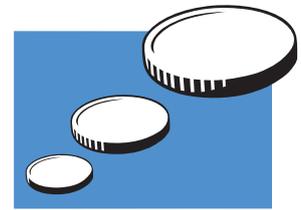


# Count me in



New  
Philanthropy  
Capital

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Esther Paterson  
Eleanor Stringer  
Belinda Vernon

## Improving numeracy in England

A guide for charities and funders



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This report has been supported by The Rayne Foundation, The Clothworkers' Foundation, John Lyon's Charity, Man Group plc Charitable Trust, and John Griffith-Jones, KPMG Chairman.

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# Summary

Imagine not being able to add up or take away. You might find yourself struggling to get a job, to manage your money, and to help your children with their homework. You might also have low confidence and self-esteem.

Unfortunately, this is the reality for millions of children and adults in England today. A fifth of children leave primary school without passing the maths test at the level expected of them, and a fifth of adults do not have the basic numeracy skills needed for everyday life.

The association between poor numeracy and other negative outcomes is striking. People who struggle with numbers are twice as likely to be excluded from school and twice as likely to be unemployed as those who are competent at numeracy. Two thirds of young people in custody have numeracy skills at or below the level expected of an 11 year old.

There is also a widespread negative attitude towards numbers in the UK, which is a major barrier to improving skills. People are happy to admit if they dislike maths and struggle with it, in a way that is more acceptable than admitting to having problems with reading or writing. What is more, numeracy is not given the same attention as literacy, and there is no national organisation to coordinate or raise the profile of numeracy interventions.

## Improving numeracy

Poor numeracy has a damaging effect on many people's lives and, potentially, on the wider economy. Any approach to improve numeracy must influence people's attitudes and behaviour, as well as their skills. This means it needs to be practical, engaging and interesting.

Improving numeracy skills is best done young—all children should get excellent classroom teaching, and those who are struggling should get targeted support as soon as possible.

But most of the population is no longer at school, so it is also important to look at adult numeracy too. Adults who struggle with numbers face some barriers that children may not have, such as a dislike of classroom-based teaching or very low self-esteem. So there are two important priorities for adult education. Firstly, people need to be motivated to learn in

the first place. Secondly, they need to be taught useful skills that are embedded in a relevant context.

## The role of government

Over the past decade, there has been a growing policy focus on raising the numeracy standards of children and adults, both to improve people's lives and to increase the supply of people with the job skills that are needed in our post-industrial society.

For younger children, the government has implemented initiatives to boost the quality and number of maths teachers and to provide additional support to those who are struggling. However, when children start secondary school, the change in maths teaching that they face can end up putting them off numbers for life.

The government also provides many courses for adults to boost their numeracy skills. This has increased the number of adults with qualifications, but there is still much more to be done.

Some initiatives have had a demonstrable impact and have raised the profile of numeracy as an issue. But the effectiveness of other initiatives is harder to evaluate, and a focus on qualifications and test results means that the government's evidence on impact may not tell the whole story.

What is more, there is no overarching strategy to improve teaching, attitudes and skills across all the different age groups in a coordinated way. A concerted, joined-up effort is needed if standards are to be raised across the whole population.

## The role of charities

Few charities focus on numeracy, and where they do, the work is fragmented across many different organisations, with little coordination.

Some charities have been highly successful in developing approaches to boost the skills of children who are really struggling, but many are limited to operating at a local level, only scraping the surface of the problem.

Charities are not responsible for providing mainstream teaching to children or adults, but they do play a vital role in this field. They can help to improve attitudes towards numeracy, develop

innovative ways of helping people to learn, supplement the efforts of teachers through volunteers, or lobby the government to improve the situation.

## What can funders do?

Charities have an important role to play, but there are few charitable initiatives that funders can choose to support, and even fewer that are likely to bring about the step change in the level of numeracy skills we need. Nevertheless, there are gaps where charitable funding could make a real difference. Funders could help to:

- **Create innovative ways to teach numeracy to secondary school pupils and adults**, to match the good progress that has been made with primary school children.
- **Change attitudes and behaviours**, motivating people to improve their numeracy skills, and making it no longer acceptable to say, 'I can't do numbers.'
- **Build a stronger and more coherent lobbying voice**, to keep numeracy high on the government agenda, coordinate initiatives for different age groups, and share best practice.
- **Support targeted and local interventions**, so that charities can measure their results and demonstrate the difference they make. This may enable successful charities to scale up and increase their impact.

The greatest need is for a national campaigning voice and coordinating body focused on improving the numeracy of children and adults. Supporting the recommendations above, funders could help to **build a new National Numeracy Trust**, following in the footsteps of the National Literacy Trust. This new organisation could lobby government, hold government to account, and take on the challenge of changing attitudes towards numbers.

It is misleading to think there has ever been a 'golden age' when children and adults were adequately equipped with the level of numeracy required by employers. Leaving it up to government is not enough, and charities need to play a greater role to reduce the number of people who suffer the consequences of very poor levels of numeracy.



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# Introduction

This report is about numeracy, and how charities and funders can help people to become confidently numerate. By numeracy, we do not just mean the ability to calculate; we also mean the ability to understand when and how to use basic maths skills. Numeracy is not a set of rules about how to add or divide, but is a way of approaching and solving a problem with numbers and symbols.

## The purpose and scope of this report

This report examines the role charities and funders can play in raising numeracy standards. We are interested in numeracy because, despite its low profile in the charity sector, it is an important life skill, affecting people's chances of getting good qualifications and jobs.

Our focus is on tackling disadvantage, so this report is about helping those with very poor numeracy skills, rather than, for example, increasing the number of pupils taking A-level mathematics.

We look at the role of charities in improving both children's and adults' numeracy skills. In order to keep the policy discussions straightforward, we focus on England, although most of the lessons also apply to the rest of the UK.

This report is aimed at anybody interested in numeracy and the charity sector's role in improving it. It does not go into much academic detail about issues that have been written about elsewhere, such as educational psychology, and it is not a critique of government education policy. Instead, it provides an overview of the situation, and offers an analysis of what more can be done.

## Structure

**Chapter 1** discusses what numeracy is, looks at how numerate the English population is, and explores some of the causes of poor numeracy.

**Chapter 2** looks at ways of improving numeracy.

**Chapter 3** provides an overview of the government's recent efforts to raise numeracy standards, and the progress it has made.

**Chapter 4** discusses what charities are doing to improve numeracy, and outlines other roles that they could play.

**Chapter 5** outlines priorities for funders, including the idea of creating a new National Numeracy Trust.

## About NPC

New Philanthropy Capital (NPC) is a charity think tank and consultancy dedicated to helping funders and charities to achieve a greater impact.

We provide independent research, tools and advice for donors and charities, and shape the debate about what makes charities effective. We have an ambitious vision: to create a world in which charities and their funders are as effective as possible in changing people's lives and in tackling social problems. For charities, this means measuring the results of their work and using evidence to learn and improve, as well as to attract support. For funders, it means using evidence of charities' results to make funding decisions and to measure their own impact.

To date, we have published over 60 reports on a wide range of social welfare and voluntary sector issues, from education and mental health to social campaigning and funding practice. For further information about NPC, and to download our reports and analysis, go to [www.philanthropycapital.org](http://www.philanthropycapital.org).

