


HSRC RESEARCH OUTPUTS



5237



Supporting teachers to improve learning: Application of a computerised assessment system in the classroom

Keynote presentation:
Association for Mathematics Education in South Africa
13th Annual National Congress, 2-6 July 2007, Mpumalanga

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National Education Quality Initiative



Purpose of NEQI

What is NEQI?
High level initiative established by the HSRC to assist government in making a positive impact

Primary purpose:
To support government and other key role-players (teachers, parents, learners, NGOs, donors) enhance decision making processes for implementing relevant and effective strategies to improve education quality at all levels of the system in South Africa

Approach

- Initiative – 4 to 5 years
- Draw on Local, National, Regional and International expertise and experience
- Use available inter/national data
- Close collaboration with key roleplayers

Projects

- To develop a classroom assessment system to support teachers enhance learning
- To design and implement the Grade 9 national assessment study (leading to a national set of indicators and a framework for monitoring the functioning of the education system)
- To review current assessment policies practices and structures at all levels of the system (classrooms, schools, districts, provinces and nationally)

Supporting teachers to improve learning: Application of a computerised assessment system in the classroom

South African Department of Education



Outline of presentation

- Take-away point & Caution
- Definition & functions of assessment
- Significance of feedback
- Support teaching context
- Overview – Classroom Assessment System for Improving Learning
- Assessment Resource Banks
- Demonstration: Classroom Assessment System for Improving Learning
- Way forward
- Caution

Take-away POINT

To improve learning, we must enhance the formative function of assessment

How?

Support teachers obtain AND use relevant evidence

Caution

National Education Quality Initiative

- **Assessment only a means to an end – not an end itself**
- **In practice – range of different types of evidence to determine learner performance**
- **Current system limited to paper and pencil type assessments**
- **Focus – to support teachers with ONE aspect of assessment**

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- Take-away point & Caution
- **Definition & functions of assessment**
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- Supporting teachers
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- Assessment Resource Banks
- Way forward & Caution

Definition of assessment

Assessment defined as

“the process of obtaining information that is used to make educational decisions about students, to give feedback to the student about his or her progress, strengths and weaknesses, to judge instructional effectiveness and curricular adequacy and to inform policy”

(AFT, NCME, NEA, 1990: 1)

3 core functions of assessment

- **Formative:**

assessment that provide feedback to learners about how to go about improving, i.e. evidence for learning based on the on the here and now.

