



Policy: Mathematics Policy

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AIMS OF THE POLICY

- to provide a common framework for mathematics policy and practice within West Lothian schools
- to support staff in providing quality teaching and learning opportunities
- to seek to ensure continuous improvement in the quality of learning and teaching and of pupils' attainment in mathematics

ADOPTING THE POLICY

All of the recommendations made within this policy are built upon pertinent national guidelines and advice and provide opportunities at local level for audit and evaluation against best practice. Initially, the quality of the mathematics education across the stages within a school should be the subject of a review against the key aspects of practice contained within this policy. The views of staff, parents and pupils will form part of the review. Regularly thereafter, the Headteacher, or the teacher with responsibility for mathematics, should audit the programmes to ensure that the policy continues to influence appropriately practice within the school.

BACKGROUND AND RATIONALE

'... mathematics is presented as a problem-solving activity supported by a body of knowledge, which will help our children understand the world about them and prepare them to act effectively in work, in recreation and in their role as citizens.' (National Guidelines: mathematics 5-14)

'Literacy and numeracy are the foundation stones of education. Without acquiring a sound basis of knowledge and skills in literacy and numeracy, children will not be able to benefit fully from school education and will face serious difficulties in reaching their full potential.' (Ministerial Foreword, Improving Attainment in Literacy and Numeracy in Schools, 2002)

West Lothian Council is committed to providing highest quality learning and teaching in mathematics education and therefore endorses the recommendations included within important national documents, including:

Improving Mathematics Education 5-14 (HMI, 1997)

Standards and Quality Report: Secondary Mathematics (HMIE, 1999)

Standards and Quality Report: Primary Mathematics (HMIE, 2001)

Improving Attainment in Literacy and Numeracy in Schools (SEED, 2002)

Since 1991, the National Guidelines 5-14 have shaped what is taught in mathematics programmes in primary schools and in S1/S2 of secondary school. The Framework 3-5 Curriculum now influences mathematics education pre-school, whilst Standard Grade and the recently introduced National Qualifications determine what is taught in mathematics classrooms from S3 onwards.

AIMS OF MATHEMATICS EDUCATION ARE TO HELP PUPILS:

- understand key concepts, facts and techniques
- develop, use and apply a range of mental calculation strategies in a variety of contexts
- become adept problem solvers
- understand and use appropriate mathematical language
- appreciate the value and challenges of mathematics
- become equipped to face the challenges of a technological society

CURRICULUM (HGIOS KEY AREA 1)

Time for teaching

Whilst the Framework 3-5 Curriculum highlights that children should be provided with opportunities for interactive number work, there is an expectation that, within the final term of pre-school experiences, children should be engaged in structured, practical activity with number e.g. aspects of the IPM Foundation programme, and Creating a Climate for Developing Numeracy in the Early Stages (Univ. of Strathclyde Early Intervention Training).

'Structure and Balance of 5-14 Curriculum' recommends:

in primary schools, a minimum of 15% (approx. 3 ¾ hours) be dedicated to the teaching of mathematics. In order to raise attainment in mathematics, the 'flexibility factor' *should* be used

to facilitate daily teaching of mathematics, e.g. 5 x 50 minute lessons (1 of which would be dedicated to mathematical problem solving).

In secondary schools, a minimum of 10% (approx. 3 hours) be allocated to teaching mathematics. Again, the 'flexibility factor' should be used to raise this figure significantly.

ATTAINMENT, ASSESSMENT, RECORDING AND REPORTING (HGIOS KEY AREAS 2 AND 3)

Assessment, formal as well as informal, must be integral to learning and teaching and fully incorporated into programmes of study and planned pupil experiences. In line with national support in Assessment is for Learning, due attention should be given to the importance of formative assessment in which teachers seek to:

- understand, through assessment, an individual's strengths and weaknesses
- use this assessment to identify next steps in a pupil's learning in discussion with the pupil
- provide appropriate learning and teaching to help the pupil resolve their weaknesses
- provide opportunities for self and peer-assessment as part of the learning experience

An attainment record should be maintained for each pupil and should form the basis for effective transfer of quality assessment information between stages and at points of transition, and for effective reporting to and communications with parents and carers. Quality reports to parents should indicate clearly:

- the child's progress through the level at which she/he is working
- next steps in the child's learning

Appropriately realistic and challenging attainment targets for mathematics should be identified for individuals within their PLP. Such targets should:

- engage the pupils in their determination and review
- inform the programmes of work
- be monitored and reviewed regularly
- take appropriate account of the recommendations made in Improving Mathematics Education 5-14 that:
 - ❖ most pupils should achieve level A by the end of P2.
 - ❖ by the end of P7, most pupils should be working beyond level D and some should be well on their way to completing level E
 - ❖ secondary departments should expect that most pupils will have begun work at level E in P7.

