking and not the processes through which the student went to achieve those results. That is, they fail to satisfy the second, of Halpern's criteria.

The only task format which is likely to satisfy both of the criteria is the one-to-one interview format in which the student works individually with a teacher with the whole session recorded on videotape. The team and independent also involve some videotaping, but there is not the same opportunity for probing the student's reasoning in these formats.

Consequently, the only NEMP tasks which seem to satisfy Halpern's criteria are those which:

- are in a one-to-one interview format
- are open-ended
- ask for explanations or justifications

For want of a better word such tasks will be referred to as Halpern tasks.

Whether or not the potential of these tasks was realised in the marking and reporting of the tasks is also considered.

8.2 THE DISTRIBUTION OF HALPERN THINKING TASKS

The table below indicates:

- the subject area
- the number of tasks judged to involve each of the forms of thinking
- the number of Halpern thinking tasks for each form of thinking
- the total number of thinking tasks and Halpern thinking tasks.
- the number of Halpern thinking tasks in which the potential was realised in the marking and reporting criteria

	Number of thinking tasks				**Number of Halpern tasks**		
Subject	**Critical**	**Creative**	**Reflective**	**Logical**	**Critical**	**Creative**	**Reflective**
Logical							
Science	2	1	5	14	2	0	1
1							
Art	5	10	4	0	5	0	4
0							
GTM	1	0	2	3	0	0	0
0							
Music	0	8	1	0	0	0	1
0							
Tech	5	1	3	6	2	0	0
2							
Read/Speak	0	6	6	2	0	0	0
0							

Info Skills	0	0	6	2	0	0	0
1							
Soc Studies	0	0	6	1	0	0	0
0							
Maths	0	0	0	10	0	0	0
0							
Listen/View	5	1	4	3	5	0	2
0							
Health/PE	1	0	14	0	0	0	3
0							
Writing	2	13	4	2	0	0	0
0							
Total	21	40	55	43	14	0	11
4							
No of Halpern tasks realising potential					11	0	10
1							

8.3 DIFFERENCES RELATING TO THINKING CLASSIFICATION

The most obvious feature of this table is that although there were a good number of tasks involving creative and logical thinking in the assessments, none of the creative tasks and few of the logical tasks satisfied the Halpern thinking task criteria.

In the creative tasks, only 5 of the 40 tasks used a one-to-one format and the students were not asked to explain or justify their responses in any of these. This is not surprising. From an assessment point of view, it seems reasonable to assume that the creativity of an art work, a piece of music, or a story can be judged by looking at the end result. It would also be impractical and unnecessary to have a teacher observing all the time an art work was being made or a story written. However, in the art assessments, for example, there are some excellent examples of students being asked to think critically and reflectively on the work of others and it does seem that it would be worthwhile to ask them to consider their own creativity in the same way. Perhaps this is not practicable in the NEMP context, but it should certainly be encouraged in the classroom.

The situation is a little different in the logical tasks. 13 of the 43 thinking tasks used the one-to-one format and there is no obvious practical reason why this number could not have been greater. There was some probing of reasoning, but the researcher felt that it was relatively superficial and this is reflected in the fact that only one of the Halpern logical tasks realised its potential. There is, it seems, an unwarranted tendency to assume that if a student achieves the correct answer for a question involving logical thinking then the thinking must have been sound. There is also the fact that the logical thinking tasks tend to be less open-ended than those involving the other kinds of thinking.

In contrast, 16 of the 21 critical thinking tasks used the one-to-one format and many of them made the most of the opportunities for open-ended questions and response probing which this format provides. There is little doubt that this is the area in which the NEMP assessments were most successful in assessing the thinking of students.

In the reflective thinking tasks 26 of the 55 tasks used the one-to-one format and the majority of these were open-ended. However, in a significant number of tasks the responses of students were recorded but not probed.

8.4 SUBJECT AREA DIFFERENCES

It is clear from the above table that the distribution of Halpern thinking tasks is not even over the different subject areas. It is important to recognise in interpreting this that the NEMP assessments are not principally designed to monitor thinking skills. If they do this it is likely to be as a by-product of other objectives.

Graphs, Tables and Maps, Reading and Speaking, Information Skills, Social Studies, and Mathematics, which contributed hardly any Halpern tasks, perhaps tend to be less open-ended than other subjects and consequently good thinking assessment tasks are less likely to arise in the usual assessment patterns of these subjects. If thinking is to be successfully assessed in these areas it seems that specific questions might be required.

