ANGUS COUNCIL
EDUCATION DEPARTMENT

NUMERACY

STRATEGY PAPER

April 2010

Contents

1. INTRODUCTION

"Being numerate helps us to function responsibly in everyday life and contribute effectively to society. It increases our opportunities within the world of work and establishes foundations which can be built upon through lifelong learning. Numeracy is not only a subset of mathematics; it is also a life skill which permeates and supports all areas of learning, allowing young people access to the wider curriculum.

We are numerate if we have developed the confidence and competence in using number which will allow individuals to solve problems, analyse information and make informed decisions based on calculations."
Curriculum for Excellence: Numeracy across Learning, Scottish Government, 2009

1.1 The definition of Numeracy, as defined in Curriculum for Excellence is:

Competence with numbers and using graphical skills in relation to:

- basic number and number processes
- estimation and rounding
- aspects of fractions, percentages and decimal fractions
- money
- time
- measure
- aspects of information handling

1.2 Numeracy is a fundamental life skill. Being numerate involves developing a confidence and competence in calculating, problem solving, accessing and interpreting information, weighing up different options and hence making informed, responsible lifestyle choices. It gives increased opportunities within the world of work and provides individuals with the knowledge, concepts and skills required for life-long learning.

1.3 Numeracy is a subset of mathematics; it is also a core skill. This skill permeates all areas of learning and allows pupils the opportunity to access the wider curriculum. It is therefore essential that all teachers in our educational establishments are supported to develop and reinforce numeracy skills, within their own teaching activities and through inter-disciplinary projects and studies.

1.4 The key aims of the authority's numeracy strategy are to:

- Provide an effective framework for the delivery of high quality learning and teaching in numeracy in Angus Schools
- Ensure that all learners are provided with maximum opportunities to acquire, understand and apply numerical skills effectively and with confidence
- Promote effective progression and continuity at all stages and across areas of transition to ensure a seamless, coherent and relevant numeracy curriculum for all
- Increase staff skills and confidence in teaching numeracy
- Raise levels of achievement and attainment in numeracy among all learners

2. RATIONALE

'All teachers have responsibility for promoting the development of numeracy. With an increased emphasis upon numeracy for all young people, teachers will need to plan to revisit and consolidate numeracy skills throughout schooling.'
Building the Curriculum 1, Scottish Executive, 2006

2.1 Angus Council believes it is important to nurture in all children and young people a love of learning and a capacity to acquire the values, skills and knowledge needed for life in the 21st Century. This strategy, although seemingly focused on the development of *Numeracy*, also serves as a foundation for *Mathematics* teaching, since it describes the methodologies and pedagogy which underpin effective learning and teaching.

2.2 The Scottish Government has published a series of documents including the *'National Statement for Improving Attainment in Numeracy in Schools'* (2002), 'A *Curriculum for Excellence' (2005), 'Improving Achievement in Mathematics in Primary and Secondary Schools'* (2005), *'Improving Scottish Education 2005-2008'* (2009) and '*Learning Together: Mathematics'* (2010). All of these documents provide a context within which developments in learning and teaching should be made, in order to raise achievement and attainment in numeracy for all.

2.3 *'Improving Achievement in Mathematics in Primary and Secondary Schools'* (HMIE, 2005) highlighted a number of key strengths and main areas for improvement in learning and teaching approaches to Mathematics. Angus Council conducted an audit and produced a statement, comparing their position with the national perspective, and made key recommendations for action. A follow up survey to the original audit which informed the Angus Position statement was conducted in 2009 (Appendices 1 and 2).

2.4 Due attention has also been paid to the findings of national and international surveys including the '*Trends in International Maths and Science Survey'* (2007) and the '*Scottish Survey of Achievement',* (2008).

2.5 The *"Trends in International Maths and Science Survey (TIMSS)*' 2007 assessed a total of 3929 Scottish P5 pupils and 4070 Scottish S2 pupils. Findings show that in "Number" Scotland's performance is lower than the international average, despite Scottish teachers spending an above average amount of time on this topic.

2.6 The findings of the *'Scottish Survey of Achievement'* (2008) generally aligned with the findings of the TIMSS report. However, across all stages, the *Mathematics* attainment profile for Angus was lower than that of Scotland. Although Angus pupils performed slightly better in *Numeracy* than in Mathematics, figures were still lower than the national average at P3, P7 and S2. In contrast, proportionally more Angus pupils at P5 attained higher levels than Scotland overall. Notably, Angus teacher judgements of attainment were not consistent with *actual* attainment levels, and confidence amongst primary teachers for teaching mathematics was not particularly high.

3. CURRICULUM

3.1 Scottish Education is undergoing radical change. Teachers are being challenged to embrace Curriculum for Excellence and reflect on how their practice embraces the four capacities and seven principles of curriculum design.

3.2 The Curriculum for Excellence numeracy experiences and outcomes promote effective learning and teaching methodologies which stimulate the interest of young people, and promote creativity and ingenuity. They are designed to ensure that learners are challenged at an appropriate level and that they are given the opportunity to progress at a suitable pace.

