

**MINISTRY OF EDUCATION, YOUTH
AND CULTURE**

**MATHEMATICS
AND
NUMERACY POLICY**

May 2003

The Aim of the policy

The aim of this Policy is to provide clear guidelines concerning the expectations for mathematics education. The Policy places importance on the development of Numeracy, which is concerned with the use of mathematics both as a natural tool throughout the curriculum, and one to be used in everyday life.

It outlines the principles which must underpin the teaching and learning of mathematics at early childhood, primary and secondary levels.

The Policy further enunciates the implications for, and expectations of Teacher Education.

Process

Consultations were made with several representative organisations, both public and private sectors, with equal input from Education Officers, Principals, Teachers, Parents and Students. Included in this consultation was a visit to England to understudy their Numeracy Policy and Strategy and to see its implementation at the various levels.

Reviewers were also instrumental in developing the document. Some of these persons include: The Chief Education Officer, The Regional Directors and Heads of Units, Assistant Chief Education Officers, NGO's and some members from The Private Sector.

Executive Summary

The unsatisfactory performance of students in mathematics and the low levels of numeracy which pervade the Jamaican educational system have been the cause of much concern in the wider society. The impact that such a situation has on the nation is significant and the provisions for mathematics education must therefore be addressed. The Government of Jamaica/British Department for International Development Jamaica All Age Schools Project, (JAASP), in addressing its mandate to improve the quality of education provided for children from the most disadvantaged, remote rural communities in Jamaica, embarked on an initiative aimed at improving the standard of mathematics education and raising the levels of numeracy of all children in Jamaica. In so doing a National Mathematics and Numeracy Policy was developed as a joint effort of JAASP and the Ministry of Education, Youth and Culture (MOEYC).

Informed by reviews of research and by international trends in mathematics education, the MOEYC has adopted a policy position which places emphasis on numeracy as a proficiency to be attained by all pupils in the educational system. Within this Policy, emphasis is placed on a Numeracy Strategy aimed at promoting effective teaching approaches at both primary and secondary levels. While the Policy outlines the framework for this Strategy, the National Numeracy Strategy (NNS) will be further developed and will be published separately.

The Government of Jamaica, through the MOEYC, commits to providing the human, material and institutional resources needed for policy implementation. Teacher training programmes are expected to adequately prepare teachers to teach mathematics and numeracy skills to all ability levels in early childhood, primary and secondary schools. Mathematics learning and the attainment of high levels of numeracy must also involve the awareness and cooperation of school boards, learners, teachers, parents and communities.

In ensuring equity and access, special provision must be made for all learners with exceptionalities as well as both males and females.

The main area in the document:

1. The Problem

In Jamaica, there is concern about the unsatisfactory performance of students of Mathematics at all levels of the system. Poor attitudes to the subject are evident among many students, and some view mathematics as being of little use to them outside of school. In addition to this is a concern that an insufficient number of persons in the society are equipped with the skills and understandings required to function effectively in life after school and are unable to apply the mathematics they learn in unfamiliar contexts. The fact that there have been no commonly agreed principles, aims and objectives for mathematics education in Jamaica has only served to exacerbate the problem.

2. Rationale

The implications to the nation of consistently poor performance in mathematics are far-reaching and significant. Not only is it important that Jamaica produces good mathematicians in order that they may fit key roles in society, but it is also vital that persons who emerge from the school system – at whatever level – are equipped with basic numeracy skills in order that they may be empowered to participate equitably, effectively and efficiently in the wider society. Indeed, literacy and numeracy skills are requisites for successful participation in society in the 21st century and the structures of education must be seen to contribute to the development of such skills.

Further, as Jamaica strives to take its place within a fiercely competitive and highly globalized marketplace, the persons who will be best equipped to provide leadership in many significant areas are those whose reasoning, problem solving and critical thinking skills are best developed. Since it is claimed that the mathematics classroom is the ideal nursery for the development of such skills, it seems important that attention be paid to ensuring that the product of mathematics education is the best it can be.

3. Towards a definition of Numeracy

3.1

Numeracy is a proficiency which involves the ability to use a range of mathematical skills and processes confidently to solve problems in everyday life. It goes beyond mere knowledge of number facts and processes and the ability to perform arithmetic operations.

Numeracy involves both the ability and propensity to use mathematics to clarify issues, to anticipate possible consequences, to decide on alternative courses of action, to develop appropriate strategies in the solution of problems, including those involving measures and money, and to evaluate decisions.