## Funding

A group of funders, led by The Rayne Foundation, have come together to commission this research. They have supported it because they are concerned about the proportion of people who struggle with numeracy, and want to understand what charitable funders could do to improve the situation.



Photo supplied by Tower Hamlets Education Business Partnership.

# What is the problem?

**How often do you use numbers in your life? If your work involves managing budgets, you probably use numbers a lot. If you are a designer or a plumber, you may be used to working out measurements and calculations. But numeracy is important even for people who have a less obvious need. Being able to manipulate numbers and make calculations are crucial skills. Without them, people can feel embarrassed and ignorant, unable to make sense of everyday information, to progress in their work, or to help their children with homework.**

**Poor numeracy has been associated with school exclusions, truancy, crime, and other social, emotional and behavioural difficulties. For example, people with poor numeracy skills are more than twice as likely to be unemployed as those who are competent at numeracy.**

**Yet poor numeracy is all too common in the UK—around a fifth of adults do not even have basic numeracy skills—and there is a widespread negative attitude towards numbers. People are happy to admit if they dislike maths and struggle with it. But this is a barrier to improving skills, so changing attitudes towards maths and numeracy is crucial.**

## What is numeracy?

Numeracy means many different things to different people. Some see numeracy as the foundation of **mathematics**, the concepts that you learn in school that are necessary for understanding more advanced mathematics, such as quadratic equations, statistical analysis and calculus. Some see numeracy purely as the ability to perform simple number **calculations**, and therefore as a subset of wider mathematics. Others—including the government when discussing adult numeracy—define it in terms of its purpose or its **function**: numeracy skills are those you need to do a job (for example, using spreadsheets, calculating invoices) and to be an engaged citizen in the modern world (for example, making sense of statistics reported in the media).

This report uses the following definition of numeracy:<sup>3</sup>

*'To be numerate means to be competent, confident, and comfortable with one's judgements on whether to use mathematics in a particular situation and if so, what mathematics to use, how to do it, what degree of accuracy is appropriate, and what the answer means in relation to the context.'*

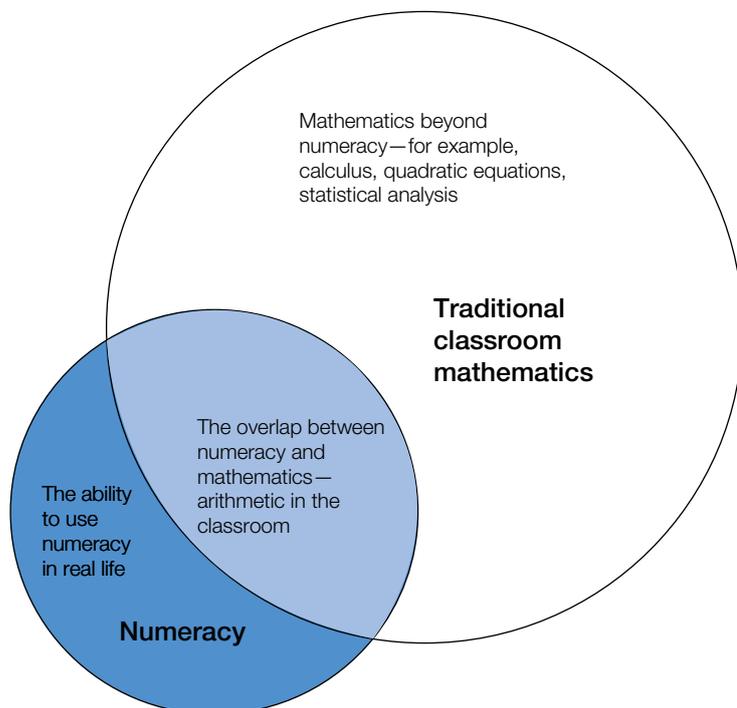
This description includes essential skills such as solving problems, making decision and interpreting data, rather than just computation. As well as being able to add up, people need to be able to process information and use reason to solve problems.

Our concept of numeracy is represented in Figure 1. Numeracy does overlap significantly with a subsection of what is taught in classroom mathematics, but it also includes a skill that is often not taught in schools: the ability to use numbers in real life.

But the numeracy that we describe is not purely what is taught in schools (mathematics) or in adult education colleges ('functional' numeracy). This means that school and college exams test different types of skills and knowledge, and these differ again from the numeracy that adults actually use in their lives.

Our definition has many implications for addressing the problem of poor numeracy. For example, it implies that 'rote learning' can only get you so far—it may teach pupils to memorise facts, but not how to use them. A good numeracy teacher may be very different to the traditional caricature of a mathematics teacher who leads a class in chanting times tables. But it is difficult to assess what a good numeracy teacher looks like: the ability to teach quadratic equations to 14 year olds is very different to teaching unemployed adults how to understand percentages.

Figure 1: Numeracy and mathematics



One in three adults cannot calculate the area of a room that is 21 by 14 feet, even with the aid of a calculator.

### What this means for charities and funders

The different meanings of ‘numeracy’ and ‘mathematics’ have implications for what charities do and how they assess their work. A community centre that already has a maths homework club for children may not want to use the same teacher to start a new course for adults with low numeracy skills. And while lobbying for better mathematics teaching could be tested by improved GCSE results, working to improve adults’ real life numeracy skills is much harder to assess.

### How numerate is the UK?

A 1999 government-commissioned review of adult basic skills gives some useful examples of numeracy standards in England:<sup>4</sup>

- One in three adults cannot calculate the area of a room that is 21 by 14 feet, even with the aid of a calculator.
- One in four adults cannot calculate the change they should get out of £2 when they buy the goods displayed in Figure 2.

Box 1 gives another example of poor adult numeracy, with a Lottery scratch card being withdrawn because players could not work out whether they had won or not.

We also have data on how good children and adults are at passing mathematics exams but,

Figure 2: The cost of groceries



as discussed above, this does not necessarily correspond directly to their numeracy ability. With this caveat in mind:

- **Primary school:** In the summer of 2009, 21% of 11 year olds in England left primary school without passing the mathematics test at the level expected of them, and 5% failed even to achieve the level expected of a seven year old.<sup>5</sup>
- **GCSEs:** In 2009, 43% of pupils in England failed to achieve an A\*-C grade at GCSE mathematics. Much more worryingly, 8% did not even get a grade D-G.<sup>6</sup>
- **Adults:** A government survey of adult skills in 2002/2003 found that a fifth of adults in England (6.8 million people) possessed numeracy skills below what the government believes is the basic level needed for everyday situations.<sup>7</sup> A further 17 million adults had numeracy levels lower than the equivalent of a low level GCSE. Problems with numeracy were more common than problems with literacy.

Given our interest in the wider concept of numeracy, the results of maths exams should not be the only indicator of numeracy levels. Most academic exams test a narrow concept of what numeracy is and how it should be done. People may fail at such tests, but be able to do numerical tasks in their own way.