- **Summative:**

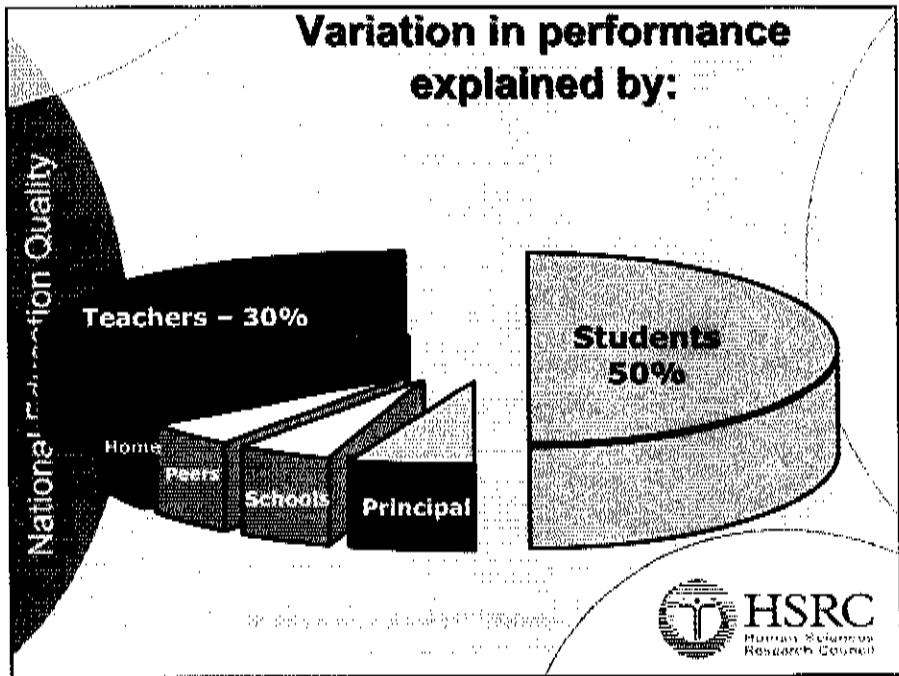
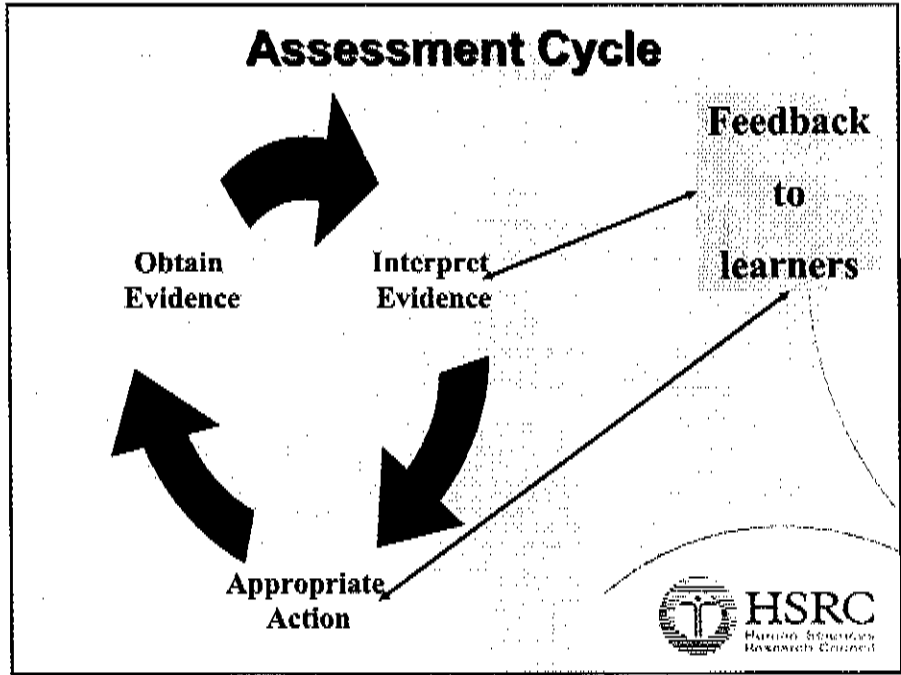
summative assessments are used to certify achievement or potential, i.e. evidence pertaining to what learners have been or will be able to do used for certification & selection

- **Evaluative:**

assessment are used to evaluate institutions and curricular and serve the purpose of accountability -

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National Education Quality Initiative

Results based on

- over 337 meta-analyses,
- 200,000 effect-sizes from
- 180,000 studies,
- representing approx 50+ million students, and
- covering almost all methods of innovation.
- John Hattie



Most significant effects

<u>Influence</u>	<u>Effect Size</u>	<u>Source of Influence</u>
Feedback	1.13	Teacher
Students' prior cognitive ability	1.04	Student
Instructional quality	1.00	Teacher
Direct instruction	.82	Teacher
Remediation/feedback	.65	Teacher
Students' disposition to learn	.61	Student
Class environment	.56	Teacher
Challenge of Goals	.52	Teacher
Peer tutoring	.50	Teacher
Mastery learning	.50	Teacher
Parent involvement	.46	Home
Homework	.43	Teacher
Teacher Style	.42	Teacher
Questioning	.41	Teacher

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Empower teachers to

- Identify learner strengths & weakness
- Determine appropriate interventions
- Obtain ideas for “next steps”
- Records trends in performance over time
- For use/abuse by **TEACHERS ONLY** – i.e. lowstakes (no M&E by principal or district)

Assessment information -

- **CRITICAL for providing relevant feedback**
- **Available when you need it**
- **Specific to assessment standards**
- **Integrated within teacher plans and timeframes**
- **Reduce work load**

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Demonstration

- **Model applied in New Zealand**

- www.education.govt.nz/assessment/standards/standards.htm

What does the system do?

- Produces a valid, reliable test to assess against specific Assessment Standards
- Provides detail reports on performance by:
 - Classroom level
 - Learner level
- Tracks learner performance over time
- Provides ideas for next step – i.e. lessons

District system – analysis by school

Example of items generated

P2. $17 \times 2 =$

P3. Draw a circle around the picture that has exactly 3 apples.



P4. Draw a line to match the sentences with the correct shapes.

1. Four 3 sides



2. Four 2 sides



P5. Write the answer in the box.

