

## EDUCATION AND TRAINING INSPECTORATE

# Better Numeracy

in Primary Schools



Evaluations and prompts for self-evaluation



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# BETTER NUMERACY

*in Primary Schools*

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EVALUATIONS AND PROMPTS FOR SELF-EVALUATION





## 1. INTRODUCTION

- 1.1 In April 2009, the Department of Education (the Department) launched *Every School A Good School*, the new policy for school improvement. The overall aim of the policy is to raise the quality of children's achievements and standards so that 'every child will leave compulsory education with the appropriate standards of literacy and numeracy'. At the heart of the policy is a clear focus on learning and teaching and on self-evaluation leading to sustained self-improvement. It is recognised within the policy that, whilst the Department can provide the framework within which improvement takes place, it is the teachers and support staff who will make it happen.
- 1.2 In 1999, the Education and Training Inspectorate (the Inspectorate) published *Evaluating Mathematics* which outlined the characteristics of good quality provision in mathematics within the primary and post-primary sectors. This was followed in 2001 by *Improving Mathematics* and in 2006 by *Better Mathematics*, both of which focused on mathematics provision in post-primary schools.
- 1.3 This report is the latest addition to the suite of mathematics publications. Unlike its forerunners, it focuses exclusively on numeracy provision within primary schools. It is based on the findings of 77 inspections and a range of survey and district visits carried out during the reporting period January 2008 to June 2009.
- 1.4 *Better Numeracy in Primary Schools* has two main purposes:
- to identify the characteristics of the very good practice in numeracy which exists within primary schools in Northern Ireland; and,
  - to assist teachers, co-ordinators and senior managers in their ongoing work to promote improvement in the interest of their children.
- 1.5 The report lists the characteristics of good and less effective practice under the headings: Ethos; Planning; Learning and



Teaching; Information and Communication Technology (ICT); Assessment; and Leadership and Management. To fulfil the second purpose, it also provides a series of self-evaluative prompts for use, as appropriate, at individual, key stage or whole-school level.

- 1.6 *Better Numeracy in Primary Schools* complements *Better Literacy in Primary Schools*, which was published in February 2008.



## 2. CHARACTERISTICS OF GOOD AND LESS EFFECTIVE PRACTICE

### 2.1 Ethos

In the most effective practice:

- the school gives a high priority to the development of numeracy across the curriculum;
- there is a sense of enthusiasm about numeracy; the co-ordinator is effective in promoting numeracy throughout the school;
- the children and staff have a positive attitude towards numeracy;
- there is a numeracy-rich environment; mathematical thinking and problem-solving are promoted through the creative use of the wider environment; interactive displays capture the children's interest and enhance their enjoyment and understanding of numeracy;
- there are very good working relationships between the teachers and the children; the teachers nurture the children's confidence whilst encouraging them to respond positively to learning challenges;
- risk-taking is promoted as an opportunity to learn; and
- parents are involved in workshops and activities which enable them to support their children's learning effectively.

Where the ethos was less effective, it was often characterised by:

- the need to emphasise more strongly the value of mathematics across the curriculum and in real life;
- insufficient emphasis being given to numeracy in the school environment; and
- a culture which is overly supportive rather than challenging or risk-taking.

Is mathematics explicitly connected to other areas of learning and to everyday life?

Do classroom and corridor displays capture the children's interest and enhance their enjoyment and understanding of mathematics?

Do the children have the opportunity to contribute to the development of a numeracy-rich environment through, for example, the school council?

Do we promote engagement with mathematics within and beyond the school? How? To what effect?

To what extent do children have opportunities to engage in difficult and challenging tasks rather than routine, repetitive and 'safe' calculations?



Does the whole-school programme for mathematics ensure sufficient progression across each area of the maths curriculum?

Is each area of the mathematics curriculum revisited regularly within each year group?

Is there an agreed mental mathematics programme which outlines strategies?

Do the teachers in the Foundation Stage make use of the pre-school transition information to continue the children's development in mathematics?

Do the teachers make use of information on children's progress and attainment gained from the previous class/year?

## 2.2 Planning

In the most effective practice:

- there is a comprehensive whole-school programme which clearly outlines the progression for each area of the mathematics curriculum and which provides appropriate guidance for the class teachers to create their medium- and short-term planning;
- the planning for each class focuses on the knowledge, skills, understanding and language to be promoted and identifies clearly how the teacher intends to meet the range of needs within the class;
- the well-planned integration of mental mathematics into lessons promotes the development of flexible thinking and the consolidation and extension of the children's learning;
- the teachers in the Foundation Stage take account of the children's pre-school experiences in mathematics; they build on what the children already know, understand and can do;
- the teachers in the Foundation Stage plan a range of play-based activities through which the children develop early mathematical language, concepts and understanding appropriate to their age and ability;
- the teachers take account of the children's previous learning and use this information to inform their planning;
- the classroom assistants have a clear understanding of the planned learning intentions, methodology and mathematical language to be developed and are able to challenge and support children using approaches which mirror those of the class teacher; and
- the teachers evaluate regularly the quality and extent of the children's learning and use the outcomes to inform their future planning.





