

Case study: mathematics in primary school



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During a child's early years it is vital to develop the cognitive and social skills that will allow them to generate a foundation of knowledge and a basic set of skills for learning, which can be applied and developed throughout the rest of their schooling and adult life. This begins with the parental and familial influence on the child and progresses through their Primary School years and interaction with teachers and peers. Communication between parents, teacher and child are therefore of vital importance. Without these ingredients, a child may not achieve their full potential.

For the reasons noted above it is necessary to ensure that the mathematical ability of young pupils is well established in the early years setting. A number of recommendations which have implications for pupils and Early Years practitioners are made in the Williams report and will be reviewed below.

The impact of parental influence on the developing child is immeasurable. As such it is critical to ensure that the mathematical ability of, and teaching method used by parents is sufficient to understand and teach their child in a way which is relevant to the current syllabus (parents mathematical skills may be weak or outdated). It is also important for parents to encourage positivity towards mathematics – this is only possible if they are confident with mathematics themselves. Provision of programmes, such as Sure Start, Effective Provision of Pre-School Education and the work of Parent Support Advisors, aim to achieve this and should continue to receive funding to break the continuing cycle of negativity towards mathematics.

It is the responsibility of the Early Years teacher, with specific regard to mathematics, to:

- Form effective bonds with pupils to affect their learning (one of the key features of Early Years Foundation Stage).
- Treat the child as a unique individual and adapt pedagogy accordingly, creating an enabling environment for all pupils.
- Generate interest in the subject matter.
- Provide basic skills in the core mathematical operations. It is suggested that learning goals should be expanded to include time and capacity. This seems a logical expansion of the core mathematical concepts and will allow for accelerated understanding of the more difficult concepts.
- Challenge the pupil and generate progression of knowledge, thinking skills and learning methods. However, the child must not be overloaded.
- Assess progress or lack thereof (allowing generation of the child's Individual Education Plan), provide intervention if necessary, supervise the intervention and correctly assess and acknowledge progress.
- Involve parents in the child's learning process and provide feedback, especially if the child needs extra support. This can bring the child's ability in-line with peers and prevent the child from falling behind. This is also important in the converse scenario; it is important to challenge a gifted pupil. Parents can be influential here.
- Assist in the generation of a positive attitude towards Mathematics for pupil and parent(s)/guardian(s).
- Ensure that the child's confidence is maintained and therefore retain the child's appetite for new learning.

Therefore it is vital that teachers develop an effective pedagogy. This process begins with the development of teaching strategies through Initial Teacher Training (ITT) and is enhanced through continuous professional development (CPD). The application of effective pedagogy includes focusing learning appropriately (with guidance from the syllabus), creating realistic yet challenging and tailored educational aims, implementing a well honed teaching technique to achieve educational aims, supported by sufficient subject knowledge. Provision of quality teaching shares a linear relationship with the mean qualification level of all staff. Consequently it is suggested that the “DCSF continues to increase the proportion of graduate practitioners in early years settings recognising the respective contributions of the Qualified Teacher”. This provides further support for the direction of all staff toward CPD which should be tailored around children’s understanding of mathematical concepts and ways of learning.

Effective Early Years mathematical pedagogy must support children in developing new skills, generating the ability to understand and analyse mathematical concepts, and eventually to evaluate and apply those concepts to problem solving tasks. The learning environment should make mathematics less stressful from an early age. With Early Years pupils in mind it is important to utilise play and daily routines to generate interest in numeracy and mathematical problem solving. Simple activities can carry a mathematical concept such as division by sharing, addition/subtraction in weighing activities, assessing shape etc. To continue the cycle, mathematical exercises must be fun to retain the child’s interest and expand

confidence. Involving peers in problem solving tasks expands social skills and provides partners for discussion whilst knowledge is improved.

The head teacher and management team should prioritise and manage professional development opportunities to develop subject knowledge and pedagogy, through learning, coaching and mentoring initiatives for all staff members. It must be ensured that this is not detrimental to contact time. Williams' review would encourage the inclusion of a mathematics component in the CPD programme for head teachers themselves.

The head teacher must manage resources in-line with the advice of the management team regarding finance available for manpower and learning aids. It is appropriate for the head teacher to appoint subject leaders who become subject specialists, capable of training and supporting other teachers. Ultimately the head teacher and management team are responsible for demonstrating and coaching good practice to their staff. The head teacher should encourage their staff to deliver the curriculum content to emphasis connections between various mathematical concepts.

It is important to note that mathematical concepts and the analysis and evaluation of these concepts cannot occur in the absence of English language skills. Pupils and teacher must be comfortable with mathematical language. Problems with language can cause a cyclical reduction of confidence which generates a lack of motivation and ultimately lack of progress.

If the child does experience a difficulty in either numeracy or literacy, some form of intervention should be utilised to raise the attainment level of the

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child. This can be one of three waves of intervention based within the Primary National Strategy. The three waves are of increasing intensity and correlate largely with the group size requiring intervention.