$7 - \square = 2$

P6. Complete the drawing of the square on the grid below.



P7. What fraction of this circle is shaded?

Shaded area = \square



Examples of items generated

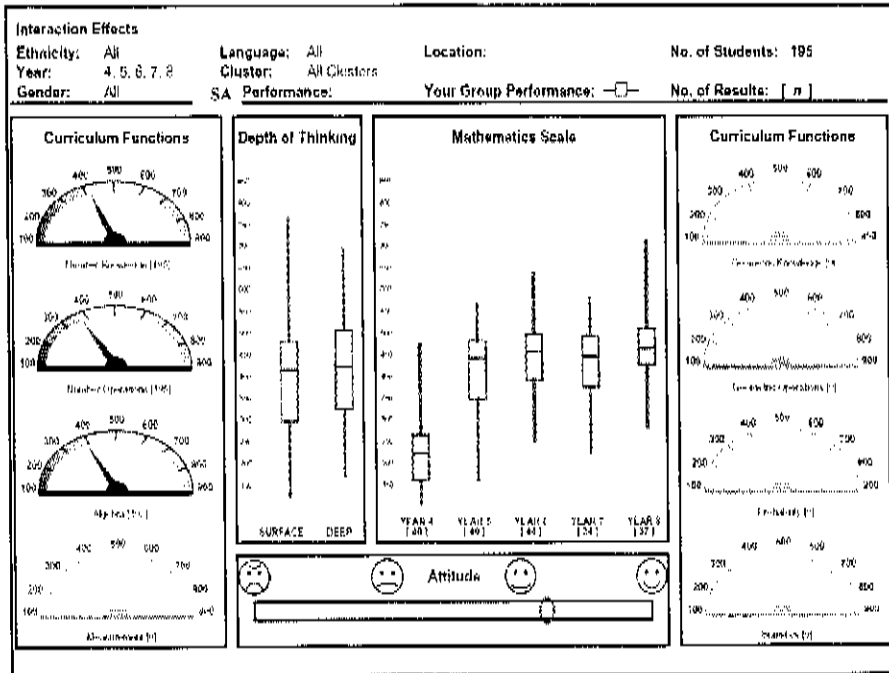
25. Margaret got the answer 78.8 when solving this problem.

$$\begin{array}{r} 2.93 \\ + 4.95 \\ \hline \end{array}$$

Margaret's answer is incorrect. Explain a strategy that she could use to check her answer.

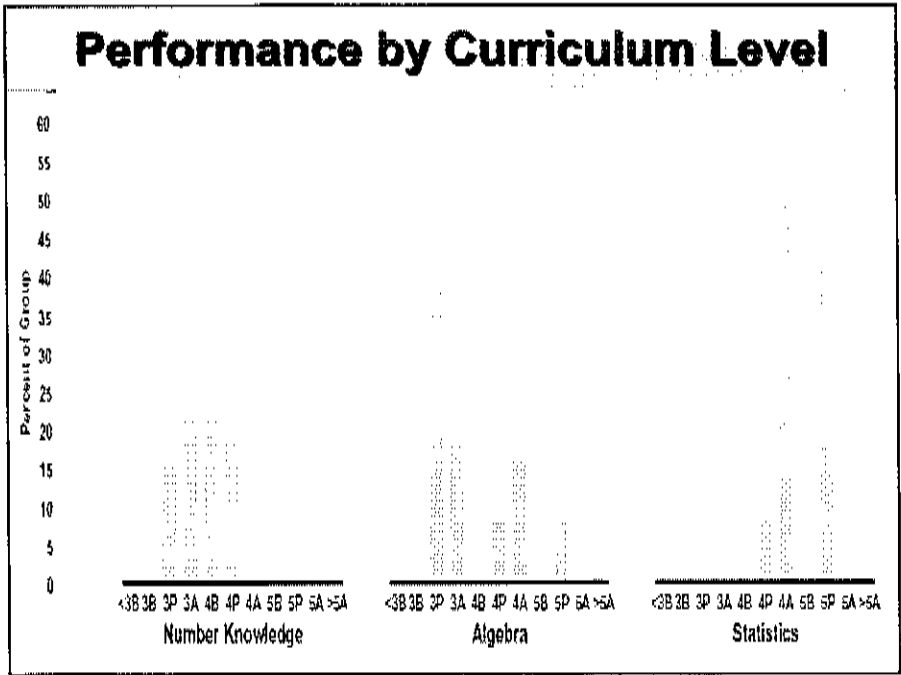
20. Circle the two fractions that are equivalent to $\frac{2}{3}$.