For example, one research project compared different ways of working out deals in a supermarket, where shoppers had to calculate which of two goods was better value. Some shoppers were given the task as a theoretical exercise, with pen and paper, and only 44% got it right. Other shoppers were asked which products were best buys while they were doing their normal grocery shopping, and 93% of this group got it right.<sup>8</sup>

Other people may pass maths exams, but be unable to use the skills outside the classroom. The government survey of adults found that nearly a quarter of people with a good level of mathematics education (to O Level or GCSE) were classified as having low numeracy skills.<sup>7</sup> Ofsted, the statutory inspectorate of schools and children’s services in England, published a report in 2008 assessing the teaching of mathematics in schools. It concluded that there was too much ‘teaching to the test’ and not enough emphasis on helping pupils to understand, and be able to apply, their skills:<sup>9</sup>

*‘Too often, pupils are expected to remember methods, rules and facts without grasping the underpinning concepts, making connections with earlier learning and other topics, and making sense of the mathematics so that they can use it independently.’*

**Box 1: Win or lose?**

In 2007, Camelot had to withdraw a Lottery scratch card because players could not work out whether they had won or not. As reported in the Manchester Evening News:<sup>2</sup>

*'To qualify for a prize, users had to scratch away a window to reveal a temperature lower than the figure displayed on each card. As the game had a winter theme, the temperature was usually below freezing.*

*But the concept of comparing negative numbers proved too difficult for some. Camelot received dozens of complaints on the first day from players who could not understand how, for example, -5 is higher than -6.*

*Tina Farrell, from Levenshulme, called Camelot after failing to win with several cards.*

*The 23 year old, who said she had left school without a maths GCSE, said: "On one of my cards it said I had to find temperatures lower than -8. The numbers I uncovered were -6 and -7 so I thought I had won, and so did the woman in the shop. But when she scanned the card the machine said I hadn't.*

*"I phoned Camelot and they fobbed me off with some story that -6 is higher, not lower, than -8 but I'm not having it."*

Other evidence of low numeracy skills comes from employers. A long-standing complaint of businesses is that people are leaving schools without adequate basic skills. The Confederation of British Industry reports that 39% of employers are concerned about employees' basic numeracy skills.<sup>10</sup> As a senior executive from a major fast food retailer reported:<sup>10</sup>

*'On the odd occasion, I have seen crew members completely thrown if a customer hands over a one pound for a 99p item and the employee rings up £10 by mistake. When the till shows that £9.01 change is due, I have even seen that amount handed over, the crew member not realising that there is anything amiss.'*

### How England compares with other countries

Given the difficulties of pinning down the concept of numeracy and of assessing standards, it is hard to say how well England performs compared with other countries across all age groups.

The Trends in Mathematics and Science Study (TIMSS) is a regular survey designed to compare international mathematics standards. Tests are sat by a sample of 425,000 students across 59 countries.<sup>11</sup> This attempt to compare mathematical skills on an international level has found that English children perform relatively well compared with those in other countries.

In the 2007 TIMSS survey, England came seventh in primary and secondary mathematics. English children in primary schools have shown a particularly big

improvement since the initial TIMSS survey in 1995 (the largest improvement of all countries surveyed). The results of the survey are very encouraging and may be a reflection of the success of government initiatives. However, the tests are designed to assess what students have been taught in school about mathematics, so the results may not be an accurate reflection of their ability to apply the skills in real life.

Comparisons of adult numeracy skills are less comprehensive and frequent, but paint a gloomy picture, and should warn against any complacency when looking at numeracy levels of children. For example:

- In a 1997 study by the OECD (Organisation for Economic Co-operation and Development), Britain came 11th out of 13 countries in terms of adult numeracy and literacy skills, beating only Poland and Ireland.<sup>4</sup>
- The then Basic Skills Agency (a government body) commissioned research in 1996 to compare numeracy skills across seven countries. In the UK, 13% of people refused outright even to attempt the questions, compared with 0–6% in other countries. The UK also had the lowest percentage of people answering correctly.<sup>1</sup>

### What causes poor numeracy?

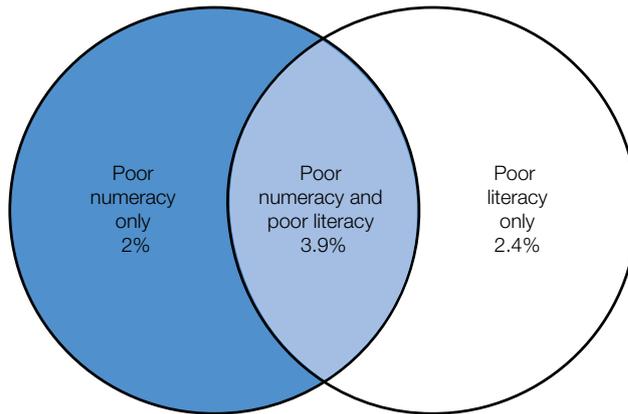
#### Difficulties with learning

Even though mathematics is often viewed as particularly difficult, it is not clear that it is 'uniquely incomprehensible'—at least at primary school.<sup>12</sup> So it is unsurprising that there is an overlap between those who struggle with numeracy and those who have problems with other aspects of education.

Is there anywhere else in the world where it is actually acceptable, actually cool ... to admit to your peers that you can't do mathematics and you can't do basic arithmetic?

Dame Julia Higgins,  
Chair of the Advisory  
Committee on  
Mathematics  
Education

**Figure 3: The percentage of children leaving primary school, failing to reach level 3 (the level of an average seven or eight year old) in Key Stage 2 tests<sup>14</sup>**



For example, language problems or memory difficulties will hinder a person’s ability to understand and learn how to manipulate numbers.<sup>13</sup> Also, 3.9% of children leave primary school with poor maths and English skills, failing to reach the level of an average seven or eight year old in both subjects (see Figure 3).<sup>14</sup>

However, mathematical difficulties are not always connected with other difficulties—2% of children who left primary school in 2005 really struggled with maths, but performed reasonably in English tests.<sup>14</sup> Some educational experts believe that a small percentage of people have a particular problem with number concepts. Box 2 discusses the condition of ‘dyscalculia’.

**Home life and social background**

Those tackling numeracy problems must be aware that numeracy interventions might fail if a child’s numeracy problems are caused not by a difficulty in learning, but by other factors. As one expert put it: ‘I’ve worked with children where

*clearly what they needed wasn’t a numeracy intervention, but to have their complicated home lives sorted out.*’ It is important that all children who are struggling at school, whether with numeracy or literacy, are given support for the other difficulties they may have, such as their home life or their confidence in their ability to learn.

Social background is a large predictor of people’s educational achievement. In maths as in English, poorly-performing children are more likely to be from socially and economically disadvantaged backgrounds (although it is important to note that while disadvantaged children are over-represented, there are children from a range of backgrounds who struggle with mathematics).<sup>13</sup> The same is true for adults, whose numeracy skills tend to be lower in deprived areas.<sup>7</sup> This is a common finding, and shows the influence that home life and parental education have on how well children perform at school.

**Box 2: Dyscalculia**

Many people struggle with numeracy, but some educational experts think that a small proportion of people may have particular difficulties, akin to the problems dyslexic people experience with trying to read and spell.