The 'Every Child Counts' programme is delivered during wave 3 intervention and targets year 2 pupils who are not expected to achieve expected levels of attainment by the end of Key Stage 1. Currently in its second year of development, for national application in 2010-11, Every Child Counts aims to "develop a highly effective numeracy intervention for young children with the greatest difficulties in mathematics" ([http://www.](http://www.everychildachancetrust.org/counts/index.cfm)

[everychildachancetrust.org/counts/index.cfm](http://www.everychildachancetrust.org/counts/index.cfm)). In support of this aim, Every Child Counts provides training and support for teachers. However, teachers must ensure that their CPD targets allow them to effectively deliver any intervention which they deem necessary for the pupils in their care.

Understanding intervention, when it is necessary and its importance should be included within the content of ITT – understanding of these factors in the early part of a teacher's career allows them to apply the principles during delivery of high quality teaching tailored to each child on a daily basis (rather than as purely remedial action).

As noted earlier, the child's familial and social situation impact upon their education. As such, the Every Child Counts programme is developed in line with the Every Child a Chance Trust which aims to maximise the achievement of children from socially disadvantaged groups. However, it is important to note that wave 3 intervention delivered through the Every Child Counts scheme is targeted at the 5% lowest attaining pupils nationally, not the lowest 5% in each school. This decision has to be based upon time and

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resources, the availability of specialists to deliver the intervention and costs of the aforementioned – it is impossible to provide intervention for all.

Unfortunately this leaves a number of pupils without the support they need.

As such it must be a long-term target to provide intervention for more children to prevent disadvantaging one over another.

According to the Williams' report, wave 1 intervention involves “ quality first teaching in a daily mathematics lesson”. This suggests that quality teaching of mathematics is provided only when remedial action becomes necessary, perhaps this is due to a lack of confidence of the teacher with mathematics.

Regardless of the specific reason for this assertion, it has implications for teachers and trainee teachers. ITT and CPD courses must also ensure that their mathematical ability, and confidence with mathematics, is high.

Furthermore, it is suggested that a Mathematics Specialist is employed to ensure delivery of high quality teaching in mathematics through support of teachers and assistance with intensive wave three interventions.

Any intervention technique/programme has a number of essential components/considerations; (i) assessment, (ii) timing, (iii) duration, (iv) withdrawal from regular schooling, (v) group size, (vi) the intervention leader, (vii) intervention resources and (viii) parents. It is critical to continually monitor the progress of all pupils (in comparison with peers and themselves) in order to accurately assess the need for intervention. The assessment phase should highlight goals for and the likely timing of the intervention based on attainment, without negative impact upon the child's confidence in their achievements or ability. Continual assessment through the programme will update the duration of the intervention (determined

during assessment. It is suggested that implementation of Every Child Counts is appropriate in Year 2 is timely and practical and will appropriately limit the pressure on Year 1 teachers and pupils.

The supportive and corrective intervention programme must not be detrimental to, the need for the pupil to continue learning in other subjects. The intervention must also prevent isolation from peers. Wave 2 intervention is often able to ensure that pupils are brought ' up-to-speed' with the rest of the class whilst receiving the remedial action they require. With this in mind, it is also important to consider the group size used in any intervention. As noted by Dowker's review of the research conducted by Denvir and Brown (1986b), " pupils are more relaxed and positive when taught in a group but can often be distracted by others". This has been reflected in the research phase of Every Child Counts. The head teacher and staff must collaborate on the choice to stream children to support the provision of teaching which stretches all pupils.

It becomes more difficult to tailor the intervention activities to the unique needs of each child if they are provided in a group session. Progress assessments can also become difficult if the child ' hides' during comprehension activities. It is therefore necessary to balance the benefits against the consequences of group based intervention.

The intervention leader and resources needed must be selected according to the level of support required to sufficiently increase attainment; delivery can be undertaken by the class teacher, teaching assistant, Mathematics Specialist (as suggested by Williams) or parents. Cost factors must also be

considered, for example, it is more economical for a teaching assistant to deliver a group intervention than a highly qualified teacher or specialist to deliver one-to-one intervention. It is important to ensure that parents understand and are committed to the intervention and provide learning support at home.

It is important for the head teacher to allocate time to assess progress of Year 2 pupils with teachers throughout the year allowing them to plan and manage the timetabling and allocation of/need for resources, including intervention resources.

To summarise, best practice in teaching mathematics gives children an understanding and appreciation of mathematics. This requires an effective pedagogy which generates progression of knowledge and understanding. The teacher must be confident, inventive and possess excellent communication skills. ITT is central to developing these skills which should be supported by subject-specific Specialists and CPD programmes provided by the Head teacher. Quality teaching and Intervention programmes such as Every Child Counts must be regarded as an investment in a child's abilities at an early stage to allow them to contribute positively to the economy in adult life. The head teacher and management team must consider the suggestion to employ and manage a Mathematics Specialist and recruit staff who can deliver effective teaching in collaboration with TAs and parents.

Work referenced: [http://www. everychildachancetrust. org/counts/index. cfm](http://www.everychildachancetrust.org/counts/index.cfm)
accessed on 30 August 2010

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