$\frac{1}{12}$	$\frac{3}{4}$
$\frac{12}{16}$	$\frac{4}{10}$
$\frac{3}{9}$	



Classroom Performance Profile

Item	Percentage of Students	Percentage of Items
Number Knowledge		
Order any set of three or more whole numbers up to 99	100	100
Number Operations		
Read and use a language or convention for order of operations (e.g., PEMDAS)	100	100
Demonstrate the ability to use the Multiplication Table	100	100
Give change for sets of money (e.g., \$1, \$2)	66	33
Number Concepts and Problem Solving		
Use the mathematical symbols $<$, $=$, $>$, \neq , \leq , \geq	100	100
Write a ratio whole number ratio problems using e.g., 1:2, 10:20, 25	50	50
Write a ratio whole number ratio problems using e.g., 1:2, 10:20	50	50
Algebra		
Generate sequential patterns & describe a rule (e.g., 1, 2, 3, 4, 5, 6)	100	100
Find a positive value for any member of number sequence (e.g., 1, 2, 3, 4, 5, 6)	100	100
Solve problems of the type $(x+1) + 9 = 13$, etc.	25	25
Solve simple linear equations such as $2x + 10 = 17$	100	100



Performance by Curriculum Level

Number Knowledge (Click to Return to Graphs)

<3B	3B	3P	3A
		Ken Son Cofee Wicket	Mary Goldenschat Claire Pheasing Bill Trankerson Dolce Trankerson
4B	4P	4A	
Terry Bort Train Director Scott Wing	Chamyagne Bobdeley Pressure Gain Fred Ox		
5B	5P	5A	>5A

What next ideas?

What Next Report for Test: Maths, A, S, NK
Group: All Test Candidates

Date Tested: 01 November

	Mathematics							
	Number Knowledge	Number Operations	Algebra	Measurement	Geometric Knowledge	Geometric Operations	Probability	Statistics
6 Advanced	●		●					●
6 Proficient	●		●					●
6 Basic	●		●					●
6 Advanced	●		●					●
5 Proficient	●		●					●
5 Basic	●		●					●
4 Advanced	●		●					■
4 Proficient	●		●					●
4 Basic	■		■					●
3 Advanced	●		●					●
3 Proficient	●		●					●
3 Basic	●		●					●
2 Advanced	●		●					●
2 Proficient	●		●					●
2 Basic	●		●					●

Learner Performance Profile

Correct

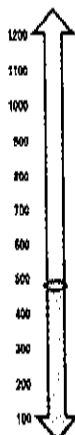
Strengths

- Solve problems of the type $(x+15)(3x-116)$ (16)
- Use the mathematical symbols $=$, $>$, $<$ (21, 23)
- Write & solve whole number story problems using $+$, $-$, \times , \div (26)
- Give change for sums of money (24)

Achieved

- Use the mathematical symbols $+$, $-$, \times , \div (22)
- Solve problems of the type $(x+15)(3x-116)$ (15, 16, 21)
- Write & solve whole number story problems using $+$, $-$, \times , \div (12)
- Write & solve whole number decimal problems using $+$, $-$, \times , \div (11)
- Continue sequential pattern & describe a rule: (1, 2, 4)
- Perform calculations of squares & fractions (27)