The Council also *expects that schools will make use of* curriculum flexibility and appropriate methods of accelerated learning in mathematics. In secondary departments for example, appropriate use should be made of National Qualifications to complement the Standard Grade provision with a view to maximising certification for students, particularly for those who are at risk of failing to achieve an appropriate Standard Grade award. Schools should also utilise the relaxation of Age and Stage Restrictions to ensure that students are presented for examinations when most appropriate.

TEACHING AND LEARNING (HGIOS, KEY AREA 3)

Planning for mathematics

Planning will be well-established in all schools. Plans should be comprehensive, reflect national guidance and be monitored regularly by teachers and senior managers. Key features of mathematics plans are provided in **Appendix 1**.

Organising for effective teaching and learning

Whilst effective teaching and learning requires a judicious mix of teaching and learning styles including group teaching and individual work, due attention should be paid to the important

role of whole-class interactive teaching. As a general guide, successful mathematics lessons take the following format:

- A 'Starter' to the lesson, which would be approx. 10 mins in duration and in which a focus would be on consolidating previously taught facts and techniques, e.g. interactive mental number work..
- A 'Main Activity', which would take some 25/30 mins, in which lesson objectives would be shared with pupils, new concepts would be taught and pupils' would work individually or collaboratively, as appropriate, on related tasks.
- A 'Consolidation' session of approx. 10 mins, in which the key concept taught would be summarised, appropriate homework issued and links to next lesson highlighted.

Additional features of *best practice* are provided in **Appendix 2**.

Where appropriate, managers should consider broad-banding or setting to facilitate more effective direct interactive teaching.

Mathematics programmes

Schools should have effective programmes of work in place for all teaching groups. It should be emphasised that an effective mathematics programme requires more than the use of a single dominant textbook. Quality programmes require a variety of resources and activities to be used. In all cases, due account should be taken of prior learning and support needs when programmes of work are being designed for individuals or groups.

Good attention should be given in mathematics programmes to the progressive development across the stages of appropriate problem solving skills. In the early and middle stages of primary, research suggests that due emphasis on promoting 'inductive' reasoning in young children is developmentally more appropriate; this can be achieved by providing children with a range of problems and supporting the children to evolve their own strategies and rules for solving them. In the upper primary and early secondary stages however, greater focus on 'deductive' processes should be encouraged, by presenting the pupils with strategies and rules and asking them to apply these to a range of problems. The key to effective development of problem solving skills lies in regularly engaging the pupils in discussing their approaches to solving problems, encouraging them to explain the strategies they used and why, and promoting consideration of alternative strategies and possible extensions to the problem under discussion. It is also important that, across the stages, children are given opportunities to apply their skills to a mixture of relevant 'real-life' problems as well as more abstract mathematical problems.

Good use should also be made of appropriate, modern ICT, including programmable toys in P1-P3. All primary schools were issued with a copy of the DfES software pack 'Using ICT to Support Primary Mathematics' and a suite of Interactive Resources has also been licensed to all schools. Both of these resources can provide excellent enhancements to mathematics learning and teaching across the stages. Many schools and departments are also making appropriate use of data projectors, interactive white-boards and graphic calculators to enhance their mathematics provision, *and this practice should feature appropriately in all mathematics programmes*. The WL Learning and Teaching website also contains numerous references to quality software and useful websites, see <http://edweb/Teaching/>.

The use of calculators should however be limited and monitored, particularly in the early stages. Calculators can contribute significantly to aspects of mathematics, e.g. in problem solving, in pattern work, when numbers are very large and where a child requires to use one for access to the mathematics programme. The emphasis of programmes must however be on developing pupils' oral and mental mathematical skills. It should also be noted that calculators may only be used in national assessments at level F, unless their use is a normal aspect of support provided to a pupil. Key features of mathematics programmes are provided in **Appendix 3**.