3.3 As part of a broad, general and deep education, all young people have an entitlement to well planned experiences and outcomes in numeracy to the end of third level. Fourth level experiences and outcomes should provide further enrichment for many.

3.4 Curriculum for Excellence places a strong emphasis on deep learning, and on the development of conceptual understanding and transferable skills. Teachers will plan to frequently revisit topics, building on and extending prior knowledge. They will nurture the development of positive attitudes and provide an environment where learners can develop as ***successful learners, confident individuals, responsible citizens and effective contributors.***

3.5 All young people will be enabled to become successful, numerate learners who can:

- think innovatively, creatively and independently when solving numerical problems as they appear in the real world
- use technology appropriately to enrich and enhance their mathematical learning
- locate, select, process, synthesise and transform numerical information from a range of sources
- understand and use mathematical language in discussions with others
- use numerical skills successfully over a range of curricular areas and in different learning situations

3.6 All young people will be encouraged to develop as confident, numerate individuals who can:

- demonstrate self-awareness by reflecting on the relevance of numerical skills across a range of disciplines and using these skills appropriately
- apply numerical skills confidently in real life situations in order to lead an independent life style
- relate to others by describing solutions, listening attentively to alternative views and responding appropriately
- show resourcefulness and initiative in problem solving and express solutions creatively, in a way that engages others
- take information from a range of sources and identify the relevant issues
- predict, estimate and use approximations, being alert to the accuracy and reliability of results and measurements

3.7 All young people will be supported to develop as effective, numerate contributors who can:

- understand and appreciate the usefulness of numeracy and the connections from numeracy to their daily experiences
- use numeracy to evaluate environmental, scientific, social and technological issues
- demonstrate an awareness of the importance of numeracy in history and the development of civilisation
- apply skills and understanding to creatively and logically solve problems
- show resilience by working on suitably challenging problems, both independently and with others
- apply critical numerical thinking in new contexts, by posing and reflecting on previous solutions

3.8 All young people will be helped to develop as responsible, numerate citizens who can:

- show knowledge of how numeracy is applied in everyday life
- draw conclusions, assess risk and make informed decisions through the analysis of numerical data
- apply critical thinking to evaluate new and enterprising contexts
- critically follow a chain of reasoning, including proving/disproving mathematical arguments
- work individually, co-operatively, share ideas and present their conclusions

3.9 All learning should be planned within a rich and supportive learning environment which incorporates a skilful variety of approaches including:

- active and co-operative learning
- planned, purposeful play
- development of mental agility and problem-solving capabilities
- frequent opportunities for young people to explain their thinking
- use of relevant and meaningful contexts and experiences
- use of technology in appropriate and effective ways
- building on the principles of Assessment is for Learning
- developing a balance of collaborative and independent learning
- linking learning across the curriculum, so that concepts and skills are developed further by being applied in different contexts
- promoting an interest and enthusiasm for numeracy

3.10 Active Learning is a key feature of the new curriculum. Learners do not need to be engaged in a practical activity, playing a game or moving around to be actively learning. Rather, active learning is about interaction: teacher to pupil, or pupil to pupil. Teachers should adopt a balance of whole group interactive teaching, individual work and co-operative learning. Lessons should cater for a range of learning styles and focus on metacognition. Wherever possible, learners should have access to a wide variety of resources. Information and Communications Technology should be used to enhance learning experiences.

3.11 Within the new curriculum, problem solving and the development of mathematical thinking should be an integral part of all learning and teaching. Teachers need to stimulate learners' curiosity by providing opportunities for observation, exploration, investigation, experimentation, discussion and reflection.

3.12 The development of mental agility is very important. Learners need access to a range of strategies for calculating and problem solving, and should be encouraged to develop their own strategies. There needs to be a focus on the use of mathematical vocabulary and learners should be given frequent opportunities to explain their thinking and share their learning with others.

3.13 Through real contexts, learners will be supported in developing an awareness of the relevance of the concepts and relationships they encounter in their daily lives. Interdisciplinary studies, where appropriate, will serve as a useful tool for reinforcing prior learning, as well as making meaningful links between subject areas.

3.14 Play should be the medium through which all learning in numeracy is planned for the youngest pupils.

4. KEY ENTITLEMENTS

4.1 Pupils have an entitlement to participate in programmes of planned learning which offer challenge and enjoyment, breadth, depth, progression, personalisation and choice, coherence and relevance in relation to numeracy. These programmes should provide opportunities for learners at all stages to:

- participate in motivating activities that promote an enjoyment of working with numbers
- experience appropriate levels of support and challenge to enable each individual to achieve his or her potential in numeracy
- be actively involved in applying numerical, mathematical and statistical skills in everyday situations and in more abstract contexts
- have the opportunity to understand the relevance and application of numerical skills in a variety of cross-curricular contexts
- participate in a range of enterprising activities that facilitate the development of financial capability
- engage in an appropriate range of experiences that include problem solving, the development of thinking skills and extended activities enabling them to develop the ability to understand and use number effectively
- experience continuous and coherent progression in developing numerical skills from 3 to 18
- build upon previous skills and understanding of numeracy at each stage of learning, ensuring a smooth progression of skills development and a pace of learning matched to individual needs
- access new technologies which offer exciting potential to enrich learning in numeracy
- engage in dialogue regarding personal choice in numeracy, from a range of relevant strategies and approaches
- understand the value and the relevance of number work in the context of life-long learning.