Where planning was less effective, it was often characterised by:

- an over-emphasis on number work;
- the need to identify more clearly the intended learning outcomes;
- insufficient planning to meet the range of abilities within the class;
- the need to identify clearly and plan specifically for the opportunities within play-based sessions to promote the children's numeracy skills, to build effectively upon their interests and curiosity, and to exploit the full learning potential of all resources; and
- the need to ensure that individual, group and whole-class outcomes are evaluated and used to inform future planning.

Do classroom assistants contribute to the class planning for numeracy?

Do the teachers' evaluations aid future planning for specific children or groups of children?



At the beginning of a new topic, do the children have the opportunity to demonstrate what they already know, understand and can do?

Are the teachers' expectations explicit and known to the children?

Is there adequate provision made for the children with additional needs?

Is there a clear learning outcome for all practical work?

Do the children have regular and frequent opportunities to apply their learning to problem-solving, problem-posing and investigative activities?

## 2.3 Learning and Teaching

In the most effective practice:

- the teachers build effectively on the children's previous knowledge and experience;
- the teachers have realistically high expectations of what the children can achieve; the children are challenged to extend their learning and appropriate support is provided when children are experiencing difficulties;
- practical approaches are used effectively to develop mathematical concepts and to lay the foundation for more abstract work;
- the use of open-ended questions, problem-solving tasks and investigative activities develops the children's capacity to reason logically, think flexibly, and make and justify decisions;
- the teachers make effective use of routines and incidental opportunities to promote mental mathematics;
- the children are given appropriate time and encouragement to communicate and explain their mathematical thinking, to articulate the processes they use, to ask questions and to talk about their learning;
- the teachers use the learning intentions and success criteria throughout the lesson to focus the children's attention on and consolidate learning;
- the interactions between the adults and children are consistently of a high quality;
- the children's mathematical knowledge and skills are developed systematically across the school;
- the children make good year-on-year progress;
- the children can draw effectively on a range of mental mathematics strategies; they are flexible in their mathematical thinking;



- the children work well together in groups and co-operate effectively during practical sessions;
- the children engage actively in their learning and are confident in working independently and in applying their knowledge, understanding and skills in unfamiliar contexts; and
- the children talk confidently about their thinking and learning in mathematics.

Where learning and teaching were less effective, they were often characterised by:

- over-direction by the teacher;
- lessons which lack pace and which do not sufficiently meet the needs and abilities of all of the children within the class;
- insufficient emphasis being given to the development of mathematical processes;
- questioning which has little challenge and requires only a limited response from the children;
- practical work which has no learning outcome;
- the need to develop further the opportunities for children to apply their mathematical knowledge in real life contexts and in other areas of the curriculum;
- ineffective plenary sessions;
- the need to promote greater flexibility in children's thinking and to encourage them to take greater risks in how they work;
- the children having difficulty transferring their mathematical knowledge and skills to other areas of the curriculum and to everyday situations; and
- the poor recording of written work.

Are the children encouraged to explain and discuss the strategies they use in mental mathematics and problem-solving?

Are plenary sessions used to extend the children's thinking and to assess their learning?



Do children have sufficient opportunity to support their numeracy development through the five Es<sup>1</sup>?

## 2.4 Information and Communication Technology (ICT)

In the most effective practice:

- the children's experiences in the use of ICT to support mathematics and numeracy are carefully planned, appropriately supported and evaluated;
- interactive whiteboards (IWBs), websites and learning platforms are used by children and teachers to explore, express, evaluate, exchange and exhibit understanding and learning; and
- mathematics-based computer programs are used effectively to:
  - engage the interest of the children;
  - draw out connections between different aspects of mathematics;
  - consolidate further the children's understanding of important concepts; and
  - extend their skill at problem-solving.

Where the use of ICT was less effective, it was often characterised by:

- insufficient planning to support learning and teaching;
- stand-alone activities which do not sufficiently promote the children's learning;
- the insufficient involvement of the teacher or classroom assistants in promoting and developing mathematical language and understanding; and
- the lack of opportunity for the children to use the IWB.

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<sup>1</sup> Explore, Express, Exchange, Evaluate and Exhibit.





Do the children know what they need to do to improve?  
How do they know?

How reliable are the standardised test outcomes?  
Is there consistency in the administration and marking of standardised tests?

Is the school's internal and external data being used effectively to:

- track the progress of individual children;
- diagnose individual strengths and difficulties; and
- inform target-setting?