Because no creative thinking tasks fitted the Halpern criteria, the more creative subjects of Art, Music, Reading and Speaking, and Writing appear strongly on the table of tasks which involve thinking skills but less strongly in the Halpern tasks than they might have done.

Science, Technology, and Listening and Viewing covered a wide range of thinking tasks.

The thinking in Health and Physical Education was principally reflective although in a number of tasks it seemed that the assessment was mostly concerned with the student's opinion rather than the thinking behind that opinion.

The subject area which stands out most in the table is Art. In the three assessments undertaken, there were 28 assessment tasks in total, 19 of these were judged to require thinking skills. 10 of these were creative thinking tasks, not in the one-to-one format and consequently not included in the Halpern tasks. However, there is little doubt that the creative thinking of these tasks was evident in the work which the students produced, even if the thinking was not probed. Of the other 9 task all were in the Halpern task category. Only logical thinking was missing.

8.5 TWO EXAMPLES OF VERY GOOD THINKING ASSESSMENT TASKS

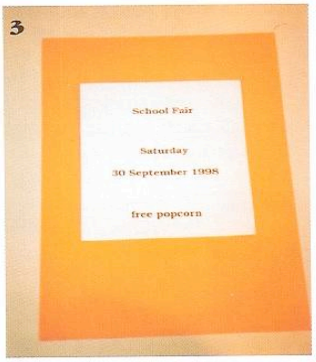
The two tasks which follow are, in the researcher's opinion, examples of the best thinking assessment tasks in the NEMP assessments. The first is a critical thinking task taken from the 1998 Listening and Viewing assessment.

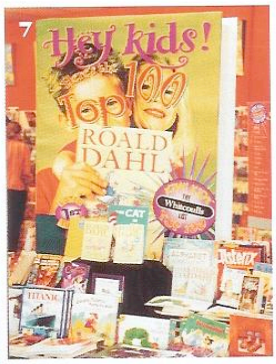
Looking Around

Approach: One to one

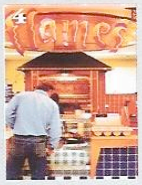
Level: Year 4 and year 8

Resources: Photographs of seven signs or posters.





Questions/instructions		% responses y4	% responses y8
There are lots of interesting signs and posters that you can see in all sorts of places. Some examples are shown in these 7 photographs.			
Arrange all 7 pictures in front of student.			
1. First, I want you to choose one sign or poster from these pictures that you think is very good because of the way it has been made.	**Picture chosen:** 1	43	32
	2	7	10
	3	1	0
	4	9	17
	5	6	6
	6	3	3
	7	31	32
Allow time. Write picture number on recording sheet.			
2. Now look carefully at the picture you have chosen. I want you to try to explain to me everything about the way this sign/poster has been made that makes it very good.			
Allow time. *Possible elements include attractive features, colour, symbolism.*			
	clear with multiple ideas	37	58
	relevent, not fully developed	29	30
	on right track, but vague	26	10
	very limited	8	2



		% responses y4	% responses y8
3. Now choose one sign or poster that you think is not very good because of the way it has been made.			
Allow time.	**Picture chosen:** 1	1	0
	2	8	5
	3	63	86
	4	6	1
	5	9	4
	6	10	3
	7	3	1
4. Now look carefully at the picture you have chosen as being not very good. Try to explain to me why it is not very good — because of the way it has been made.			
Student responds.	**Quality of explanation:**		
	clear with multiple ideas	29	54
	relevent, not fully developed	34	35
	on right track but vague	24	9
	very limited	13	2
5. What are some of the things that could be done to make this a really good sign?			
	Quality of explanation:		
	clear with multiple ideas	45	75
	relevent, not fully developed	26	20
	on right track but vague	19	4
	very limited	10	1

Commentary

This task was designed to assess students' ability to explain why some signs or posters seem effective and others do not. Year 4 and year 8 students chose the same effective and ineffective examples, but year 8 students were substantially better at explaining the reasons for their choices.

The second is a reflective thinking task from the 1995 Art assessment.

Two Sculptures

Approach: One to One Interview *Level:* Year 4 and year 8

Resources: Video recording of two sculptures; colour photographs of each sculpture

Description

The student viewed a short video recording of two sculptures in public places. The student viewed the first sculpture and responded to interview questions on that sculpture before seeing the second sculpture and responding to associated questions. Colour photographs of the sculptures were used to support discussion after viewing the video (see opposite page).

The teacher administrator asked a sequence of questions to investigate the student's knowledge, understandings and ideas about each sculpture in turn, then the two sculptures in relation to each other. Prompts (in italics) were given only when it was considered necessary to seek or encourage clarification from the student.