4.2 Parents and carers are entitled to:

- a clear understanding of the range of numeracy experiences available for young people
- guidance on ways to support young people to develop and apply numerical skills
- relevant and meaningful information about their children's progress and development in numeracy
- support in improving their own numeracy skills if required.

4.3 To promote numeracy in schools, teachers are entitled to:

- relevant, high quality continuous professional development according to their individual needs
- clear advice and guidance on expectations
- information on local and national initiatives
- examples of effective local and national practice.

"Those skilled in using a range of effective teaching techniques, and with a greater depth of subject knowledge, foster young mathematicians who have a disposition to recognise embedded mathematical ideas and apply them."
Learning together: Mathematics, HMIE, 2010

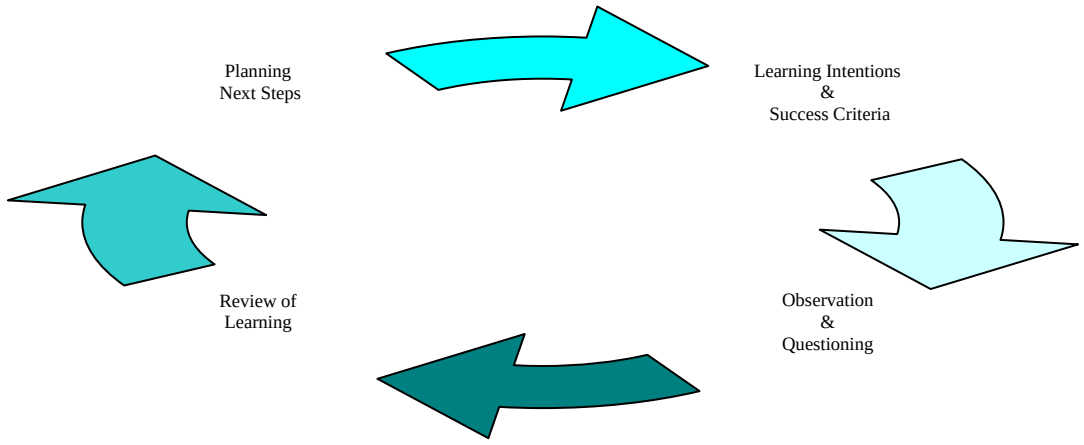
5. MONITORING PROGRESS AND ACHIEVEMENT

5.1 Curriculum for Excellence levels describe achievement and are not solely based on attainment. Teachers need to gather evidence of achievement in numeracy as part of day-to-day learning. This learning can be planned across the curriculum or as part of subject focused numeracy lessons. Evidence gathering could be done in a number of ways, for example through observation, questioning, collection of annotated photographs, undertaking diagnostic interviews, developing learning journals or portfolios. Assessment should not be restricted to summative forms.

5.2 The progress of young people should be defined in terms of breadth and depth of achievement. Pace is not about how quickly levels can be completed, but is about providing learners with an appropriate degree of challenge. Emphasis should be placed not just on how much, but on how well pupils learn.

5.3 Assessment should focus on learners' understanding as well as their procedural skills. It needs to be used to diagnose the nature and causes of barriers to learning and to monitor the progress of learning and teaching.

5.4 The principles of 'Assessment is for Learning' fully inform the curriculum and assessment frameworks. Learning intentions and success criteria should be shared at the start of every lesson, referred to throughout the lesson and reviewed in a plenary session. Teachers need to actively gauge understanding through observation and the use of effective questioning. Learners should be encouraged to reflect on and take ownership of their own learning through opportunities for self and peer assessment. Teachers need to provide quality feedback to learners and support them in identifying and planning their next steps.



5.5 Rigorous moderation will be vital in ensuring consistency of approach in sharing standards, both within and across sectors. The National Assessment Resource (NAR), due to be launched in September 2010, will provide teachers with a forum for thinking and reflecting on the *process* of assessment. This will help promote better professional understanding and a sharing of expectations and standards between teachers.

5.6 The Scottish Qualifications Authority (SQA) will continue to collect data on learners' progress in Numeracy at P4, P7 and S2 through the Scottish Survey of Achievement. The first Scottish Survey of Literacy and Numeracy (SSLN) will be undertaken in 2011. The numeracy assessments which will be conducted bi-annually will assess competence in the following areas:

- Knowing (facts, concepts and techniques)
- Reasoning and Applying (across learning and in everyday situations)
- Communicating and Collaborating
- Using Technology

5.7 Numeracy units will be made available at SCQF levels 3, 4 and 5. These will be designed to form part of the mathematics' course at levels 3 and 4 and embedded into the mathematics course at level 5. They will not be certificated separately. For those pupils who require separate certification, freestanding units will be available.