‘Dyscalculia’ was formally recognised by the government as a learning disability in 2001, and is described as ‘a condition that affects the ability to acquire arithmetical skills. Dyscalculic learners may have difficulty understanding simple number concept, lack an intuitive grasp of numbers, and have problems learning number facts and procedures. Even if they produce a correct answer, or use a correct method, they may do so mechanically and without confidence.’<sup>15</sup>

The nature of the problem is not clear, but a test for it has been developed, and the proportion of people with dyscalculia is estimated to be around 6%.<sup>13</sup>

There is some controversy in the mathematics education field about the nature and existence of the condition, and what impact it should have on how we teach numbers. There is a fear that an acceptance of the existence of such a condition risks suggesting that some children have insurmountable difficulties with learning to use numbers. Instead, it is probably best to assume that dyscalculia is a scale, and that therefore all children who struggle with numbers have such a condition to some extent.<sup>16</sup> Efforts should be focused on how to help those children who are falling behind, rather than trying to define or label them.

This has implications for how numeracy should be prioritised by schools, colleges, the government and charities. For example, children need to be able to read and write well in order to learn how to work with numbers, so it is important that literacy is prioritised in children's first years at school.

### Issues of gender

There is some evidence to support the view that girls and women have more difficulties with numeracy than men. For example, a survey of adult skills showed that men have higher levels of numeracy than women, even when controlling for differences in education and employment.<sup>7</sup> However, the gender difference is not a result of differences in ability or potential, but a result of attitudes and how mathematics is taught in schools. And the view that girls struggle more with maths, or that maths is more of a subject for boys, may be self-fulfilling: it could affect how teachers respond to pupils, thereby making girls feel less confident.

There is also an argument that girls (generally) do not learn as well as boys in lessons based on abstract logic and competition (which mathematics lessons traditionally tend to be); they do best in classroom environments based on problem solving and group work.<sup>17</sup> For this reason, girls have always benefited from the coursework element of GCSE mathematics—this allows them to use skills that boys tend to be worse at, such as planning and conscientiousness. Consequently, girls have traditionally performed slightly better than boys in mathematics at GCSE level. When the coursework element of the exam was removed in 2009, they fell behind boys for the first time in years.<sup>18</sup>

### Negative attitudes

There seems to be a widespread acceptance of difficulties with and a dislike of numbers. This is a great concern to all of the numeracy experts we met with, who think it is a problem peculiar to English-speaking countries, particularly when compared to countries in East Asia.

Experts are concerned that this negative attitude is a partial cause of poor numeracy skills, because it affects teachers' and pupils' enthusiasm for the subject and incentive to learn. But it is also a consequence of poor numeracy skills—if people struggle with a subject, it is likely that they will profess a dislike of it. As Sir Peter Williams wrote in his review of mathematics teaching in primary schools:

*'The UK is still one of the few advanced nations where it is socially acceptable—fashionable, even—to profess an inability to cope with the subject.'*<sup>12</sup>

This may not mean that adults actually think it is acceptable to be poor at mathematics. Rather, market research for the government has found that people tend to be embarrassed by their inabilities, but fear and a lack of confidence keep them from participating in numeracy courses.<sup>19</sup>

One particularly damaging attitude is that numbers are something that you are either good or bad at, rather than a skill that you can improve. Maths is seen as something that only 'clever' people can do. This means that some people are reluctant to make the effort to improve their skills.

Negative attitudes are also a problem because they are passed on: if teachers and parents are scared of or dislike maths, or perpetuate the idea that some people are simply 'bad' at it, this will affect how their pupils and children feel about mathematics. This can make it much more difficult to raise standards. Changing attitudes is therefore crucial if there is to be a sustainable improvement in numeracy skills.

On a positive note, children are not born with a negative attitude towards numeracy: primary school pupils often enjoy maths, which at this stage is mostly about numbers and shapes. But something seems to happen at secondary school that results in many pupils losing motivation and interest. Experts we spoke with suggested several reasons for this: for example, secondary school teaching is often much more abstract and less hands-on than in primary school, which makes things more difficult for those who struggle with maths. And those who were coping well at primary school may find that secondary school classes are initially very easy and perhaps uninteresting, as teachers try to ensure that everyone is keeping up.

### Why does numeracy matter?

The impact of poor numeracy on people's lives is much less self-evident than not being able to read or write. But there is substantial evidence that low numeracy skills are associated with poor outcomes for many people, which has a negative impact on them and their families. The government also worries about the effects on the economy and society as a whole.

Poor numeracy is a problem in its own right. People who struggle to use numbers may feel embarrassed about it, and it can affect their confidence and self-esteem. They may be unable to help their children with their maths homework, and be held back from putting themselves forward for demanding jobs. They may struggle to manage their money or to get the best deals when shopping.

‘The UK is still one of the few advanced nations where it is socially acceptable—fashionable, even—to profess an inability to cope with [maths].’

Sir Peter Williams

People with poor numeracy skills are more than twice as likely to be unemployed as those who are competent at numeracy.

A quarter of young people in custody have a numeracy age below that expected of a seven year old.

Poor numeracy can affect individuals' ability to succeed in the workplace, and is thought to be a brake on the country's economic growth as a whole.

Numeracy also seems to be linked to many other issues, but it is difficult to show that poor numeracy causes other problems, rather than just being associated with other factors that result in poor outcomes later in life. For example, people with poor literacy and numeracy skills often have a relatively disadvantaged home life when growing up, and it is likely that this background is an underlying cause both of poor numeracy and of other problems that may occur later in life.<sup>20</sup>

Yet the association between poor numeracy and other negative outcomes is striking. For example, people with poor numeracy skills are more than twice as likely to be unemployed as those who are competent at numeracy. And people with poor numeracy but competent literacy skills are just as likely to have left school at 16 as those with both poor numeracy and literacy skills, implying that numeracy alone plays a crucial role in influencing when a person leaves school.<sup>21</sup> Numeracy problems are also associated with:

- **Social, emotional and behavioural difficulties:** Children with these difficulties are more likely to struggle with numeracy, even when taking into account other factors, such as home background and general ability.<sup>14</sup>
- **School exclusions:** Data from the Department for Children, Schools and Families shows that pupils beginning secondary school with very low numeracy skills but good literacy skills have an exclusion rate twice that of pupils starting secondary school with good numeracy skills.<sup>14</sup>
- **Truancy:** 14-year-old pupils who had poor mathematics skills at 11 are more than twice as likely to play truant as those achieving the expected skills at 11.<sup>14</sup> As NPC has discussed elsewhere, truancy and exclusion have significant costs for society.<sup>22</sup>
- **Crime:** A quarter of young people in custody have a numeracy age below that expected of a seven year old, and assessments of prisoners found that 65% have numeracy skills at or below the level expected of an 11 year old.<sup>23</sup>

This is not to say that all people with poor numeracy have such problems, or that poor numeracy causes these problems, so improving numeracy might not have an impact on all or any of these other areas.

Very poor numeracy poses the biggest problem—there are great returns from bringing people who have very poor numeracy skills to a level of good basic skills, whereas improving numeracy skills from an already good basic level has less of an impact.<sup>24</sup> So while we recognise that there may be a related need to increase the number of people who have highly-developed mathematical skills, this report focuses on the pressing problems facing people with very poor numeracy skills.

There have been attempts to estimate the different costs associated with the variety of problems that are associated with very poor numeracy (see Box 3). This is helpful, as it documents the wide variety of effects of poor numeracy, but as with all such attempts, the final numbers should be treated with caution.