aMs Score



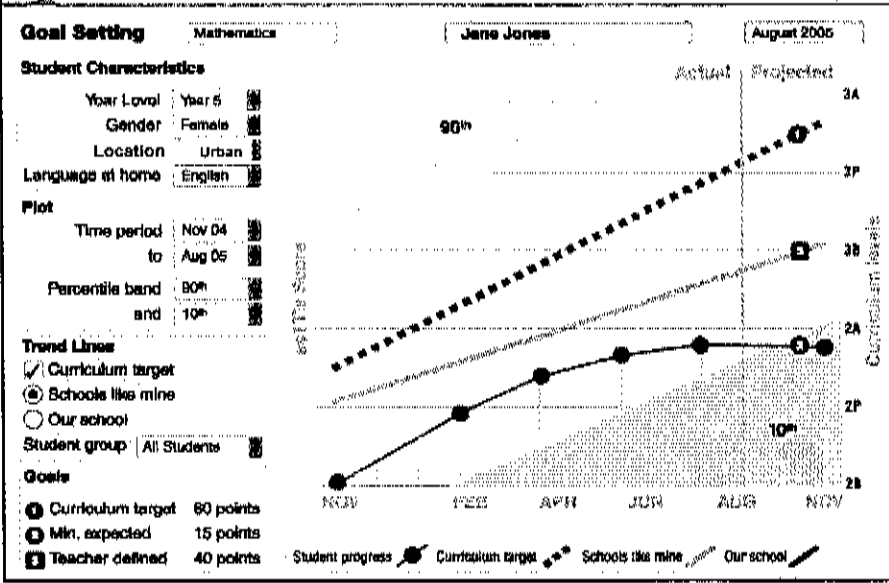
Incorrect

To Be Achieved

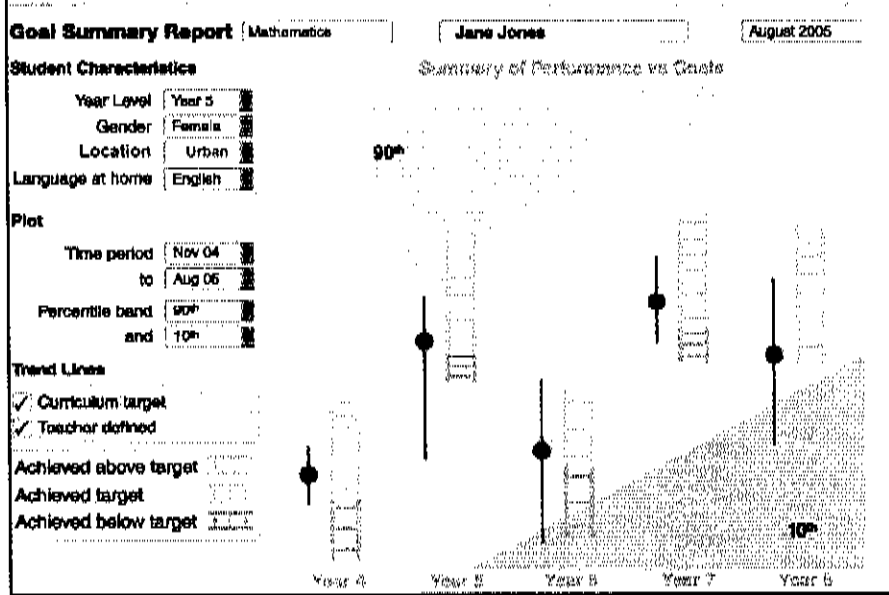
- Write & solve whole number story problems using $+$, $-$, \times , \div (18, 29)
- Order any set of three or more whole numbers (up to 56) (20)
- Give change for sums of money (26, 27)
- Continue sequential pattern & describe a rule: (14, 32, 33)
- Write & solve whole number decimal problems using $+$, $-$, \times , \div (28)
- Demonstrate knowledge of conventions for order of operations (15, 17)
- Find & explain rules for any member of number sequence (50)
- Solve simple linear equations such as $(2x+11)(6)$ (51)

- Demonstrate the skills of sum & difference between: 155
- Continue sequential pattern & describe a rule: 112
- Solve problems of the type $(x+15)(3x-116)$