6. THE WAY FORWARD

"An increasing number of teachers are transforming the curriculum by engaging actively with colleagues to evaluate continuously the outcomes of learning to improve learners' experiences and attainment. However, in too many schools, innovation has been insufficient and the outcomes for young people have not improved."
Learning together: Mathematics, HMIE, 2010

6.1 Curriculum for Excellence is not about "matching" existing courses, schemes of work or programmes of study to the new experiences and outcomes. It is about reflecting deeply on methodology and pedagogy. The new curriculum demands that teachers have a strong content knowledge and firm grasp of how learners develop mathematical understanding.

6.2 Recent research demonstrates that learning improves best when staff at all levels engage in focused, professional dialogue and self and peer evaluation.

6.3 The following table outlines the key actions to be undertaken in all Angus schools to fulfil the aims of the numeracy strategy and develop numerate citizens for the 21st century.

	Key Actions for all Schools
Year 1	• Engage with relevant Curriculum for Excellence Principles and Practice Papers • Identify existing good practice across school/ department and how this can be built on • Identify and address the development needs of all staff to ensure that they have the appropriate skills to teach and reinforce numeracy, effectively (see Appendix 3 – learning and teaching audit) • Engage with the numeracy and mathematics experiences and outcomes • Plan using the Angus numeracy and mathematics learning programmes (repacked outcomes) and "Numeracy Across Learning: a practical guide for secondary teachers", as appropriate • Ensure that the development and application of numeracy skills are recognised as the responsibility of all staff • Consider approaches used to develop numeracy across the curriculum • Review the extent to which formative assessment approaches support the learning process • Review the progress of all staff in developing active and co-operative approaches to learning • Ensure play experiences in the early years provide opportunities for progressive development of numeracy skills • Ensure there is a whole school approach to numeracy led by a member of the school leadership team

Year 2	• Review and act on the evaluation of progress made in Year 1 • Fully implement the Angus numeracy and mathematics learning programmes and provide young people with a range of curricular and cross curricular contexts through which they can develop their understanding of numeracy • Ensure formative assessment approaches are fully embedded to support the learning process • Ensure all staff develop a confident understanding of conceptual number development • Increase familiarity with the MAAR assessment rubrics and NAR resources • Consider how pupil progress through the numeracy outcomes and experiences will be tracked and recorded, supported by MAAR where appropriate • Work in cluster groups to ensure coherence and progression in the planning and range of numeracy experiences offered • Develop a policy statement on numeracy embracing the aims of the Angus numeracy strategy • Set challenging, achievable targets and implement appropriate strategies to improve attainment in numeracy
Year 3	• Review and act on evaluation of progress made in Year 2 • Implement the school's numeracy policy and monitor its impact on outcomes for young people • Further develop opportunities for moderation to ensure continuity, progression and consistency of standards • Monitor standards of achievement and attainment in numeracy through an ongoing process of self evaluation

6.4 To support schools to achieve outcomes against the above key actions, the Education Authority will:

- support and develop effective leadership, commitment and collaborative working, within and across sectors, to engage with the numeracy experiences and outcomes
- identify and support challenging and enjoyable opportunities for developing numeracy skills across learning
- provide opportunities for collaboration among staff including supply teachers, peripatetic staff, support staff, support for learning and other specialists
- identify and disseminate good practice in numeracy

- ensure the effective management and deployment of resources to support the teaching of numeracy as a permeating theme

- seek the views of children and young people, and of teachers, to evaluate the effectiveness of these approaches

- monitor and review standards of achievement and attainment in numeracy through existing quality assurance procedures

- plan and deliver CPD to support related pedagogical developments.

This strategy paper will be reviewed in light of new national developments in June 2011 and bi-annually thereafter.

Appendix 1: Secondary Questionnaire

HMIE Improving Achievement in Mathematics – Angus Schools Audit - Secondary

Collated responses (5 out of 8 schools responded)

In my department/school:	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Comments**
• pupils' skills in problem-solving and enquiry are systematically developed	1	3	1		It is essential that we recognise Mathematics as a problem solving activity supported by a body of knowledge. Very concerned that CfE contains neither the rigor nor the methodology which was successfully shared across sectors in 5-14.
• programmes include the use of computers to organise and display information in a range of graph forms	2	3			More access to computers needed.
• pupils are appropriately challenged and actively engaged in learning when carrying out mathematical tasks	4	1			
• pupils are given frequent opportunities to work collaboratively on mathematical tasks	1	4			Not all teachers embrace co-operative learning.
• there are well planned approaches which allow pupils to develop skills in applying appropriate strategies to solving problems in new contexts	1	2	2		
• there is consistency in teaching approaches, and the use of mathematical vocabulary, across the school which ensures that pupils can effectively use their mathematics in other subjects		2	3		This will develop through numeracy across the curriculum. This has been identified as an area which we have begun to develop more formally.