### Numeracy and the modern economy

There is evidence that numeracy is more needed in the workplace now than ever before. For example, there are fewer unskilled jobs in manufacturing, and there has been growth in the service industry, which often requires some element of IT, target-setting or financial awareness.<sup>21</sup>

Poor numeracy can affect individuals' ability to succeed in the workplace, and is thought to be a brake on the country's economic growth as a whole. Most of the government reviews about skills emphasise that improving the country's skills (meaning both basic skills, including numeracy and literacy, and higher skills, such as engineering) is fundamental to increasing our productivity and therefore economic growth. According to the 2006 Leitch Review of Skills:

*'Without increased skills, we would condemn ourselves to a lingering decline in competitiveness, diminishing economic growth and a bleaker future for all.'*<sup>25</sup>

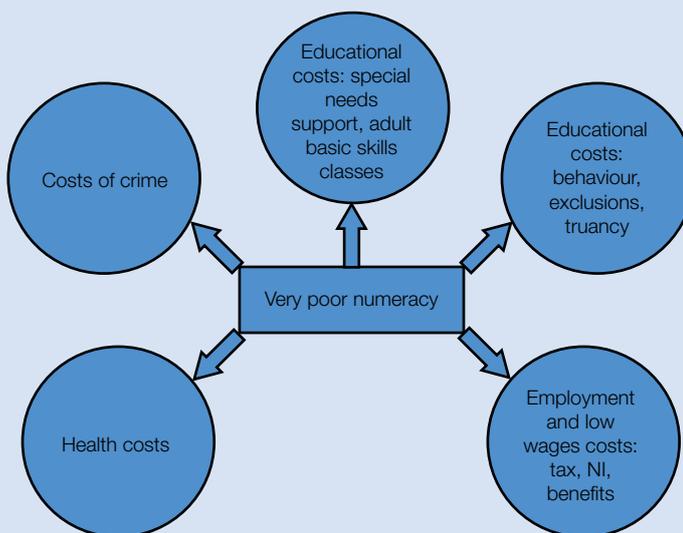
However, it is difficult to quantify the extent to which improving numeracy skills will actually result in higher economic growth.<sup>26</sup>

### Box 3: The costs of poor numeracy

The Every Child a Chance Trust, an organisation which brings together charitable funders, businesses and government to develop solutions for children struggling at school, has tried to aggregate the costs of poor numeracy. The Trust's director has written a report compiling the different costs to the public purse associated with poor numeracy (attempting to eliminate the costs of poor literacy), and comparing these with the costs of the numeracy intervention it had developed (see Appendix).<sup>14</sup> The report outlines the different areas of costs (see diagram below), such as providing special needs support, and missing out on tax revenues that the government would receive if people were numerate and therefore in well-paid jobs.

The report concluded that the total lifetime costs for an annual cohort of 35,843 children with very poor numeracy (the lowest-performing 5%) could be up to £2,389m, compared to a cost of £89m of providing additional support to raise the numeracy skills of these children.

As with all such calculations, the final number should be viewed with caution. There are always difficulties with such attempts to calculate costs and returns. For a start, the numbers involved are always estimates, and often based on past data. Also, it is difficult to say that the cost of a problem 'associated' with poor numeracy will definitely be reduced if numeracy skills improve. The report assumes that the intervention is successful in 79% of cases, based on evidence from pilots of the programme. However, in NPC's experience, success rates normally decrease when programmes move from pilot stage to roll out, although that does not seem to have happened in Every Child a Reader—the parallel initiative to improve reading skills. In spite of these questions, the report is a helpful attempt to combine the costs of poor numeracy, and most usefully, to document the many different areas on which numeracy appears to have an impact.



### Lessons

**Greater effort is needed to raise the profile of numeracy and boost numeracy skills.** This is because there is a common attitude that it is acceptable to be bad at maths, and because difficulties with numeracy can be hidden more easily than other difficulties, such as problems with literacy.

**The numeracy skills of both adults and children need to be improved.** It is much better—more effective, cheaper and easier—to teach children well (at both primary and

secondary school) than to deal with adult numeracy problems later on. However, over 70% of our 2020 workforce have already finished school, and given that the government believes that a fifth of them do not have basic numeracy skills, this group cannot be ignored.<sup>25</sup>

**Changing attitudes to mathematics and numeracy is crucial.** It is unacceptable that numeracy is viewed with such fear, dislike or complacency. Such attitudes are a barrier to improving skills and need to be challenged and changed.



Photo supplied by istockphoto.

# Improving numeracy

Poor numeracy has a damaging effect on many people's lives, so what can be done to improve it? When considering the impact of an approach to improve numeracy, it is important to consider whether it influences people's attitudes, behaviour or skills. All of these elements must be addressed if someone who lacks numeracy skills is to become numerate.

Improving numeracy skills is best done young, and maths lessons in primary school are the best place to start. All children should get excellent classroom teaching, and those who are struggling should get targeted support as soon as possible.

Adults with poor numeracy skills face some barriers that children may not have, such as an ingrained fear of maths, a dislike of classroom-based teaching, or very low self-esteem. So there are two important priorities for adult education. Firstly, people need to be motivated to learn in the first place. Secondly, they need to be taught useful skills that are embedded in a relevant context.

Finally, any approach to improve numeracy, whether for children or adults, needs to be engaging and interesting.

## Setting the scene

When considering the best ways to improve numeracy, there are several points to bear in mind.

Firstly, **there is no single solution for every person in every situation**. This is because there is no single cause of poor numeracy, and everyone is different. Numeracy encompasses a wide range of skills and concepts, and people can be good and bad at different elements of it.<sup>12, 13</sup>

Secondly, **the effectiveness of numeracy projects varies between locations and over time**. This is not a problem specific to numeracy interventions: NPC has seen it happen in many

other fields. For example, imagine that a project is being piloted in a small group of schools that volunteered to take part. The very fact that they volunteered means that the teachers—most importantly, the head teacher—are enthusiastic about the initiative, and are ambitious for their students. Also, being part of a pilot will have an effect in itself—the school will feel 'special'. If the scheme is then made compulsory and rolled out across all schools, including the more chaotic ones, the results are unlikely to be as impressive as in the pilot.

Thirdly, **there has never been a 'golden age' of numeracy**. A government-commissioned review of skills from the 1980s quotes a 1925 report from the Board of Education:

*'Accuracy in the manipulation of figures does not reach the same standard which was reached twenty years ago. Some employers express surprise and concern at the inability of young persons to perform simple numerical operations involved in business.'*<sup>27</sup>

This emphasises the scale of the challenge: overturning decades of education that does not teach all pupils to understand mathematics sufficiently to use numbers in their lives is not going to be easy.

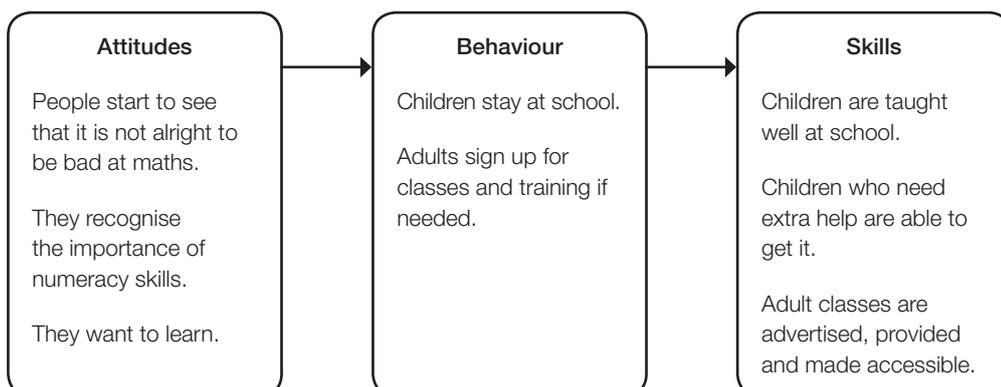
## Skills, behaviour and attitudes

A useful way to think about the effectiveness of an approach is to consider whether it influences people's attitudes, behaviour or skills (see Figure 4).

