## Mathematical Literacy

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## Mathematical Literacy

- Description of god practices
- Why it can be considered as good practice
- Why is reform necessary
- Concerns

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## What is Mathematical Literacy?

1 *Mathematical Literacy provides learners with an awareness and understanding of the role that mathematics plays in the modern world.*

2 *Mathematical Literacy is a subject driven by life-related applications of mathematics.*

3 *It enables learners to develop the ability and confidence to think numerically and spatially in order to interpret and critically analyse everyday situations and to solve problems.*

Department of Education [DoE], 2003, p.9

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## What is Mathematical Literacy?

Being "mathematically literate" means **being able to use mathematics to make well-founded mathematical judgements** and to engage in mathematics, in ways that enable a person to be a constructive and reflective citizen. It is further concerned with the capacity of an individual to draw upon their mathematical competencies to analyse, reason and communicate ideas effectively by posing, formulating and **solving mathematical problems in a variety of domains and situations**. This entails more than just knowing mathematics at some minimal level, but also **using mathematics in a whole range of situations**

(OECD, 2004).

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## Other terminology

Numeracy

Quantitative Literacy

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## Numeracy

*We would wish 'numerate' to imply the possession of two attributes.*

*The <u>first</u> of these is an 'at-homeness' with numbers and an ability to make use of mathematical skills which enable an individual to cope with the practical mathematical demands of his everyday life.*

*The <u>second</u> is ability to have some appreciation and understanding of information which is presented in mathematical terms, for instance in graphs, charts or tables or by reference to percentage increase or decrease.*

**Cockcroft (1982, par. 39)**

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## Quantitative Literacy

To understand the meaning of quantitative literacy, a better model is one based on a categorisation of mathematical behaviours into six major aspects:

## Quantitative Literacy

- *Data representation and interpretation*
- *Number and operation sense*
- *Measurement*
- *Variables and relations*
- *Geometric shapes and spatial visualization*
- *Chance*

## Quantitative Literacy

These aspects provide a broad basis for examining the ability to interpret and act in a variety of mathematics-related settings.

(OECD, p15)

## Description of good practices

It is <u>not</u> likely that mathematical literacy is going to be put into practice by someone who does not <u>understand the notion of mathematical literacy</u> and does not believe that it is important to develop students' mathematical literacy. The subject cannot be taught in isolation, and the traditional teaching methods to which many teachers still adhere to, will not be effective. Mathematics Literacy will require a complete new mindset from teachers.

## What is <u>expected</u> of Mathematical literate teachers?

…understand the notion of mathematical literacy…

- *Not the transferring of a body of knowledge and techniques to be mastered (Traditional teaching)*
- *Teachers who understand the role that mathematics play in the world.*
- *Teachers who can use and engage in Mathematics in ways that meets the needs of an individual's life.*

- *Give learners time to do things for themselves*

- *Standing back and listen carefully as learners are engaged in a task*

- *Encourage learners to reflect on their use of Mathematics to encourage them to see the purpose of the task.*

- *Ask other teachers for support*

Description of good practices                          13

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# Why can it be considered as "good practice"?

Lay-out of programme developed
at Unisa

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# The programme consists of four modules

Module 1: Learning outcomes one and two
  - Numbers and Operations and Functions

Module 2: Learning outcomes three and four
  - Space, Shape, Measurement and Data Handling

Module 3: Frameworks in Mathematics Literacy Education

Module 4: Mathematics Literacy Praxis

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- Each module is divided into number of units, which are based on various themes

- At the beginning of each unit, the outcomes are given, which the student is expected to achieve.

- Various activities are given, all relating to the theme of the unit.

- At the end of each unit, the student is given a self-assessment task, to enable him or her to reflect on the work done in the unit.

Why can it be considered as                          16
"good practice"?

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By doing so the student will see the value of doing the mathematics that is presented, and will be ready to communicate this value to their learners.

The mathematics in this programme is introduced in real life contexts, applied to problems that one might encounter in one's everyday life.

Why can it be considered as                          17
"good practice"?

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Each unit relates to a real life situation. It may relate to something in the newspaper, advertisements or other printed media. The strength of the study material lies in the fact that the Mathematics is not isolated or partitioned, as one would find in the traditional curriculum. The Mathematics is embedded into the context. Students develop skills which will enable them to solve problems involving different mathematical concepts.

Why can it be considered as                          18
"good practice"?

The mathematics is explained in relation to the problem at hand. Diagrams, calculations and captions are given, assisting the student with the solution to the problems. In this way, we trust that students will begin to see mathematics as a useful tool in the solution of real life problems.

We anticipate that teachers will communicate the same message to their learners. We believe that after teachers have completed this course they will be convinced about the value of being mathematically literate in society today.

As an example, the units of the first module (Numbers, Operations and Functions) will be dealt with shortly

# UNIT 1

## Working through this study guide

- What you can expect
- Dealing with the embedded mathematics
- Activities and applications
- What is Mathematical Literacy?
- Mathematical Literacy Assessment Standards, Grades 10, 11 and 12

# Unit 2

## Planning a school excursion

- Choosing where to go
- Working with numbers

# Unit 2

*It enables learners to develop the ability and confidence to think numerically and spatially in order to interpret and critically analyse everyday situations and to solve problems*

Let's hope they are all interested in an excursion to Hartebeespoort!