• courses in Mathematics extend pupils' learning beyond the demands of their current course requirements. This includes outcomes which go beyond the minimum assessment requirements for SQA examinations at S3/S4	1	4			
• pupils in S3 and beyond often repeat work related to outcomes already mastered in S1/S2		2	3		Revision and practice of skills essential to ensure that skills do not atrophy – tables, fractions, algebra etc.
• courses take account of previous attainment levels and meet the needs of *all* pupils	1	4			
• *all* staff regularly share learning intentions with pupils		2	1	2	The term "learning intention" is not used consistently by all staff.
• in mental mathematics, pupils of *all* levels of ability are challenged appropriately	1	2	2		
• *all* teachers make appropriate use of ICT to enhance their teaching and improve the quality of pupils' learning experiences	2	3			The skills which have been developing since the introduction of Interactive Whiteboards still require an investment of a great deal of our development time.
• pupils are involved in assessing their own progress and identifying the next steps in their learning	1	3	1		Continuing to develop the use of "Follow-up Sheets" for all formal assessments which identify suitable work to help ensure understanding. Outcomes on GLOW.
• pupils in need of extra support in mathematics use appropriate resources	2	3			

• pupils are given regular opportunities to fully explain their answers and explore the thinking behind their answers, right or wrong, in order to improve understanding	1	4			
• every mathematics lesson includes a review of prior learning		3	2		
• the effectiveness of class groupings in mathematics is regularly monitored, and pupils have the opportunity to move between attainment groups	2	2	1		In reality, once courses have started the only movement is down therefore I don't encourage movement. The appropriate balance is ESSENTIAL between formative and summative approaches.
• the needs of all pupils are met through effective use of differentiated courses and activities	1	4			
• all pupils are given appropriate and regular homework	3	2			
• development priorities in Mathematics have a clear focus on improving learning and teaching	3	2			

How do the levels attained by your pupils at the end of S1 compare with their levels when they started secondary school?

A significant proportion of pupils will attain the next level by the end of S1 and most will make progress through the level they are working within.

Most pupils consolidate the level they started S1 at, while working within the level above. A significant minority will attain the next level by the end of S1.

We find the abilities of our pupils at the end of S1 has improved significantly from starting secondary school.

Pupils' achievement has increased, currently S1 pupils are often exposed to work beyond the expected level – no national measure of attainment used.

Suitable progression. We take account of prior levels through initial assessment and appropriate course placement. In addition to ongoing assessment by the class teacher, 5-14 assessments and our block assessments given a clear indication of retention and ability to apply skills.

What mathematical activities do you undertake jointly with your associated secondary or primary schools?

We have active learning days, teach in primaries and take part in maths challenges (local and national) together.

P7 pupils from the two main feeder primaries are taught by a maths teacher for approximately 1 hour per week for 12 weeks. The transition teacher visits all primary schools in the cluster and provides maths input.

Enterprising Maths Day – with Angus secondary schools
Peer mentoring – S6 pupils help out in the feeder primaries

Maths slot in Science Challenge Day. Transition teacher visits feeder primaries regularly. Started "big jotter" this year.

INSET Day – methodology. Mathematics in context.
Transition teacher and other staff – regular planned visits to all cluster primary schools throughout the year.

How does your S1 course allow all pupils to make appropriate progress from their earlier learning in primary school?

As with all courses, we consider prior learning and use suitable resources to develop required skills. Pace and challenge are closely monitored and regular quality assurance takes place.

Pupil attainment information from primary schools is used to inform course level in S1.

Yes.

Pupils discuss prior learning in topics; pupils stretched and challenged by the work offered to them.

3-4 week block of settling in; mixed assessment to include mastery of basic skills.
Classes are broad banded allowing clear routes of progression including formal and informal assessment which ensure that pupils are following the course which offers the appropriate pace and progression for their ability.

To what extent are you aware of the mathematical skills which pupils use in other subjects and when they are needed?

We are working closely with all faculties to develop numeracy across the curriculum and regular discussion regarding vocabulary and required skills are taking place.

This is currently being gathered.

Very aware. As a result of CfE a Numeracy Group has been set up which aims to discuss the use of Maths across the school and also to gain a more consistent approach across the school.

Beginning the process. Some informal links happening between teachers allowing us to link learning.

It is not always possible to ensure that a particular skill has been taught to all pupils in Mathematics prior to the skill being required in another subject, e.g. the level of Algebra required for S3 Physics or Technological Studies may not be taught to a pupil who has achieved Level E at the end of S2 but will be particularly accessible to a pupil who has followed an accelerated course in S1/2. It is issues such as this which are only solved through co-operation between departments. Dialogue has begun with departments which make the greatest use of numeracy skills.

The department has been involved in cross-curricular projects and the Improvement Plan includes the continuing development of a core of flipcharts to help inform the teaching of basic methods and mathematical language. Continuing to develop this further.

If you have an interactive, electronic display to what extent are you using pre-prepared lessons, selected websites and graphics packages?

Within the faculty we make use of many resources, using the Interactive Whiteboard as and when appropriate.