Many interventions target just one or two of these elements, but all three must be addressed if someone who lacks numeracy skills is to become numerate. For example, offering courses to improve skills is not enough on its own. First of all, you need to change people's attitudes so that they realise that numeracy is something that they can and want

There has never been a 'golden age' of numeracy.

Figure 4: Where numeracy initiatives can have an influence



Maths lessons in primary schools are the best place to develop numeracy skills, and these skills should be nurtured in secondary school.

Teachers not only need to understand maths, but also need to understand how to teach it.

to be better at. Then you need to influence their behaviour so that they actually enrol and attend a course. Without changing people's attitudes and behaviour, it is very difficult to improve their skills. It also makes it less likely that the skills intervention will have the desired impact: if people are forced to attend a course, they are much less likely to learn than if they are motivated to do so.

**What works?**

With these thoughts in mind, we consider some lessons that are emerging from the available research and from our discussions with experts and charities, looking at children, adults, and how to make numbers fun.

**Children**

Improving the numeracy skills of children is best done young. Maths lessons in primary school are the best place to develop numeracy skills, and these skills should be nurtured in secondary school. It is important not only that young children get excellent classroom teaching, but also that children who start to fall behind get targeted support as soon as possible.

The government has endorsed this approach as part of the National Numeracy Strategy, and describes three 'Waves' of intervention for primary school pupils depending on their ability (see Table 1). Wave 3 interventions are the most intensive and expensive. However, if the work is targeted appropriately, *'then most children may not need very intensive interventions.'*<sup>28</sup>

The idea is that intensive intervention is worthwhile because once pupils have grasped the basic concepts of using numbers, they should not fall behind again. But while there is strong evidence that interventions improve children's abilities initially, there is not yet the long-term evidence of how this affects their ability in the following years. It might be that the children who struggled from the start may require ongoing support.

The success of approaches to improve children's numeracy, including classroom teaching, can depend on various elements.

**Good subject-specific teaching**

There is widespread concern that many maths teachers do not have the skills to ensure that their pupils confidently and enthusiastically grasp how to use numbers. As Sir Peter Williams concluded in his review of primary school mathematics, teachers not only need

to understand mathematics, but also need to understand how to teach it.<sup>12</sup>

While there are many examples of excellent teaching in a range of schools across the country, more can be done to improve teachers' mathematics subject knowledge and teaching skills. This is a particular issue for primary school teachers, whose teacher training does not normally require specialist subject knowledge, and who are not required to have any maths qualification beyond a grade C at GCSE. It is not that all primary school teachers should have excellent maths backgrounds, but they should have the skills to teach children to understand and apply the basic number concepts.

**Enough trained maths teachers**

Some experts report that there is a shortage of specialist mathematics teachers in state secondary schools in England. Teachers need to have both the skills to teach maths, and confidence and enthusiasm for the subject. If they struggle with maths or are bored by it, they may pass this attitude on to their pupils.

**Targeted interventions**

Targeted interventions, such as individual tuition, make a difference to children's skills. Any individual attention—whether subject-focused or not—has some impact, and this impact is increased if support comes from specially trained staff. Targeted interventions seem to be much more common in primary than secondary schools.

**Effective management and training**

The success of numeracy interventions depends significantly on the management and training given to teachers, teaching assistants and volunteers. As one government-commissioned review highlights: *'There needs to be guidance and training for teachers and teaching assistants as to how to provide the assessments and the interventions.'*<sup>13</sup> For an externally-driven programme to succeed, it needs the support of the school's teachers, particularly its head teacher. Without this support, even the best intervention can wither and die within a school.

**Assessment**

Good assessment of children's skills should ascertain what their strengths and weaknesses are, and which number concepts—such as counting aloud, writing numbers, or understanding tens and hundreds— they struggle with.<sup>13, 17</sup> Such assessments can take a long time, and cannot be done through simple

**Table 1: Waves of intervention<sup>28</sup>**

Wave	Intervention	Group
1	Good quality classroom teaching	All children
2	Small group support	Children falling just below expectations
3	Individual or very small group support by a trained teaching assistant or specialist teacher	The lowest attaining children

written tests, but are crucial for identifying how children learn and what support they need.

### Useful equipment

Games and tactile apparatus, such as shopping tills and percussion instruments, are clearly useful for engaging and interesting children, and computer programmes can provide fun opportunities for children to practice. However, in themselves, apparatus and computers are not the answer: they must be used in the context of good teaching.<sup>13</sup>

### Adults

Unsurprisingly, a major cause of poor adult numeracy is poor numeracy as a child. It is therefore important to improve children's skills in order to reduce the number of children entering adulthood with poor numeracy skills. However, there is evidence that improving skills as an adult can also reap benefits for individuals. For example, women whose numeracy skills improve between the ages of 21 and 34 are more likely to be in a full-time job than those whose skills do not improve.<sup>30</sup>

Adults with poor numeracy skills face some barriers that children may not have, such as an ingrained fear of maths, a dislike of classroom-based teaching, or very low self-esteem. Poor adult numeracy skills cannot be improved just by providing classes: they have to want to improve their skills in the first place.

Even once they are on a course, teaching adults is particularly difficult: imagine helping a class of adults who have the numeracy skills of 11 year olds to become confident and comfortable with numbers. Not much is known about numeracy teachers, but most experts in the field believe that there are not enough specialists.

There are two important priorities for adult education. Firstly, people need to be motivated to learn in the first place. Secondly, they need to be taught useful skills that are embedded in a relevant context.

### Motivating learners

Adults can be motivated or provided with the incentive to learn in various ways. For example, targeting parents who want to help their children to do their homework has led to a growing interest in the idea of family learning—working to improve adults' and children's skills and confidence by teaching them together.

Another key motivation for adults is employment. But people have to be able to see the benefit. Courses targeted at new employees who want to improve their skills to progress in their job, and courses for unemployed people that are directly linked to employment opportunities, will be more successful than courses that are isolated from any employment initiative.

### Box 4: Estelle's story<sup>29</sup>

Estelle's teacher described the seven year old as *'maths phobic'*: she used to cry whenever there was a class maths lesson. Her home life had its ups and downs, so attendance was also a major problem.

Estelle was identified as a prime candidate for the Every Child Counts intensive tuition programme, Numbers Count (see Appendix). She was assessed by Sue, her tutor, at the start of her term of daily lessons. This showed big gaps in her knowledge. She could count by rote but did not match each number name to the objects or pictures she was counting. She could not read or write numbers.

So Sue focused the lessons on plugging the gaps in Estelle's knowledge and building her confidence. Sue constantly made explicit what Estelle had learned: *'Yesterday you had to think for a long time about how to work out half of six, but today you knew straight away.'* Sue also helped Estelle apply her learning to 'real world' situations. For example, as a halving exercise, Sue asked Estelle to sort out little pots of yoghurt, packet drinks and a bowl of tangerines onto two trays (*'one for Wednesday, one for Thursday'*) for the school Breakfast Club.