- How to get there
- How long will the excursion be
- How many learners will go along
- How many teachers will go along
- The meals
- What to do

# Unit 3

### Child development

- Growth in infants and children
- Graphs of development
- Interpreting graphs

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**GROWTH CHART**

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Height in Inches vs Ages in Years graph:
- Boys
- Girls
- Pre-adolescence
- Girls / Boys
- Childhood, Girls
- Adolescence, Boys
- Adolescence, Girls
- Childhood, Boys
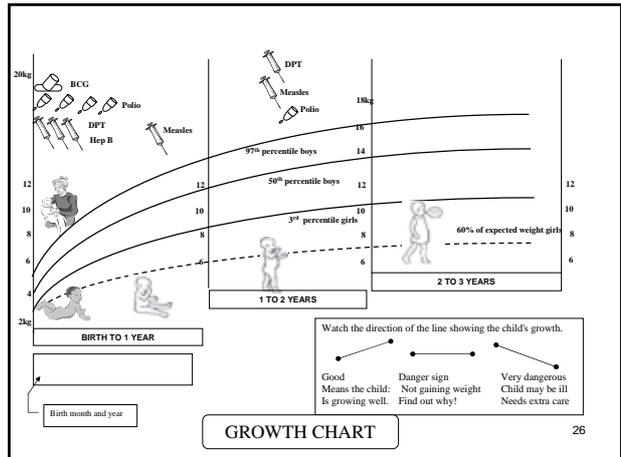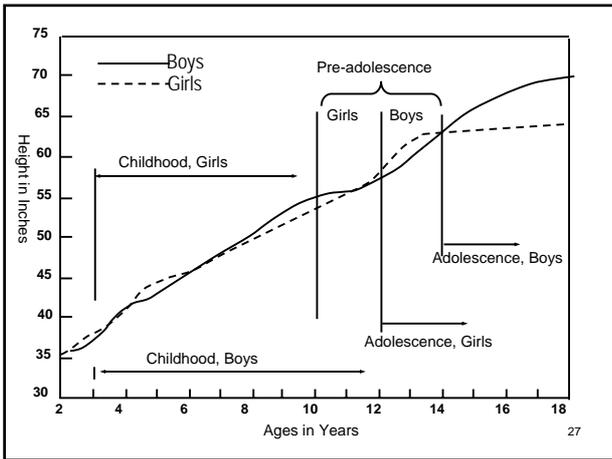
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# Unit 4

### Incredible people, unbelievable things

- The Guinness Book of Records
- Some unbelievable figures

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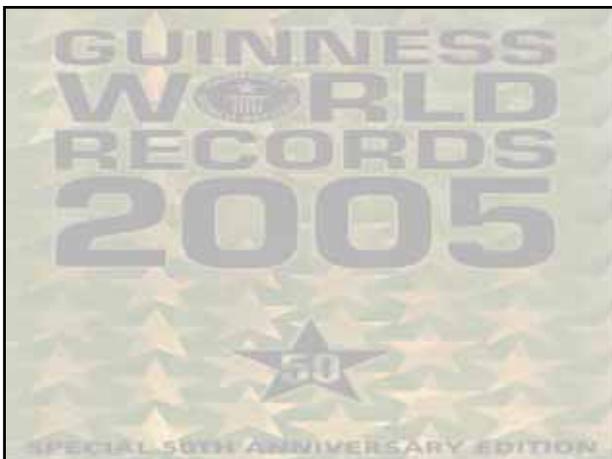
The masses 15 of the heaviest fruit and vegetables in the world are given in the table below

| Fruit or vegetable | Mass | Country where it was grown |
|---|---|---|
| Apple | 1,67kg | England |
| Cabbage | 56,24kg | England |
| Carrot | 8,61kg | USA |
| Lemon | 5,26kg | Israel |
| Mango | 1,94kg | USA |
| Onion | 7,24kg | England |
| Potato | 3,5kg | England |
| Pumpkin | 606,7kg | USA |
| Radish | 31,1kg | Japan |
| Tomato | 3,51kg | USA |
| Cucumber | 12,4kg | England |
| Marrow | 61,23kg | England |
| Pineapple | 8,06kg | Papua New Guinea |
| Squash | 436kg | Canada |
| Sweet potato | 22,5kg | Australia |

# Unit 5

We are all involved in politics

- Politicians and people
- What does your vote count?
- Proportional representation

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## What does your vote count?