Regular use of powerpoint lessons and websites. Teachers prepared lessons on electronic flipcharts are often used.

On a daily basis by everyone in my department (2)

Maths staff use a variety of approaches throughout all courses, making good use of extensive sites available. Limiting factor however is TIME to share good, well structured material. There is a wealth of material but time can be wasted in finding it.

The focus needs to be on using departmental time to share appropriate material and allow time to practise using it. Limited use of Maths graphics packages such as Autograph. Is it worthwhile purchasing an Authority license for this or something similar? Require time to develop more effective sharing through use of “e-handbook”. This is vastly superior to GLOW for most of our requirements.

How do you monitor the progress of individual pupils, groups (for example the lowest attaining 20%) and classes in mathematics across all stages?

We have a programme of monitoring and tracking in place and regular contact with home for pupils who are not meeting set targets.

Regular class assessments; communicating with teachers; discussions at departmental meetings.

Through regular monitoring and tracking; use of electronic mark book to record marks; comparison with MIDYIS test results; assertive mentoring.

Use MIDYIS data; offer appropriate courses at an appropriate pace; have high expectations of lowest 20%; monitoring and tracking in place.

In what ways does Mathematics in your school currently address the capacities and principles of Curriculum for Excellence?

We are aware of the need to address these capacities and use a coherent plan of lessons providing support for development of the capacities – co-operative learning, discussion of maths, peer assessment, clear rubrics for success etc

The increasing frequency of co-operative learning strategies and cross-curricular, rich tasks are helping develop the four capacities.

Numeracy Group has been formed to discuss all aspects of CfE

Have taught S1 this year looking at Experiences and Outcomes. Co-operative learning helps address the capacities.

Prior to formal delivery of new Maths and Numeracy outcomes we are well placed to deliver the four capacities and provide the inspiration, challenge and enjoyment which is embodied in CfE.

Our main priorities remain to develop links between subjects (both for staff and pupils) and to continue the development of a wide variety of skills and approaches which staff had already begun to develop following the focus on Assessment is for Learning, Co-operative Learning strategies and the introduction of Interactive Whiteboards.

What additional support do you feel would be beneficial to you in developing Curriculum for Excellence Mathematics?

As with all curriculum development, time to develop our curriculum is the thing we most need.

Time and resources to develop lessons that involve more active learning.

More help on what assessment will look like.

Time and joined up thinking.

If Numeracy, Literacy and Health and Wellbeing are the responsibility of all teachers, we require guidance/suggestions on ways to bring Numeracy outcomes to teaching in Literacy classes (it has been relatively simple to focus on Literacy in Mathematics classes).

Appendix 2: Primary Questionnaire

HMIE Improving Achievement in Mathematics – Angus Schools Audit - Primary

Collated responses (41 of 53 schools responded)

In our school:	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**	**Comments**
• learning and teaching approaches, **at the early stages,** build effectively on pupils' pre-school experiences through active learning and planned, purposeful play	25	16			Very much in P1 and P2, not so evident in P3 Play provided in nursery rather than classroom Play areas, contextualised learning, real contexts, ICT Planning for progression
• pupils' mental calculation skills are effectively developed from the early stages onwards	21	20			One or two classes require to develop this more effectively Well planned and consolidated throughout school beginning in P1 Cannot fit in mental maths with every class every day
• learning and teaching approaches focus on developing pupils' understanding of the relationships between arithmetical processes e.g. +, -, x, ÷ and fractions, decimals and percentages	20	21			How to reflect in planning Consolidated through mental maths activities and core skills taught through relevant, meaningful contexts

• pupils' skills in problem-solving and enquiry are systematically developed	17	19	5		Again, one or two classes require to make further progress Development not systematic enough Increase in active/co-operative group activities has led to a decrease in systematic teaching of strategies via programme Programme used to support the teaching of skills and problem solving strategies, alongside relevant contexts
• pupils can use computers to organise and display information in a range of graph forms	20	*20 one tick "mid box"	*1		Scope for developing further Pupils do, but not fully across a range of forms
• pupils are **appropriately challenged** and **actively engaged in learning** when carrying out mathematical tasks	18	22	1		Need to consider appropriate planning for differentiation Pupils are actively engaged – not always appropriately challenged Challenging yes. Always room for more active learning Differentiation of learning at all stages. Active learning and active teaching, taking into account different learning styles As far as possible. Range of stages in class

• pupils are given frequent opportunities to work collaboratively on mathematics and numeracy tasks	15	25	1		Not all stages They do work together but collaborative lessons are not planned Time is the pressure here as the pressures of workload and attainment still prevail Not frequently Co-operative problem solving (Let's Think Through Maths, strategy games, play activities), use of shoulder partners
• there are well planned approaches which allow pupils to develop their skills in applying appropriate strategies to solve problems in new contexts	9	23	9		We as a school need to further problem solving to ensure consistency across all classes and stages Co-operative learning tasks, learning contexts and ICT
• there is consistency in teaching approaches, and the use of mathematical vocabulary, which ensures that pupils can effectively use their mathematics in other subjects	18	22	1		Almost! Consistency in teaching approaches. More frequent use of varied vocabulary would ensure deeper understanding No formal agreement for vocabulary In rural, same teacher for several years
• teachers' planning takes account of previous attainment and meets the needs of *all* learners	24	17			Need – planning to support differentiation