## 2.5 Assessment

In the most effective practice:

- the children are aware of the intended learning outcomes, share in the development of success criteria and use them to evaluate the extent of their learning;
- there is good formative marking of the children's oral and written work; children are given clear oral or written advice on what they need to do to improve;
- the strengths and difficulties which individual children experience are diagnosed regularly and this profile is used to inform the children's subsequent learning programmes;
- the progress of each child is very carefully tracked and monitored;
- the teachers in the Foundation Stage make effective use of observations to identify the children's strengths and needs and to inform future planning;
- the assessment outcomes are used to good effect by individual teachers to evaluate the effectiveness of their own practice; and
- the outcomes from monitoring and evaluation and the analysis of data are used effectively to inform target-setting at individual, group and class level.

Where the assessment of children's learning was less effective, it was often characterised by:

- marking that comprises only ticks and crosses;
- an over-emphasis on peer marking that is not monitored by the teacher;
- insufficient opportunities being provided for the children to address misunderstandings and correct mistakes in order to consolidate their learning;



- the lack of a coherent method of assessment in the Foundation Stage; and
- the need to develop further the analysis and use of standardised test outcomes to track progress in learning for all the children and inform planning and learning programmes.



Does the Numeracy Action Plan have a clear focus on raising standards in learning and teaching?

Are there strategies in place to monitor the quality of the numeracy provision and learning within the school?

Is the school's internal and external data being used effectively to identify priorities for whole-school development?

Is there sufficient, appropriate in-service training for teachers and classroom assistants?

## 2.6 Leadership and Management

In the most effective practice:

- numeracy is prioritised within the School Development Plan (SDP) and supported by an appropriate Action Plan (AP);
- the Numeracy AP has a clear focus on learning and teaching and the improvement of the children's standards and achievements;
- the numeracy co-ordinator/leader is a role-model for good practice, has a clear vision for the development of mathematics and provides excellent leadership, focused on ensuring that high quality learning experiences are provided for all children;
- the teachers have a sound mathematical knowledge; there is a shared understanding of pedagogy and stages of conceptual development;
- there is structured, effective monitoring and evaluation of the quality of numeracy provision and learning across the school; this includes scrutiny of the planning and children's written work, observation of lessons and effective analysis of data;
- the analysis of data is used effectively to identify priorities for whole-school development;
- staff development needs are identified and there is effective dissemination of best practice within numeracy;
- the school uses the teachers' knowledge and experience, as well as a wide range of standardised tests, to identify early those children requiring





additional help in mathematics, and provides appropriate and effective intervention to support them;

- classroom assistants are deployed effectively to maximise the potential learning experiences for all the children; and
- there is effective transfer of information about the children's attainments and standards in numeracy from the primary school to the post-primary schools to which they transfer.

Where leadership and management were less effective, they were often characterised by:

- a lack of vision for the development of numeracy;
- the need to develop further the role of the numeracy co-ordinator/leader:
  - as a lead practitioner and role-model; and
  - in monitoring and evaluating the quality and effectiveness of the planning, learning and teaching in numeracy;
- the need to disseminate more effectively the good numeracy practice that exists within the school; and
- insufficient support for children with additional learning needs in mathematics.

Are there effective links between the numeracy co-ordinator/leader and the Head of Departments of the main post-primary schools to which the children transfer?



### 3. Summary

- 3.1 Many of the characteristics of both the most and least effective practice reported in the preceding sections are similar to those in earlier Inspectorate publications<sup>2</sup>. This does not detract from their relevance and importance, especially as they are based on extensive evidence arising from recent inspections.
- 3.2 Although the following four guiding principles provide a concise summary, it is important that primary schools take note of all the characteristics when self-evaluating their numeracy provision.
- i. Children need to understand how mathematics contributes to their everyday lives and provides a way for them to solve many problems they will encounter in the future; their learning experiences need to be set within meaningful contexts with appropriate opportunities for them to apply their knowledge, skills and understanding.
  - ii. The relationship between learning and teaching is complex but the quality of teaching has a direct influence on the effectiveness of learning in mathematics; high expectations for children's thinking are central to quality mathematics teaching.
  - iii. Learning in mathematics is incremental; teachers need to ensure that their planning takes good account of what the children already know, understand and can do and that their teaching builds on this.
  - iv. Learning and teaching are supported and enhanced by sound leadership and efficient and effective management arrangements; the role of the numeracy co-ordinator/leader is of paramount importance to the effective development of numeracy within the school.

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<sup>2</sup> For example: *Children and Their Learning: Primary Inspections (1992-98)*; *Evaluating Mathematics, 1999*; *Literacy and Numeracy in Primary and Post-primary Schools: Characteristics that Determine Effective Provision, 2008*.





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