By the end of her Numbers Count lessons, everyone noticed that Estelle's confidence had grown in leaps and bounds, not just in maths but in other subjects too. Now she puts her hand up and answers in class, and tests show she has caught up with her classmates in numeracy skills. She is no longer afraid of maths, and the gaps in her learning have been addressed in readiness for her making the move to secondary school.

### Embedding learning

Embedding learning in relevant contexts is particularly important when teaching adults, both to engage learners' attention, and to ensure that they are learning the skills they need. For example, numeracy is a part of many vocational courses, sometimes taught separately, and sometimes taught as an integrated part of the course. One study compared vocational courses that incorporated numeracy in different ways. The qualification rate was only 70% where numeracy was taught separately, but was 93% when it was taught fully within the context of the vocation.<sup>19</sup>

Figure 5 gives an example of how tutors can identify the numeracy elements of a hairdressing course, and therefore the skills that learners need to develop (taken from the government-sponsored website aimed at providing resources to staff in the further education and skills sector).

### Making numbers fun and relevant

Any approach to improve numeracy needs to be engaging and interesting, whether for children or adults. To give three examples, teaching can involve computer games, sports or supermarkets to engage people.

### Computer games

There have recently been two new developments in using computer games with a maths element: the charitably-funded Bowland Maths project (see Appendix) and the commercial software Manga High. Both

Women whose numeracy skills improve between the ages of 21 and 34 are more likely to be in a full-time job than those whose skills do not improve.

Embedding learning in relevant contexts is particularly important when teaching adults, both to engage learners' attention, and to ensure that they are learning the skills they need.

look like typical computer games, except that they require players to complete a variety of mathematical tasks in order to succeed. Both initiatives are targeted at secondary school teachers interested in finding new ways to motivate their pupils. They have been launched only recently, so it is difficult to judge their effectiveness.

A more developed initiative is RM Maths, another commercial product. It is a programme designed to deliver 15-minute lessons to primary school pupils, assessing their progress and targeting support accordingly. There has also been much publicity surrounding the recent online maths school ([www.themathsfactor.com](http://www.themathsfactor.com)) launched by Carol Vorderman, aimed at making maths fun.

As already discussed, computer programmes cannot replace good teaching, but they can be useful tools to engage and excite pupils, and to give them the opportunity to apply numerical concepts to real life situations. They could also be useful for helping adults to learn new skills while having fun, by taking advantage of the recent popularity of brain teaser games on handheld consoles.

**Sports**

Some initiatives have used sports that involve calculations, such as darts, snooker and cricket. For example, through a partnership between the government and The British Darts Organisation, darts-themed calculators and maths scratch cards have been used by hundreds of colleges across the country to help learners to improve their maths skills.<sup>32</sup>

While such initiatives might be useful in raising the profile of and interest in numeracy, they are in themselves unlikely to do much to improve standards. However, there may be scope for using popular sports as a 'hook' to engage people—perhaps by working with local community sports organisations to embed numeracy into their training. For example, one company, Dance Equation, goes into schools to provide workshops that combine maths with dance. Again, although this is an exciting idea, a one-off workshop is unlikely to make a lasting difference to children's skills.

**Supermarkets**

Most adults go to supermarkets regularly, and supermarkets are places where basic numeracy skills are very useful. For example, numeracy skills are needed in deciding which offers give you the cheapest deal, and in working out if you have been given the correct change. There has therefore been some interest in the idea of using supermarkets to encourage people to improve their numeracy skills.

As part of Maths Year 2000 (a government-sponsored project to raise awareness of the importance of maths skills), stalls were set up at supermarkets with maths games targeted at adults. Although NPC could not find any evidence of whether this worked or not, there is a case for using places such as supermarkets to advertise local courses in a fun and engaging way.

**Lessons**

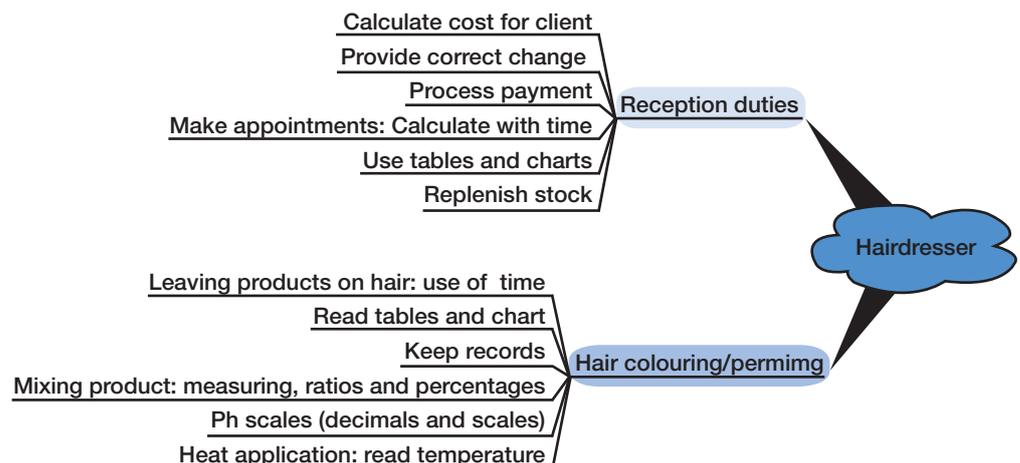
There has never been a 'golden age' of numeracy, and we may never reach that position. But some things can be done to improve the situation.

For children, it is essential to provide good quality teaching, using teachers who have the necessary skills, supported by early, targeted interventions for those children who fall behind. These interventions work best when based on a detailed assessment of the individual child's needs.

For adults, just providing courses is not enough. Adults must be motivated to learn before they can be expected to enrol on or benefit from a course.

Underlying all of this is the need to make numbers more engaging and relevant for people. However, anyone wishing to improve numeracy through an initiative that uses a hook such as sports or supermarkets must have a clear and realistic idea of what the scheme will actually achieve. Will it just try to make people stop for a few minutes and realise that numbers can be fun? Will it try to make people understand that numeracy is important to their lives and encourage them to want to improve their skills? Or will it actually aim to improve their numeracy skills?

Figure 5: Embedding numeracy in a hairdressing course<sup>31</sup>



# The role of government

Over the past decade, there has been an increased policy focus on raising the numeracy standards of children and adults, both to improve people's lives and to increase the supply of people with the job skills that are increasingly needed in our post-industrial society. The government has increased funding, introduced new teaching methods and commissioned independent reviews of the subject.

Some initiatives have had a demonstrable impact and have raised the profile of numeracy as an issue. But the effectiveness of other initiatives is harder to evaluate, and a focus on achieving targets (usually set in terms of the numbers of people gaining qualifications or passing tests) means that the government's evidence on impact does not tell the whole story.

Although there have been efforts to improve numeracy for many sections of the population, there has been no overarching strategy to improve teaching, attitudes and skills across all the different age groups in a coordinated way. A concerted, joined-up effort is needed if standards are to be raised across the whole population.