The following questions were asked:

1 I would like you to describe what you saw in the video. This picture of the sculpture will help you.
(Give the student the photo)

2 What do you think this sculpture is about?
What is the purpose of the sculpture?
Why do you think the artist made the sculpture in this way?
What is the artist trying to say with this sculpture?

3 Why do you think this sculpture has been put in a public place?
Why do you think the place was chosen for the sculpture?

4 How does the sculpture make you feel?
Do you like it? Can you explain why?

Questions relating the two sculptures.

5 I would like you to explain any similarities between the two sculptures — are there any ways in which they are similar? Are there any other ways in which they are similar?

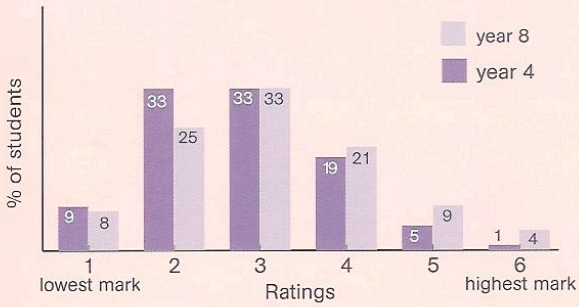
6 Could you now explain the important differences between the two sculptures.
Are there any other important differences that you notice?

7 We haven't got a title for the sculptures. I would like you to think of a title or a name for each one.
What name or title would you give to each sculpture?

8 Which of the two sculptures do you like most?
Why do you like that one most?
Are there any other reasons why you like that one most?

Although the assessment procedures, interview questions and marking scheme were the same for years 4 and 8, the stimulus pictures of sculptures differed. Accordingly, the results should be read separately.

Global ratings: Two sculptures



There is a very similar distribution of ratings across the 6 point scale for both year 4 and 8 students. Although one sculpture was changed between year 4 and 8, the task procedure was the same.

Key attributes (1 low – 4 high)	**Qualities**	**Mean score**	
		year 4	year 8
description	identification of images; detail of description; art making information (use of colour, dimensionality, etc.)	2.2	2.4
responsiveness	sense of engagement; curiosity; confidence; feelings, empathy.	2.2	2.3
interpretation	accounting for detail; narrative - tells a story; relevant use of art vocabulary; fluency of ideas; backing opinions with reasons; use of metaphor.	2.0	2.4
Global Rating (1 low – 6 high)		**2.8**	**3.1**

As explained earlier, none of the creative thinking tasks involved probing the thinking of students and none of the logical thinking tasks stood out as being particularly good.

The first task is clearly evaluative and consequently involves critical thinking. The initial questions are open-ended, there is no 'correct' answer. The students are then required to explain and justify their responses and these explanations are evaluated in the marking criteria.

The second task was considered to be predominately a reflective thinking task although there is an evaluative element towards the end. The student is asked to reflect on the sculptures; what they are about; why they are there; how the sculptures make the student feel. These are clearly open-ended questions the responses to which are probed – *can you explain why?* The responses to these probes are clearly evaluated in the marking criteria under the category of responsiveness.

9. TASKS FOR FUTURE RESEARCH

The final research question for this study was:

Is it possible to identify particular tasks, presented in a one-to-one interview format, the video tapes from which would be likely to enable a researcher, in a subsequent study, to explore the nature of the thinking which was actually used by students.

It does seems that it is possible. The tasks would need to be Halpern tasks as discussed in the previous section and this would preclude the creative thinking tasks. There did not seem to be any obvious candidates in the logical thinking tasks either. However, the responses to a number of the critical and reflective thinking tasks did appear to be worthy of further examination.

The two tasks in section 8.5, for example, would both be suitable. In both cases students were asked to explain or justify their responses. The marking criteria then asked the assessors to classify the explanations:

Task	**Marking criteria**			
Looking around	Quality of explanation:	*clear with multiple ideas*		
		relevant, not fully developed		
		on right track but vague		
		very limited		
Two sculptures	Responsiveness (how it makes you feel)			
	sense of engagement			
	curiosity			
	confidence			
	feelings / empathy			
	underdeveloped	*slightly developed*	*moderately developed*	*highly developed*

A further examination of the video tapes might enable a researcher to focus on the nature of the thinking behind the responses as well as judging their overall quality. There is almost certainly more useful information in the video tapes than was used in the initial assessment.