• *all* staff regularly share learning intentions with pupils in mathematics and numeracy lessons	17	23	1		Almost all classes Map of the Day I can statements Briefly at start of lesson
• in mental mathematics, pupils of *all* levels of ability are challenged appropriately	13	22	6		Again, in one or two classes greater consistency needs to be in place. Need to ensure most able pupils are appropriately challenged Differentiated questions, activities or levels of support given
• *all* teachers make appropriate use of ICT to enhance teaching and improve the quality of pupils' learning experiences	11	22	8		Not in current situation (2) 5 classes still to receive an Interactive Whiteboard Limited access to ICT – not all classrooms have whiteboards Not all Dependent on availability of resources Education City very informative

• pupils are involved in assessing their own progress and identifying the next steps in their learning	8	27	6		Need to extend involvement in next steps in learning One member of staff disagreed that next steps/ progression is usually dictated by planners/POS Not done formally This area requires to be addressed AifL strategies used at all stages PLPs Pupils are involved in assessment, but not fully in planning next steps More in middle stages
• pupils in need of extra support in mathematics use appropriate resources	17	21	3		Again, greater consistency of approach needed in this respect Support materials and equipment readily available to staff and pupils
• pupils are given regular opportunities to fully explain their answers and explore the thinking behind their answers, right or wrong, in order to improve understanding	10	28	3		Not all classes Not done regularly More so in middle and upper stages – use of peers/learning partners. Infants – as a class

• every mathematics lesson includes a review of prior learning	8	26	7		Split opinions Not every lesson (4)
• the effectiveness of class groupings in mathematics is regularly monitored, and pupils have the opportunity to move between groups	17	23	1		Need to ensure groups are reviewed frequently throughout session With such small numbers, often individual learning takes place (2) Reviewed frequently Not easy between groups
• the needs of all pupils are met through effective use of differentiated activities	22	17	2		Planning an issue Not consistent throughout the school With three or four stages together, this has always been done
• all pupils are given appropriate and regular homework	17	23	1		Concerns that several pupils, mainly P6 and P7, do not complete homework tasks Mainly P3-7
• development priorities in Mathematics have a clear focus on improving learning and teaching	22	17	2		CPD opportunities on Active Learning, PACT, CfE, Repacked Experiences and Outcomes

What mathematical activities do you undertake jointly with your associated primary or secondary schools?

Technology transition project involves mathematical problem solving
Maths Fun Day (Happy Puzzle Challenge Day)
This is in many ways window dressing. What is important is the quality of transmission and joint working, rather than a one off project.

None

Transition teacher visits regularly and planning of relevant information is assiduous

Staff from secondary maths department work with P7 classes

Transition visits by secondary staff to P7
At present, cluster uses a "common order" for tackling 5-14, i.e. POS for each level is undertaken in a specific order. I believe this would be difficult within CfE

Visiting specialist works with us for one term per session
P7 maths challenge set by sixth years for able learners
Audit of present provision – agreement with WHS as to which topics are to be covered in primary/secondary at levels E & F

Enterprise Challenge
P7 staff meet with secondary staff once a term (primary staff visit secondary and vice versa) – primary/secondary liaison builds upon dialogue and exchange visits between the two sectors. This helps support transition and tries to ensure continuity
Cross sector PACT Group

Do you use any of the following resources/approaches: Maths Bags, Number Partners, Let's Think Through Maths, PACT?
If so, please comment briefly on impact, sustainability and/or any other issues.

Maths Bags (15)
Super resource – time an issue (2)
Very useful – good resource for consolidation – gives children a chance to share their learning with parents
Good home-school link (2) – often gets dads more involved
Homework maths games very well received by parents
Quite popular to begin with but lost effectiveness further up school (small school)
Monitoring of bags coming to and from is a necessity – more manageable when others are involved (PSAs, parents)

Let's Think Through Maths (12)
Super resource for infants
Less useful than Maths Bags as it really needs extra adults in the room
Gives very good assessment of pupils' understanding
Very good – certainly develop children's problem solving skills but require our multi-stage classes to be split to ensure appropriate coverage – SFL staff

PACT (12)
Infant teacher involved and has provided a very high level of PACT resources – mirrored in many other schools at early stages to ensure active involvement
We are making use of the excellent resources available through Angus Council's On-line curricular resources
Planning to contextualise the learning has had the greatest impact on learning, enjoyment and attainment
Good practice from the PACT project has been shared within the school and across the cluster

Number Partners (11)
Parents volunteer on a weekly, timetabled basis
In P3/P4 – consolidate/reinforce learning
Introducing this with S6 pupils from Forfar Academy
S5/6 pupils from Monifieth High – helpful in supporting pupils who need extra help
Pupils enjoy the games but difficult to get business volunteers – used parents last year with varied success – P7 pupils keen at beginning but enthusiasm waned halfways through block
1 x six week block per session as an after school club – parent volunteers – 6 weeks is enough as they become bored (small school)
We participate and have devised our own method of working this system
Games are enjoyed by all and have helped develop the progress of targeted pupils

"We have all of these resources – used effectively by majority of teachers, offering a breadth of experience and challenging contexts. Some teachers still not confident in moving away from "core resources" and are anxious that children's learning will be adversely affected. I believe the main issue is short term planning and assessment."