| Party | National Assembly | | | Provincial Legislatures | | |
|---|---|---|---|---|---|---|
| | Votes | % | Seats | Votes | % | Seats |
| African National Congress | 10,878,251 | 69.68 | 279 | 10,591,064 | 69.21 | 304 |
| Democratic Alliance/ Demokratiese Alliansie | 1,931,201 | 12.37 | 50 | 1,846,540 | 12.07 | 51 |
| Green Party of South Africa | 0 | 0 | | 3,317 | 0.02 | |
| Independent Democrats | 269,765 | 1.73 | 7 | 245,277 | 1.60 | |
| Inkatha Freedom Party | 1,088,664 | 6.97 | 28 | 1,119,530 | 7.32 | 32 |
| Nuwe Nasionale Party/New National Party | 257,824 | 1.65 | 7 | 275,185 | 1.80 | 7 |
| Pan Africanist Congress of Azania | 113,512 | 0.73 | 3 | 110,205 | 0.72 | 2 |
| United Democratic Movement | 355,717 | 2.28 | 9 | 349,504 | 2.28 | 10 |
| Overall Totals (Including those parties not on this selected list) | 15,612,667 | 100.00 | 400 | 15,303,142 | 100.00 | 430 |

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# Unit 6

- Beadwork patterns
- Artwork from different ethnic cultures
- Analysing patterns or information numerically
- Drawing the graphs of linear patterns

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# Unit 6



Artwork from different ethnic cultures

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# Unit 6



Artwork from different ethnic cultures

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# Unit 7

## AIDS

- Who does HIV/AIDS affect?

- What we read about HIV/AIDS

- Other health crises

# Unit 7

Here then are some statistics from the Reproductive Health Research Unit (2004), National HIV & Sexual Behaviour Survey of 15 to 24 yr olds.

BAD NEWS: 1 in 5    23 year olds is HIV positive

GOOD NEWS: 1 in 20    17 year olds is HIV positive

# Unit 7

What do the numbers in a blood pressure reading tell you?

## 120/80

The **first figure** is the systolic pressure, or the force against the vessel walls during a heartbeat.

The **second figure** is the diastolic pressure, or the force between beats

# Unit 8

## Diet and dieting

- Counting calories and kilojoules

- A balanced diet

- Body Mass Index

Activity



Comparison of different meals
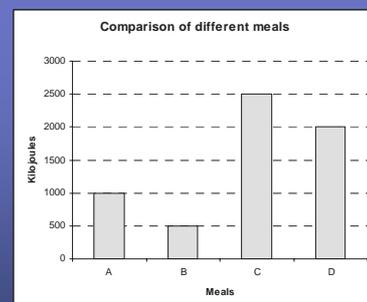
Key:
A:    2 slices of toast with butter and jam
B:    40 g serving of breakfast cereal with low fat milk
C:    1 hamburger with chips and a cold drink
D:    1 roll with chicken and a glass of low fat milk

Activity

Make up a combination of foods that fits to the following requirements:

Unhealthy lunch with ≥ 450 calories

Healthy snack with ≥ 900 calories

Healthy breakfast with ≤ 120 calories

Unhealthy snack with ≥ 350 calories

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# Unit 9

## Cell phones

- Which cell phone should you buy?

- So many packages – which do I choose?

- Comparing the networks using graphs

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# Unit 10

## Budgeting

- What is a budget

- Balancing income and expenses

- Planning your budget

- The government budget

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# Unit 11

## Buying a house

- Buying and selling – house prices and hidden costs
- Bond options and repayments
- What happens if you miss a payment?
- How much difference does it make to pay back more than your monthly instalment?

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# Unit 12

## Let's have a function!

- The menu and the recipes

- What if the recipe is not given in kilograms and grams?

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# Unit 13

## Going shopping – what are the costs?

- Percentage increase: the mark up

- Percentage decrease: discounts on the normal price

- Buying on Hire Purchase

- What is the CPI – what does it tell me?

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## Unit 14

### Saving and investing

- Who pays interest and why do they do it?
- Simple interest calculations
- Compound interest calculations

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## Unit 15

### Starting a business

- What business will be the best?
- How do I determine the best way to utilise the items that are subjected to the constraints?
- Calculating profit and loss

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## Unit 16

### Working as a teacher

- Why be a teacher?
- Your salary package
- Unemployment Insurance Fund

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## Unit 17

### Income tax

- What is income tax?
- Different types of employment and the related income tax

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## Unit 18

### Money matters

- International exchange rates and conversion of currency
- Bank rates and the black market
- Exchange control

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### Reform necessary

Who should teach

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## A reflection:
## The ingredients of success

- Outcomes
- Activities
- Reflection
- Assessment

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## Concerns in South Africa

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How will Math Literacy contribute to university entrance for school leavers by 2008?

Increased demands are placed on teachers of FET mathematics in new subject matter, learner-centred teaching methods and responsibility for final assessment.

It will be extremely difficult to retrain non-mathematical teachers sufficiently to guide learners to achieving the desired outcomes.

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How will a sufficient number of teachers be trained to guide large numbers of learners in mathematical literacy in time for implementation in 2006?

Will documents be made available describing the interpretation of the proposed syllabus?

How will under-developed English language proficiency (of teachers as well as of learners) be supported to overcome this barrier to effective teaching and learning?

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## Thank you
Ronél Paulsen

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