Numeracy also includes the ability to interpret and analyze information which is presented in different forms such as tables, graphs and charts.

A numerate person will be able to recognize those situations to which their knowledge is applicable and, when necessary, use intuition to aid in the solution of unfamiliar quantitative problems which arise in day-to-day life. Further, a numerate person will be comfortable communicating using the language of mathematics and will be versatile in the use of mental strategies as well as paper and pencil methods to arrive at solutions.

Increased numeracy outcomes for all students in Jamaica is a central aim of the Ministry of Education, Youth and Culture. This means that all Jamaica's children must be enabled to develop the necessary mathematical skills, competencies and understandings that will allow them to meet the requirements of numeracy as stated above.

High levels of numeracy may be reached WITHOUT attaining mastery of all the mathematical content within a school curriculum or achieving all the objectives in typical examination syllabi. The focus of Numeracy is on the development of "mathematical literacy" *in specific areas of mathematics*, consistent with the level of mathematics being studied. This "literacy" will be measured by the degree of fluency and facility with which one is able to apply the knowledge, skills and processes in those areas in everyday contexts.

It is important therefore that the development of Numeracy is not viewed in isolation from mathematics teaching and learning. Rather, the MOEYC expects that effective mathematics teaching will lead to high levels of numeracy

4. Situation Analysis

4.1 Performance in Mathematics across the Educational System

Performance in major mathematics tests at both the primary and secondary school typically reflects unsatisfactory levels of attainment. Tables 1 and 2 (below), show statistics on performance over the years 2000 and 2001 in the Grade 3 Mathematics Diagnostic Test and in the Grade Six Achievement Test respectively.¹

Table 1
Combined National Average Percentage of Pupils
at the Mastery Level
Grade 3 Mathematics Diagnostic Test
2000-2001

Year	Strands				
	Number	Estimation and Measurement	Geometry	Algebra	Statistics
2000	16.5	22.9	38.7	19.3	16.8
2001	27.1	22.6	43.7	12.9	24.7

Source: Student Assessment Unit, MOEYC

As indicated in the Table, the percentage of pupils who demonstrate mastery in any of the strands fall way below desirable levels.

The results of the Grade Six Achievement Test provide an indicator as to the readiness of primary school pupils to begin secondary level mathematics. Table 2 shows the results for this examination for the years 2000 and 2001.

Table 2
Grade Six Achievement Test
National Average Percentage Mark
2000 - 2001

Year	Combined National Average Percentage Mark
2000	48.82
2001	51.59

Source: Student Assessment Unit, MOEYC

¹ This test had its debut in 1996 and was first used for secondary school placement in 1999.

While the year 2001 saw an improvement in the combined national average over the previous year, the levels of attainment continue to be below expectations.

At the secondary level, the attainment levels are even more disconcerting. Table 4 shows data on performance in the Caribbean Secondary Education Certificate (CSEC) Mathematics General Proficiency Examinations over the period 1998-2002.

Table 3
Percentage of Candidates Gaining Satisfactory Grades
In CSEC General Mathematics
Jamaica
(1998-2002)

Year	Number Of Candidates Sitting Examination	Percentage Gaining Satisfactory Grades
1998	16854	26.20
1999	16064	26.84
2000	16111	37.38
2001	16558	30.28
2002	17240	35.98

Source: Caribbean Examinations Council

As can be deduced from the Table, over the 5-year period, the average percentage of candidates gaining satisfactory grades is approximately 30%. That is, about 70% of the candidates do not demonstrate competence in the areas tested. A further breakdown of these figures is even more revealing. Table 4 demonstrates that the percentage of candidates gaining the highest grade, that is, those demonstrating some degree of mastery in the majority of areas in the examination has consistently been less than 5%.