"All of the above approaches have helped our pupils to be more enthusiastic, involved and confident towards maths with a more fun and motivating approach for pupils."

"The support of having an additional adult in class during such activities is beneficial in helping to achieve better results for pupils and teachers."

"Not familiar with any of these."

"Use of Education City to set maths homework."

How do you monitor the progress of individual pupils, groups (for example the lowest attaining 20%) and classes in mathematics across all stages?

Daily observation, discussion with pupils and review of pupils' work.
All staff discuss progress against individual targets and against the outcomes and experiences which include the repacked materials
Also monitor appropriate resources to ensure all learning and teaching is supported – shared with all staff and includes 5-14 at the moment.
Regular end of topic assessments and discussions with children
National Assessments
Liaison with ASN teacher when needed
Tracking through SEEMIS, PIPS, classroom visits, work sampling, working with groups, "attainment meetings" with individual teachers
Forward planning meetings and informally
Classroom observations and monitoring
Feedback and discussion about resources and their effective use

What additional support do you feel would be beneficial to you in developing Curriculum for Excellence Mathematics?

Exemplification
Examples of good practice
Examples of good active maths lessons
Opportunities to share good practice and resources
Opportunity to visit other establishments and share ideas
High quality exemplars of rich tasks that integrate maths appropriately
Activities which further develop staff knowledge and understanding of what is in Early, First, Second and Third level outcomes
Support materials for maths within contexts/ES themes, or context boxes to support certain areas of maths within an interesting context

Planning
Planning for contextualised maths
More guidance on long term planning
A recording format consistent across the authority
Guidance on short term planning and assessment
Advice and support on planning for progression within CfE
Help with manageable planning format for a multi-stage P1-P7 class
A form of planning which is incorporated into a whole curricular area plan (2)
Idea of what broad levels look like in practice – progressive programme of skills/concepts
A sharing of cross-curricular plans across the authority in order to generate ideas/show what is possible
Good quality record keeping, tracking and planning proformas – If we want to develop more cross-curricular work, personal choice, collaborative working etc, then we need a good, concise, manageable way to record pupils' achievements/learning
Guidance and strategies to support with developing a planning format that allow class teachers to monitor and track pupil progress at each stage

Forward planning/record of what children have done to hand on to next teacher. It has proved difficult to move away from the structured programme of study for a number of reasons. I feel that after some schools manage this successfully, as they hand classes on at the end of the session they should be able to show the rest of us how it was done!

Assessment
How to assess active maths
Guidance on formative assessment would be helpful

Resources/training
More cluster based CPD
Further support for high fliers
Dependent on next session's staffing
More training in IT, especially whiteboards
Additional Early Intervention time in early years
A bank of ICT resources with **EASY** accessibility
Review of approaches and activities for problem solving
Financial assistance to purchase extra maths resources
Topic style boxes with multiple resources for practical materials
Support with compiling new programmes and identifying resources
More staff, finance and resources, particularly ones to promote active learning
Real time and opportunity to look at the Repacked Maths Experiences and Outcomes in detail
Time – to create resources, check websites etc for interesting and motivating support material
To continue to develop the role of the cluster PACT Group in order to help support the schools address the new outcomes
More In-service training – practical advice and guidelines in managing the transfer/advice on timings in moving from 5-14 levels to CfE outcomes

Appendix 3: Numeracy Learning and Teaching Audit

In your current practice, how well do you……..

Learning and Teaching Approaches	Description of Current Good Practice	Next Steps	CPD and/or Resource Needs
Plan ***active learning*** which provides opportunities for young people to observe, explore, investigate, experiment, play, discuss and reflect?			
Provide rich, open ended tasks which develop problem solving capabilities and promote critical thinking?			
Allow young people opportunities to *explain* their thinking?			
Use meaningful contexts and experiences, familiar to young people?			
Provide opportunities for young people to learn both collaboratively and independently?			

Develop mental agility?			
Make links across the curriculum so that concepts and skills are reinforced and developed further?			
Use technology in appropriate and effective ways, to *enhance* learning and teaching?			
Take account of, and build on, prior learning?			
Ensure that young people understand the *purpose* and *relevance* of what they are learning?			
Share learning intentions and negotiate success criteria with young people?			

Use questioning to engage young people, check knowledge and understanding and scaffold thinking?			
Provide opportunities for young people to engage in self and peer assessment?			
Include a quality plenary session in which young people are given the opportunity to review and share their learning?			
Provide quality feedback to young people, and support them in identifying and planning their next steps?			