10. SUMMARY

10.1 INTRODUCTION

The research involved considering all of the tasks in the 1995 – 2003 NEMP assessments to identify those which had the potential to assess critical, creative, reflective or logical thinking. A total of 711 tasks were considered and 159 of these involved one, or more, of these kinds of thinking.

Each of the kinds of thinking were considered separately and the tasks involved are presented and discussed in sections 4 – 7.

The marking criteria for the tasks were then considered to see to what extent the potential to evaluate the different kinds of thinking was realised in the assessments. The nature of these criteria is reflected well in the way the results of the assessment are reported in the subject reports. Consequently, it was decided that it was not necessary to examine the marking criteria for all of the 159 tasks identified. A sample of 52 tasks, selected to represent each type of thinking and a spread across the curriculum was chosen.

The nature of these marking criteria and the extent to which they capture the nature of the thinking involved is also presented in sections 4 – 7.

Most of the marking, and reporting, criteria, while assessing the *results* of critical, creative, reflective or logical thinking, did not capture the nature of the thinking itself. Consequently, tasks which had the greatest potential for identifying the nature of the thinking were identified using criteria suggested by Halpern (2003, page 361). In the context of the NEMP assessments, this meant using tasks which:

- are in a one-to-one interview format
- are open-ended
- ask for explanations or justifications

These tasks are referred to in this report as Halpern tasks. 29 such tasks were identified. The relationship of these tasks to the different kinds of thinking and to the curriculum areas is discussed in section 8

Finally, the question as to whether further research into the video tapes of the responses to some of the Halpern tasks would be useful was considered.

10.2 THE THINKING TASKS

Of the 711 tasks considered, 159(22%) were judged to have the potential to assess one, or more of the thinking skills. 3% involved critical thinking, 6% creative thinking, 8% reflective thinking, and 6% logical thinking.

The assessments for Maori students (1999 – 2002) used a selection of tasks from the general assessments. The distribution of thinking tasks is similar to that of the general assessment. There were 164 tasks of which 31(19%) were thinking tasks, 5% critical thinking, 3% creative thinking, 7% reflective thinking, and 4% logical thinking.

10.3 CRITICAL THINKING

The working definition of critical thinking in this report is that it is:

Thinking which involves evaluation and, perhaps, challenge.

Tasks involving critical thinking were found in 7 of the 12 curriculum assessment areas with Art, Technology, and Listening and Viewing contributing the most tasks. Most of the tasks require students to explain, justify or discuss their responses. The obvious potential which this presents for assessing the thinking of students was realised very well in some, but not all marking criteria.

10.4 CREATIVE THINKING

The working definition of creative thinking in this report is that it is:

Thinking which is directed towards solving a problem in one's own way. It often involves imagination and initiative.

Tasks involving creative thinking were found in 7 or the 12 curriculum assessment areas with Art, Music, Reading and Speaking, and Writing contributing the most tasks. All of the tasks involve producing something which is the result of creative thinking. None of the tasks require students to explain or discuss the processes used. Consequently, the marking criteria assess the quality of the product of the thinking rather than the thinking itself.

10.5 REFLECTIVE THINKING

The working definition of reflective thinking in this report is that it is:

Thinking which involves looking back on one's previous thinking, knowledge, and understanding.

Reflective thinking tasks were found in 11 of the 12 curriculum assessment areas. Health and Physical Education contributed the most tasks with the rest spread widely over the other curriculum areas. The general nature of reflective thinking means there are a very wide range of questions and contexts. In many of the tasks students are asked to "think about ….". The marking criteria seemed to capture the nature of the students thinking quite well.

10.6 LOGICAL THINKING

The working definition of logical thinking in this report is that it is:

Thinking which is directed towards making deductions or presenting arguments.

Logical thinking tasks were found in 8 of the 12 curriculum assessment areas. Science, Mathematics, and Technology contributed the most tasks. Classifying, planning and explaining were the focus of many of the tasks. The tasks tended not to

be open ended which reduced the potential for the marking criteria to capture the thinking behind the responses.

10.7 THE HALPERN TASKS

The Halpern tasks, which had the greatest potential for assessing the thinking of students, were those which:

- are in a one-to-one interview format
- are open-ended
- ask for explanations or justifications

10.7.1 The distribution of Halpern tasks

29 such tasks were identified, 14 involved critical thinking, 11 reflective thinking and 4 logical thinking. None of the creative tasks satisfied the criteria.

In the creative tasks only 5 of the 40 tasks used a one-to-one format and the students were not asked to explain or justify their responses in any of these. There was a tendency for the logical tasks not to be open-ended.

It was felt that the potential to assess the thinking of students was realised to a greater or lesser extent in 21 of the 29 Halpern tasks.