Table 4
Percentage Of Candidates Gaining Grade 1
In CSEC General Mathematics
Jamaica
(1998-2002)

Year	Number Of Candidates Sitting Examination	Percentage Gaining Grade 1
1998	16854	2.70
1999	16064	2.00
2000	16111	4.37
2001	16558	1.82
2002	17240	3.95

Source: Caribbean Examinations Council

At the Basic Proficiency Level the situation is no different. This examination tests the Core Objectives of the Mathematics Syllabus and “*contains the minimal mathematical skills, knowledge and abilities necessary for any citizen in our contemporary society.*” (CSEC Mathematics Syllabus, 2001)

Table 5
Percentage of Candidates Gaining Satisfactory Grades
In CSEC Basic Proficiency Mathematics
Jamaica
(1998-2002)

Year	Number Of Candidates Sitting Examination	Percentage Gaining Satisfactory Grades
1998	1890	20.30
1999	2255	27.67
2000	2301	13.47
2001	1929	21.82
2002	1779	22.09

Source: Caribbean Examinations Council

Table 6
Percentage Of Candidates Gaining Grade 1 In
CSEC Basic Proficiency Mathematics
Jamaica
(1998-2002)

Year	Number Of Candidates Sitting Examination	Percentage Gaining Grade 1 (Number Of Persons In Brackets)
1998	1890	0.20 (3)
1999	2255	0.53 (12)
2000	2301	0.10 (3)
2001	1929	0.36 (7)
2002	1706	0.47 (8)

Source: Caribbean Examinations Council

Even while the statistics itself, taken as a whole, is an indicator of a serious problem with respect to mathematics education in Jamaica, the annual reports of the Caribbean Examinations Council also point to the fact that generally, candidates neither demonstrate basic mathematical skills nor good reasoning and problem solving skills. In addition, the Reports consistently refer to lack of conceptual understanding amongst the candidates.

4.0 The Importance of Mathematics Education

The Ministry of Education, Youth and Culture considers that the learning of mathematics is important to every child because of its significance to so many aspects of life. Mathematics is used in the sciences, economics and in business. It is used to present information in a variety of ways, to predict, to explain, and to describe important phenomena. And it is through the learning of mathematics that spatial and visualization skills are developed. Mathematics classrooms in Jamaica must therefore become the channels through which a real understanding of the subject is developed and its potential impact on learners be fully maximized.

THE POLICY

5.0 Goals of Mathematics Teaching

In recognition of the important role that mathematics plays, the MOEYC has determined that every mathematics classroom, **at all levels of the educational system**, will embrace the following goals as central to mathematics teaching:

Mathematics teaching will:

1. place emphasis on the development of conceptual understanding;
2. provide opportunities for learners to develop an awareness of how the mathematical concepts and relationships they encounter are relevant and useful (i) in various aspects of out-of-school life and (ii) in other learning areas;
3. enable learners to experience mathematics in a variety of contexts;
4. enable learners to see mathematics as an interesting and stimulating subject that can be enjoyed;
5. facilitate the development of positive attitudes towards mathematical engagement and activity;
6. stimulate the learner's curiosity by providing opportunities to explore number patterns and their relationships;
7. facilitate the development of analytical, reasoning and critical thinking skills;
8. provide the environment in which the learner may be able to develop a sense of confidence in working within a mathematical environment;
9. use technology such as the computer and the graphical calculator, to
 - (i) enhance the learner's understanding of mathematical concepts;
 - (ii) assist in the development of specific mathematical thinking skills, such as spatial skills;
 - (iii) assist learners to use the technology to explore mathematical ideas;

10. develop a flexible approach to the learning of mathematics so that learners will be encouraged to develop their own strategies for calculating and for problem-solving which they are able to explain to others;
11. encourage mental processes, including the use of mental imagery, as a tool for exploring mathematical situations;
12. help learners to develop a spirit of inquiry;
13. provide ample opportunity for the development of mathematical processes such as conjecturing, generalizing, justifying and proving through the exploration of open ended problems and investigations;
14. help learners to acquire the range of knowledge, skills and concepts they will need for further study in Mathematics;
15. assist learners to develop an understanding of the language of mathematics and to use this language comfortably and confidently both in and outside of the classroom;
16. promote meaningful mathematical discourse among learners by (i) engaging them in group activities (ii) encouraging discussion in the mathematics classroom;
17. help learners to see the inter-connectedness of the Mathematics they learn;
18. foster in learners an awareness of the importance of accuracy, as well as an understanding of the need to make estimates and approximations.

These goals will be operationalized in the classroom through the use of appropriate teaching methodologies which are underpinned by the notion of constructivism and which focus on understanding and the development of skills and processes rather than number crunching and the memorization of facts and formulae. This is further highlighted in the ensuing sections on Numeracy.

6.0 Mathematics Content to Support Numeracy

Five major content areas have been identified as those relevant to the development of Numeracy. These are: Number and Computation, (Pattern) and Algebra, Measurement, Data Handling and Shape and Space. For each of these

content areas, Key Learning Principles (KLPs) have been identified and are presented in a separate document as Appendix I.