Recording learner trends

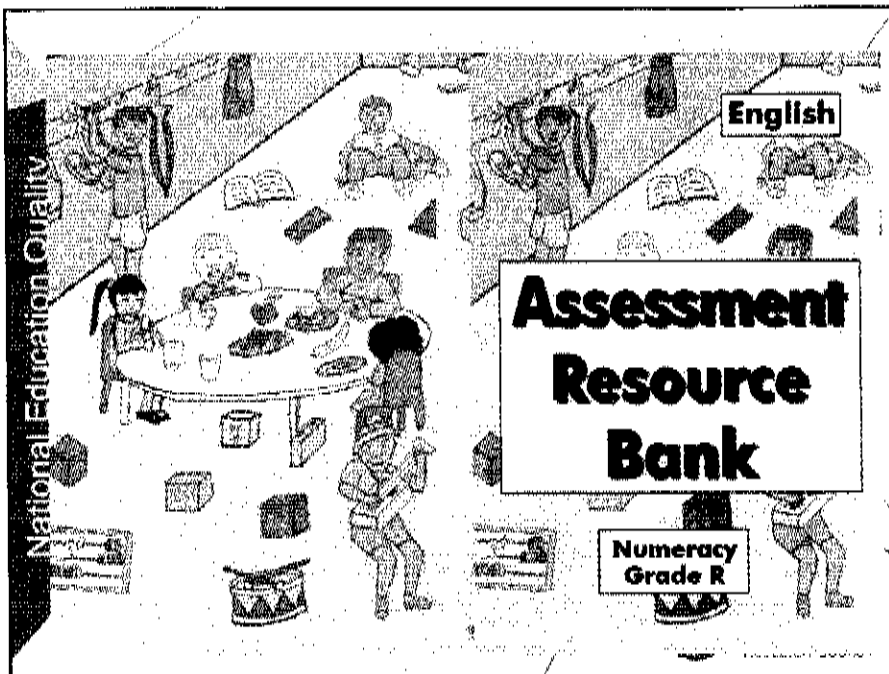


Performance by Curriculum levels



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What are ARB?

- A set of tasks - comprising different "testlets" used to assess specific assessment standards
- Tasks covers ALL assessment standards
- Teacher decides which tasks to administer
- Teacher decides when to administer tasks
- Administered within single period
- Easy to grade and Intepret
- Available for Numeracy and Literacy
- Grades R to 6

Teacher Information

English

A. Task 11

B. Learning Outcome 2
The learner is able to recognise, describe and represent patterns and relationships, and solve problems using algebraic language and skills.

C. Assessment Standard
The learner recognises and extends simple patterns using physical objects and drawings.

D. Skills
Representation and investigation
Reasoning and communication
Describing and analysing

E. Degree of difficulty Easy Moderate Difficult

G. Equipment and instructions

- Write the questions of Exercise Task 11 on the board or hand out a copy of the task to each learner.
- Explain to learners how to answer the questions but do not provide them with the correct answers.
- Learners should have the correct vocabulary of ordinal numbers e.g. first, second, etc. to the question 3.

II. Scoring

Correct answers		Marks
1a)	1a)	4 marks (1 mark each)
1b)	1b)	3 marks (1 mark each)
2a)	2b)	4 marks (1 mark each)
3a)	3b)	2 marks (1 mark for each repetition of the pattern)
3c)	3d)	
4)		2 marks (1 mark for each repetition of the pattern)
Total score		12

I. Details of your responses

Score	Level
11-12	Fully attained
9-10	Subsidiarily attained
6-8	Partially attained
0-5	Not attained

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Quality





National Ed
Init

Learner Task

Name: _____ Date: _____

Learner Task 11

- Draw these patterns in your book and complete each row.
 - $\triangle \triangle \circ * \triangle \triangle$
 - $||| \circ * |||$
 - $\square \square \triangle \triangle \square$
 - $\square \square \square \square$
- Draw the next three shapes of each of these patterns.
 - $\diamond \diamond \circ \diamond \diamond$
 - $\blacktriangle \blacktriangle \circ \blacktriangle \blacktriangle$
 - $\blacksquare \blacksquare \circ \blacksquare \blacksquare$
- Draw the next four shapes of each of these patterns.
 - $\square \circ \square \circ \square \circ$ _____
 - $\triangle \square \triangle \square \triangle \square$ _____
 - $\diamond \circ \diamond \circ \diamond \circ \diamond \circ$ _____
 - $\circ \square \circ \square \circ \square \circ \square$ _____
- Draw a pattern by using the following shapes in the order as indicated. (Repeat the pattern twice)

Last object: 
 Second object: 
 Third object: 
 First object: 

© Human Sciences Research Council 2002 2 Namanya: Grade 3



Use of ARBs by teachers

- As assessment tasks
- As examples for teaching
- As classroom exercises
- As homework exercises
- As exemplars to develop their own items

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Way forward

- Pilot items on national scale
- Develop relevant software
- Pilot assessment system
 - Impact on learner performance
 - Cost
 - Implications for scaling-up
- Disseminate to schools: no cost

Time permitting
District Assessment Model

Caution

- Assessment only a means to an end – not an end itself
- In practice – range of different types of evidence to determine learner performance
- Current model limited to paper and pencil type assessments
- Focus – to support teachers with ONE aspect of assessment

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Thank you

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National Education Quality Initiative

By Content Area: Number