SUPPORT FOR PUPILS (HGIOS, KEY AREA 4)

Clear and robust procedures should be in place for the early identification of children who are experiencing difficulties with their learning in mathematics. Targeted additional support, based on the identified needs of the child and next steps in learning, should be provided to help the child achieve their potential: specific intervention programmes such as Action on Numeracy (Univ. of Strathclyde) can assist in this respect. The programmes of work should indicate also, at all stages, appropriately challenging activities for high-attaining children. To gain greatest benefit from the provision of Classroom Assistants, they should be fully involved in planning pupils' support with the class teacher.

MANAGEMENT AND QUALITY ASSURANCE (HGIOS, KEY AREA 7)

Effective managers are key to the successful development of mathematics education in their schools. They will be strongly committed to:

- involving their staff in reflecting on their approaches to teaching mathematics
- encouraging the staff and children to recognise the value and importance of mathematics
- quality development of the mathematics curriculum
- to maximising pupils' progress and achievement.

They will provide teachers with clear and effective policies, very good programmes of work and advice on learning and teaching, and a wide range of good quality resources. Additionally, managers must provide robust quality assurance processes, which should incorporate good practice as identified in **Appendix 4**

AUDIT

On a regular basis, the quality of the mathematics programmes and courses should be audited to ensure alignment with the key *expectations* and exemplars of best practice contained within this policy. Most of *the* recommendations and exemplars are drawn from key national documents and guidelines, which are clearly identified on page 1 and which can be used to provide further evidence for an audit.

APPENDIX 1

Key features of mathematics plans:

Key features of very good plans for mathematics:

Set out clearly what teachers expect pupils to learn, matched appropriately to 5-14 Guidelines and SQA specifications

Indicate learning and teaching approaches and resources to be used

Where appropriate, include group plans, IEPs and support mechanisms

Indicate priorities for assessment

Contain periodic evaluations by teachers of the effectiveness of the work covered

APPENDIX 2

Key features of effective teaching & learning in mathematics:

Key features of very good teaching and learning of mathematics:

- Where necessary, a minimal number of attainment groups (HMIE recommend a maximum of 3 such groups). Appropriate additional support should be provided, based on the needs of the children and their next steps in learning.
- Lessons which have clear objectives, and in which quality interactive oral and mental mathematics work takes place.
- Pupils are encouraged to select and apply processes
- Skilled explanations and questioning, in which pupils' are given time to think before responding and their responses are used to test for understanding and to identify areas of weakness.
- Pupils are encouraged to demonstrate and explain their thinking
- A brisk pace of learning is evident, within which high expectations are set.
- Account is taken of pupils' prior learning.
- High standards of mathematical oracy, accuracy and presentation.
- Pupils are regularly given opportunities to solve non-routine problems
- Assessment, including pupils' self-assessment, is regular, well recorded, transferred to teachers of next stage and used to identify further needs in learning.
- Regular, relevant and varied homework, on which pupils' receive timeous, quality feedback
- Good use is made of resources, including ICT, calculators, games and puzzles
- Pupils are praised effectively to encourage and motivate them, and they are well supported according to their needs.
- Examples of good quality pupils' mathematical work, recently completed, are prominently displayed.
- Pupils are regularly reminded of the relevance and importance of the mathematical work to every day life

APPENDIX 3

Key features of very good programmes of work for mathematics:

- Have well-balanced coverage of the key aspects of mathematics over a planning block.
- Use a variety of contexts and resources for pupils to apply skills and consolidate learning.
- Take account of prior learning and provide continuity and progression through the stages, particularly at the transition stages.
- Ensure a brisk pace of progress through the attainment levels.
- Incorporate advice for teachers on learning and teaching and on meeting pupils' needs, including advice on homework, problem solving, oral work, and appropriate use of resources.
- Make effective use of modern ICT.
- Provide opportunities for appropriate practical work and estimation.
- Integrate problem solving and enquiry fully, and ensure continuity and progression therein.

APPENDIX 4

Key features of effective quality assurance processes for mathematics:

- Encourage staff to self-evaluate their teaching of mathematics
- Regular reviews of plans, programmes and pupils' experiences
- Effective strategies for monitoring learning and teaching including peer-monitoring, where possible. Focused, constructive and supportive feedback to staff should be a prominent feature of such monitoring
- Reviewing samples of pupils' work, assessments and learning targets
- Robust procedures for analysing and using attainment data effectively

GLOSSARY OF TERMINOLOGY

HGIOS – How Good Is Our School (2002 Edition), HMle

HMle – HM Inspectorate of Education

PLP – Personal Learning Plan

DfES – Department for Education and Skills

SQA – Scottish Qualifications Authority

SEED – Scottish Executive Education Department

IEP – Individualised Education Programme