7.0 Key Numeracy Outcomes

Key Numeracy Outcomes (KNOs) are the standards which students should attain at specific stages in the school system. These standards are measured by the Attainment Targets of the Mathematics Standards for Grades 1-11. Central to all the KNOs is the recognition that oral communication of mathematical ideas will be an important element of the classroom experience of all learners.

8.0 Numeracy Strategy

In order to meet the goals and objectives of this Policy, focus is placed on the implementation of a National Numeracy Strategy. This strategy, though seemingly focused on the development of Numeracy, will serve as the foundation for mathematics teaching at all levels. The Strategy describes the principles which will underpin teaching, and the structure of a typical mathematics lesson.

8.1 Teaching for understanding, application and communication.

In order to support the goals of this Policy all mathematics teaching will be focused on **understanding, application and communication of mathematical ideas**. Classroom activities will focus on the development of mathematical processes, and learners will be enabled to represent mathematical ideas in ways that make sense to them. For example, in teaching number, students will be involved in activities that reflect everyday use of numbers so that they become not only aware of *how* numbers are used but also *why* they are used. This will aid their *understanding* of number. Further, they would be encouraged to demonstrate this understanding by *applying* this knowledge in a variety of situations and to *communicate* their understanding in different ways, both orally to their peers and to the teacher as well as in written form.

Teachers therefore will:

- adopt an investigative approach to teaching in order that the students' own skills of inquiry may be nurtured and developed;
- include mental and oral work regularly in the mathematics classroom;
- adopt a good balance of whole group interactive teaching, individual work and cooperative learning ;
- use questioning extensively and effectively, giving learners enough time to think before answering;
- ensure that, wherever possible, learners have access to a variety of resources, including Information and Communication Technology and to use such technology so that learning outcomes are enhanced;
- focus lessons on sense-making rather than the regurgitation of facts, formulae or algorithms;
- encourage the use of correct mathematical vocabulary and notation;
- encourage and support meta-cognitive activity, i.e. the students' reflection on their own thinking;
- use strategies which will ensure equal access to mathematics for both male and female learners;
- use diagnostic measures to determine the special needs of learners and plan strategies to cater for such needs.
- use assessment strategies which match classroom activity and which allow for students to demonstrate what they know and understand;

8.2 The *SMP* three-part lesson

Every mathematics lesson will be structured so that three specific components are obviously evident. These relate to the start of the lesson (the Starter), the Main Learning Activity, and the close of the lesson (the Plenary). For ease of reference, this is denoted as the *SMP three-part lesson*.

The SMP Three-Part Lesson

❖ The starter

- The starter refers to the opening of the lesson. It is an obvious “beginning point” and must be clearly identifiable. (5 – 10 minutes).

❖ The main teaching activity. (25 – 40 minutes)

❖ A Closing Plenary (5-15 minutes)

The aim of the National Numeracy Strategy is not to prescribe specific, inflexible teaching approaches. Indeed MOEYC recognizes that the nature of teaching and learning requires flexibility, adaptability and creativity on the part of the teacher. However, the Policy provides information on those aspects of pedagogy which have been found to promote high levels of numeracy and enable the overall mathematical development of students. Further details of the SMP 3-part lesson may be found in Appendix 2.

9.0 Assessment

Assessment in mathematics will not be restricted to traditional summative forms such as end-of-term/end-of-year tests. Rather, assessment will be viewed as an integral part of teaching and will be used to support the learning process. This means that any assessment strategy used by the teacher will provide useful information to **both teachers and students**.

The position of the MOEYC therefore is that **assessment in mathematics will focus on the learners’ understandings as well as their procedural skills. It will be used both to diagnose the nature and causes of barriers to learning and to monitor the progress of learning and teaching** so as to improve learning.

Assessment will

- reflect the mathematics that pupils should know and be able to do;

- engage students in tasks that involve problem solving, reasoning and communication (both written and oral);
- provide opportunities for pupils to demonstrate their application of mathematics to real world situations;
- facilitate creative thought through the use of problems which hold the possibility for alternative solutions.

