

Mathematical Literacy

Information for Parents, Learners and Teachers

FACTORS TO CONSIDER WHEN MAKING A DECISION TO TAKE MATHEMATICS LITERACY

Background

Mathematics literacy is a secondary school subject offered at further education and training (FET) level. It was introduced in Grade 10 during 2006 and is therefore being phased in for matric examination for the first time in 2008. The subject is quite different from traditional mathematics in that it concerns itself with numeracy in the real world. Students learn practical skills that will enable them to find concrete solutions to numeric, spatial and statistical problems associated with the everyday challenges of life.

The subject was introduced in response to abundant and growing public concern about how well South African schoolchildren are learning mathematics. Too many students were not achieving the minimum required competency in standard grade matric mathematics. Consequently they leave school with an incomplete set of skills that, according to the policy makers, would put them at a disadvantage with respect to their future prospects and livelihood. The globalisation of economic markets, the spread of communication and information technologies, and the premium being paid for numerate workforce skills all emphasize the increasing importance of proficiency in mathematics.

Media reports of inadequate teaching, poorly designed curricula, and sub-standard examination results fuel fears that young people are deficient in the mathematical skills demanded by society. According to the 2003 Trends in International Maths and Science Study, conducted in 46 countries, South Africa was one of the worst performers.

Certain professionals in education believe that mathematics literacy should have been introduced earlier as the reasons for its establishment have been evident for many years. There are others who think that mathematics students should also be able to take mathematics literacy to expand their appreciation and understanding of the diverse approach to the benefits of the latter. A learner will develop different skills and attitudes, which are necessary to become competent in the subject.

For many years the subject of mathematics, especially at higher-grade, has been used as a way of filtering students towards opportunities in tertiary education and professional careers, in short a purely academic as opposed to practical subject. Further, higher-grade mathematics has developed a reputation as an abstract science whereas the standard grade equivalent tested memory, drill and practice efficiency and the ability of the student to recall procedures as opposed to critical thinking.

Definition

The South African National Department of Education in its National Curriculum Statement (2003) defines mathematical literacy as:

...providing an awareness and understanding of the role of mathematics in the modern world... driven by life-related applications of mathematics... enabling 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.

The Programme for International Student Assessment (PISA) views mathematics literacy as:

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...the capacity to identify, understand and engage in mathematics, and to make well founded judgements about the role that mathematics plays in an individual's current and future private life, occupational life, social life with peers and relatives, and life as a constructive, concerned and reflective citizen.

The latter suggests that a mathematical literate person would appreciate the way in which mathematic concepts can be applied to the world in an aesthetic manner as opposed to using the knowledge as a practical tool to problem solving.

Curriculum

The curriculum has been designed to develop skills necessary for students to gain confidence, become self-managing people and improve chances of success in dealing with financial and other quantitative demands of the modern world. These would include: buying a house or a car; renovating or building a house; interpreting information in the media; managing personal finances; starting a small business; understanding the financial effects of borrowing and investing money and appreciating probabilities that may affect future decisions regarding gambling. Proficiency in the subject will enable the students to develop skills categorised into various contexts as detailed in Annexure 1.

Teaching

Teaching the subject aims to create mathematically literate students; students who will be able to *ask questions* about quantitative issues rather than blindly search for answers. They will experience success while extending and challenging their existing skills and knowledge. Teachers will aim to foster an approach of curiosity and exploration in order to encourage children to enjoy, appreciate and value the subject. Students are encouraged to explore their own ways of thinking in order to develop individual methods and strategies for practical problem solving situations. The best ways to develop mathematical thinking are:

- Through effective communication whereby students should be encouraged to explore and share ideas, both verbally and on paper. As I have experienced, this requires patience, can be difficult and for some students and will take time to develop;
- To emphasise practical work, involving the use and application of mathematical concepts. Children use their understanding of relationships to construct "models" of their ideas, thereby simplifying problem solving techniques;
- To increase the use of resources. A wide range of practical apparatus will support and simplify problem solving techniques;
- To develop the students' understanding and appreciation of the context of the problem. This will assist the students in making sense of problems involving numeracy within the context of their own lives;
- To improve presentation of the work in order to clarify meaning and understanding. Students' thinking generally outpaces their ability to verbalise or to present their work on paper.