There were marked differences in the distribution of Halpern tasks across the curriculum assessment areas with 7 of the 12 areas contributing none, or only one task. The tasks in a number of assessment areas tend not to be open-ended, and the more creative curriculum areas tended not to use the one-to-one task approach.

The curriculum area which was most successful in assessing student thinking was Art.

10.8 TASKS FOR FUTURE RESEARCH

There did seem to be a number of critical and reflective thinking tasks among the Halpern tasks which might warrant further research, based on the evidence of the video tapes of the students completing the task, into the nature of the thinking involved.

11. CONCLUSIONS

Each of the following conclusions should be read remembering that the NEMP assessments were not principally designed to assess the nature of the thinking of the students.

1. There is a good distribution of tasks involving critical, creative, reflective and logical thinking in the NEMP assessments. The thinking is tested in a very wide range of contexts across the curriculum.

2. It might be worth publishing a list of the best thinking tasks in each category as a resource for teachers.

3. The critical thinking tasks were, perhaps, the most successful in assessing the thinking of students.

4. The creative thinking tasks were very successful in assessing the *results* of creative thinking, but did not explore the *nature* of the thinking involved.

5. The reflective thinking tasks seemed to have more potential for assessing student thinking than was realised.

6. The logical thinking tasks tended not to be open-ended which reduced their effectiveness as thinking assessment tools.

7. The marking schemes varied greatly in their effectiveness in capturing the thinking skills of the students.

8. The tasks which showed the most potential for assessing thinking skills were those which:
   - are in a one-to-one interview format
   - are open-ended
   - ask for explanations or justifications

   and for which the marking criteria look at the nature, as well as the result of the thinking by probing the reasons behind a response.

9. Consideration should be given to trying to include some tasks of this nature in all NEMP assessments.

10. Teachers should be encouraged to use tasks of this nature at all levels of teaching and in all curriculum areas.

11. It does seem likely that the video tapes of the student responses to some of the NEMP assessment tasks contains very useful information, not captured by the marking criteria, concerning the nature of the thinking involved. Further research in this area might be very valuable.

11. REFERENCES

11.1 NEMP REPORTS

National Education Monitoring Report: Assessment Results. Dunedin: EARU, University of Otago

1.	*Science*	*1995*
2.	*Art*	*1995*
3.	*Graphs, Tables and Maps*	*1995*
4.	*Music*	*1996*
5.	*Technology*	*1996*

6.	*Reading and Speaking*	*1996*
7.	*Information Skills*	*1997*
8.	*Social Studies*	*1997*
9.	*Mathematics*	*1997*
10.	*Listening and Viewing*	*1998*
11.	*Health and Physical Education*	*1998*
12.	*Writing*	*1998*
13.	*Science*	*1999*
14.	*Art*	*1999*
15.	*Graphs, Tables and Maps*	*1999*
16.	*Assessment Results for Maori Students, Science; Art; Graphs, Tables and Maps*	*1999*
17.	*Music*	*2000*
18.	*Aspects of Technology*	*2000*
19.	*Reading and Speaking*	*2000*
20.	*Assessment Results for Maori Students, Music; Aspects of Technology; Reading And Speaking*	*2000*
21.	*Information Skills*	*2001*
22.	*Social Studies*	*2001*
23.	*Mathematics*	*2001*
24.	*Assessment results for Maori Students, Information Skills, Social Studies; Mathematics*	*2001*
25.	*Listening and Viewing*	*2002*
26.	*Health and Physical Education*	*2002*
27.	*Writing*	*2002*
28.	*Assessment Results for Maori Students, Listening and Viewing; Health and Physical Education; Writing*	*2002*
29.	*Science*	*2003*
30.	*Visual Arts*	*2003*
31.	*Graphs, Tables and Maps*	*2003*

11.2 OTHER REFERENCES

Fasko, Daniel, Jr. (ed). (2003). *Critical thinking and reasoning. Current research, theory, and practice.* Hampton Press Inc., Cresskill NJ.

Halpern, Diane F. (2003). *The "how" and "why" of critical thinking assessment.* In Fasko (2003) pp 355 – 366.

Knight,G. (2002). *Essential Skills: Examination of Essential Skills performance*. A National Education Monitoring Project Probe Study Report. Dunedin: EARU, University of Otago.

Ministry of Education (1993). *The New Zealand Curriculum Framework.* Wellington: Ministry of Education.

Ruggiero, V.R. (2004). *The art of thinking.* New York: Pearson Education Inc.