In order to accomplish this, teachers will use a range of sources to provide information, utilizing both formal and informal methods. Paper-and-pencil tests are only one source of such information, and by themselves are limiting and inadequate in describing fully a student's knowledge and understanding of mathematics. Others sources which will be utilized include:

- Observation
- Listening to pupils
- Use of games
- Questioning
- Portfolios
- Journals
- Projects

Assessment will be a continuous, planned process of gathering information and will, in addition to informing the teaching/learning process, enable the teacher to track the progress of pupils measured against Attainment Targets.

10.0 Reporting

Schools will develop reporting procedures in order to provide feedback to parents, students and the MOEYC, in order to track the level of numeracy throughout the school life of students. Student learning outcome targets for each year will be established and used as criteria for assessment. These targets will be in line with the MOEYC's Attainment Targets.

10.0 Teaching Time

10.1 Early Childhood and Primary

In Early Childhood and Primary classes, time will be dedicated each day to numeracy and mathematics. The minimum allocations of daily time per 5-day week will be as follows:

Grades 1 – 3: 1 hour

Grades 4 – 6: 45 minutes

10.2 Secondary

10.2.1 Grades 7 - 11

All secondary schools will provide a minimum of 200 minutes dedicated to the teaching and learning of mathematics and numeracy per 5-day week. This will include at least 4 separate sessions of teacher contact per week. In addition, adequate time will be provided to complete the mathematics syllabuses for local, regional and international examinations.

11.0 Teacher Training

Teacher Training institutions : College Entrance requirements: Teacher Training institutions will ensure their full understanding of the policy with a view to supporting it, and will:

- set an entry requirement that ensures that all prospective student teachers for primary courses matriculate with a minimum of a grade nine proficiency of numeracy
- develop a programme to improve the numeracy level to the required minimum, before graduation, of any student teacher for whom this entry requirement is waived, for any special reason;
- ensure that the requirements for those prospective student teachers who are to specialize in the teaching of mathematics is grade eleven
- include courses on numeracy in all teacher training programmes in mathematics

12.0 Policy Implementation

12.1 Teacher Training

- adopt relevant pedagogies in preparing teachers for the Policy's implementation;
- produce mathematics teachers who are competent and who are aware of numeracy initiatives at primary and secondary levels
- produce specialist teachers capable of addressing the problem of low, or taking intervention to improve, numeracy levels
- produce teachers who are sensitive to the view of mathematics as being much more than rules, algorithms and formulae.

12.2 The Government of Jamaica will provide the human and material resources, facilitating the process by securing for the system:

- teachers, each with at least diploma level qualification, in all schools;
- teachers trained in mathematics/numeracy at appropriate levels in all schools;
- adequate classroom space to avoid overcrowding and noise levels which inhibit mathematics learning;

12.3 The Ministry of Education, Youth and Culture will:

- disseminate the policy document to stakeholders;
- sensitize stakeholders to implications of the policy: timelines, outcomes;
- identify and train Mathematics Resource Teachers to work with their peers and to disseminate good practices;
- ensure that schools acquire manipulatives for mathematics classes;
- equip schools with the appropriate tools to enhance the teaching and learning of mathematics including those, for children with special needs;
- develop resource materials such as activity booklets and modules;

- develop Mathematics Standards for Grades 1 – 11;
- provide regular in-service training of mathematics teachers, generally, to improve their content and methodologies;
- provide training in the implementation of a Numeracy Strategy;
- provide expertise for implementation of the policy.

12.4 Schools and school boards will study the policy and implement it, and

- implement the relevant elements within their institutional contexts;
- promote mathematics and numeracy development of pupils;
- demonstrate the use of resources

12.5 Parents and Community will gain an understanding of the policy with a view to supporting it and take active roles in the mathematics and numeracy development of their children.

12.6 Learners will

- abide by conditions agreed with school administrators for developing their competence in mathematics and numeracy
- develop and utilize with teacher support strategies for monitoring their progress in all areas of mathematics learning and numeracy development
- engage with teachers in feedback to clarify difficulties and set reasonable conditions for their on-going development
- endeavour to achieve levels, standards and outcomes set by their teachers, schools and by the MOEYC;
- engage, in discussions at the secondary level, on the mathematics education policy, and its implications for their own personal development in mathematics and numeracy.

13 Policy Monitoring and Evaluation

The MOEYC will commit to developing a Monitoring and Evaluation Plan to ensure that Policy targets are met.

14 Policy Review

The Policy will be subject to review and revision at the end of every three years, or at any earlier time as deemed necessary by the Ministry of Education, Youth and Culture.

Mathematics and Numeracy Policy Committee

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