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- Through constructive teacher facilitation. Students respond well to positive reinforcement and patient responses to ideas and questions.
- To promote co-operative learning situations. A variety of different learning skills can be experienced and developed by students working on mathematics literacy in social contexts, such as enhanced communication, leadership skills, individual accountability and an appreciation of the benefits of interdependence in workplace situations.

Students are given opportunities to experience and explore mathematics via cross-curricular links – for example geography, art and life orientation – that will facilitate a deeper understanding of mathematical literacy and its relevance. It is important that students experience a balance of mathematics that can be applied to the everyday life demands as well as basic abstract mathematics for its own sake, for example exploring number patterns. Students who experience a wide range of mathematical contexts, including abstract as well as real-life are better equipped to realise their full potential.

Tertiary Education

Many universities offer degree courses where the entry requirement is a pass in mathematics literacy. Provided that school leavers who pass mathematics literacy make a realistic choice of the type of degree, a pass in mathematics literacy should not obstruct their opportunities. Mathematics literacy counts equally with mathematics as a FET school leaving subject. Higher education institutions are regularly updating their entry requirements for admission to various faculties. Enrolment into many universities depends on a learner's aggregate performance on *all* of their subjects examined at school in grade 12 as well as the combination of subjects. The approaches of the main South African Universities with regards to mathematics literacy are diverse. It is important that parents and learners consult a specific university directly in order to clarify its position on the subject relating to entry requirements. These entry requirements depend on the choice of degree and can be summarised into the following broad categories:

- A pass in mathematics at a minimum level;
- A pass in either mathematics, or mathematics literacy at a higher level than mathematics;
- A pass in mathematics literacy on condition that the learner enrolls for a mathematics bridging course offered by the university.

Conclusion

Learners have dreams about their future and have aspirations to be successful. They strive to take advantage of their talents and academic opportunities that lie ahead. In my opinion, there can be no substitute for passion and commitment in developing skills, knowledge, attitudes and values that will unlock their true potential. The subject is ideal for students who either struggle with traditional mathematics or have decided that they will not require mathematics in their choice of career. They are encouraged to see through the suggested shortcomings of mathematics literacy and embrace the rich learning opportunities that it offers.

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References

Blaine, S. (2005, June 29). Schools to crank up the maths dial as new curriculum takes over. *Business Day*.

National Curriculum Statement, Mathematics Literacy. (2006). *Teacher Guide*, page 1.

Southwood, S. & Spanneberg, R. (1996). *Rethinking the teaching and learning of Mathematics*. Pretoria: RumeP

Annexure 1

Context	Student Ability Developed
Decision making and informed choice	<ul style="list-style-type: none">• Critique articles and advertisements in the media based on data and illustrated through graphs.• Develop arguments based on facts and the interpretations of facts.
Efficient Consumption	<ul style="list-style-type: none">• Make sense of utility costs such as water, electricity, sewerage and rates.• Choose between different options based on their value for money.
Construction	<ul style="list-style-type: none">• Read and develop plans for simple structures.
Logistics	<ul style="list-style-type: none">• Plan and schedule events to meet deadlines and demands.• Sort and classify items according to criteria.• Read maps to plan trips.• Calculate the time it takes to complete a journey.• Anticipate which seats in the stadium will give the best view of the game.
Managing a Small Business	<ul style="list-style-type: none">• Calculate profit margins, loss and breakeven points in simple transactions.• Understanding and completing VAT forms.• Develop a business plan.
Personal Finance	<ul style="list-style-type: none">• Understanding income and expenditure in order to plan a basic budget.• Recognising the impact of interest rates.• Proficiency in completing income tax returns.• Plan for the repayment of a loan and anticipate associated bank costs.
Probability	<ul style="list-style-type: none">• Predict all the possible outcomes of a sports tournament and anticipate the most likely winner.• Understand that games of chance have no patterns.
Quality of life	<ul style="list-style-type: none">• Make lifestyle choices, such as the food they should eat in relation to the energy they use in their day-to-day lives.• Calculate and interpret health indicators, such as Body Mass index (BMI).• Use resources in economical and responsible ways.
Ratios and Relationships	<ul style="list-style-type: none">• Understand the role and purpose of the gears on a bicycle.• Convert between currencies.

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