## Children

### Primary school

The most significant development for children has been the introduction of the **National Numeracy Strategy** (following the National Literacy Strategy) for primary schools in 1999. This gave teachers detailed frameworks and guidance on how they should be teaching children numeracy. The strategy stipulated that there should be a daily maths lesson for primary school children lasting about 50 minutes, with prescribed components, including a focus on mental arithmetic. Unsurprisingly, the programme was met with some resistance from teachers who disliked initiatives being forced on them.

The numeracy strategy has since been subsumed into more general National Strategies (which also cover secondary schools). It was announced in 2009 that the government will be dismantling the Strategies, having had success in raising awareness and improving primary school mathematics results. The funding previously dedicated to them will be redirected back to schools.<sup>33</sup>

But there remains a need for better maths teaching in primary schools, as the Channel 4 Dispatches programme, *Kids Don't Count*, highlighted in February 2010. In 2007, the government commissioned a review of primary school mathematics teaching, headed by Sir Peter Williams. The final report of the Williams Review was published in 2008, and one of its major recommendations was that the government should provide training so that each primary school has a 'maths specialist', whose job is to promote good maths teaching within schools.<sup>12</sup> This programme is underway, and the first cohort of specialists will be trained later in 2010. The biggest challenge will be to find enough good quality teachers who want to become maths specialists.

As well as trying to improve general maths teaching in primary schools, the government has committed to providing more targeted support for young pupils who are struggling. It is funding the **Every Child Counts** programme, developed with the Every Child a Chance Trust, to provide specialist numeracy tuition for 30,000 children aged six and seven who are significantly underachieving (see Appendix).

Through a separate scheme, the government is also providing one-to-one maths tuition for children in the last two years of primary school who are falling behind. This scheme was introduced in 2009, and by 2010/2011, it will be provided for 300,000 pupils a year.<sup>34</sup>

### Secondary school

There has been less activity focused on secondary school mathematics teaching, although the role of a 'mathematics subject leader' has been introduced as part of the National Strategies. The leaders' responsibility is:

*"to ensure that their school's ambitions for high quality teaching and learning in mathematics, leading to high levels of achievement for all pupils, are shared and pursued by all those who teach or support the subject."<sup>35</sup>*

The government also commissioned a review of mathematics education for 14–19 year olds. The Smith Report of 2004 (*Making Mathematics Count: Inquiry into Post-14 Mathematics Education*) highlighted issues such as a shortage of mathematics teachers, and suggested that mathematics GCSE should be a 'double award'

A big challenge is finding enough people who want to train as maths teachers.

in the same way that science and English are.<sup>36</sup> This is currently being developed. Again, a big challenge is finding enough people who want to train as maths teachers.

In 2006, the government launched and funded the National Centre for Excellence in the Teaching of Mathematics, to share good practice and promote continuing professional development among all teachers of maths, from early years to adult education. The centre does this through a range of activities, including a website providing tools and ideas for maths teachers, and regional coordinators who raise awareness of opportunities for teachers.

### Functional maths

The government is also introducing functional skills into the secondary school maths curriculum, and as standalone qualifications. Functional skills are:

*'skills and abilities [people] need to take an active and responsible role in their communities, everyday life, the workplace and educational settings. Functional mathematics requires learners to use mathematics in ways that make them effective and involved as citizens, operate confidently in life and to work in a wide range of contexts.'*<sup>37</sup>

The 14–19 and Skills White Papers set out the government's commitment to ensure that all young people and adults should be equipped with the functional English, mathematics and ICT skills necessary for further education, employment and adult life more generally. This is a response to calls from both employers and further educationalists for better functional skills.

Functional skills will be central to the wider 14–19 education reforms. They will be made available as stand-alone qualifications from September 2010, to help learners develop practical skills.

### Adults

The government's focus on improving adult basic skills began with the appointment of a group to examine post-school literacy and numeracy skills, chaired by Lord Moser, the then Chairman of the Basic Skills Agency. The Moser Report of 1999 was a crucial step in raising the profile of the inadequacy of the nation's skills, and persuading the government to address the problem.<sup>4</sup> It also highlighted the lack of funding and provision:

*'The teaching of basic skills to adults is often marginalised, remaining something of a Cinderella service.'*

### Skills for Life

As a result of the Moser Report, the government began to set national standards for adult literacy and numeracy, and in 2001 produced its **Skills for Life** strategy. This focused on improving adults' basic skills—literacy, language and numeracy—by boosting demand and encouraging people to gain qualifications. Before July 2004, around 80% of courses were delivered in further education colleges. Since then, courses are increasingly being delivered in different settings, including work-based learning and offender learning, and by learndirect and Train to Gain providers.<sup>38</sup>

The government promoted the courses to the public through its memorable *Get rid of your gremlins* campaign (which was initially criticised within the numeracy field for being too negative). However, the government regarded the campaign as one of its most successful, reporting a national recognition rate of 93% among its target audience, with over 370,000 people contacting the national helpline.

The Skills for Life strategy set out to improve the literacy, language and numeracy skills of 2.25 million adults by 2010, and emphasised the needs of priority groups such as unemployed people, prisoners and low-skilled people in employment.<sup>38</sup> We do not know how much of the £5bn that was invested in Skills for Life between 2001 and 2008 was spent on numeracy courses.<sup>39</sup>

In addition to Skills for Life, the government has invested in work-related skills through its Employability Skills Programme. This provides numeracy support alongside specific employability training and job-search activity for those out of work. The government also encourages employers to take responsibility for improving their staff's skills through the Train to Gain initiative (see Box 5).

The government now plans to replace Skills for Life literacy and numeracy qualifications for adults with functional skills qualifications, subject to pilot studies currently underway.

### Raising standards internationally

The most significant development of the government's wider skills policy came out of the Leitch Review of Skills published in 2006. Commissioned two years earlier by the Chancellor, Lord Leitch's remit was to identify the skills required for the nation to *'maximise economic growth, productivity and social justice'*.<sup>25</sup> Leitch found that *'the UK's skills base remains mediocre by international standards,'* and concluded that by 2020, the UK should aim

‘The teaching of basic skills to adults is often marginalised, remaining something of a Cinderella service.’

The report of a working group chaired by Sir Claus Moser, 1999

to be in the upper quartile on skills within the OECD (Organisation for Economic Co-operation and Development) countries. For basic skills, this would require 95% of adults to have at least functional literacy and numeracy, up from 85% and 79% respectively in 2005.<sup>25</sup>

The government committed itself to this ambition. Whereas the previous Skills for Life target did not distinguish between literacy and numeracy, the new ambition introduced separate measures for literacy and numeracy for the first time. It recognised that the nature of the challenge differs for each subject and that there needs to be a greater focus on adult numeracy.

## Achievements

The government has invested significant effort and resources into raising the profile of the importance of basic skills such as numeracy,

and has broadly succeeded. Numeracy and literacy are now much higher up the agenda of government departments, local authorities, schools and colleges than they were 20 years ago. For example, according to the Williams review of primary school mathematics:

*'There was clear evidence that the introduction of the National Numeracy Strategy ... has brought about nothing less than a transformation in the way mathematics is taught.'*<sup>12</sup>

But has the government actually raised standards? It has highlighted the fact that primary schools mathematics results have improved as a result of the National Numeracy Strategy, and that millions of people have taken Skills for Life qualifications or have been on courses organised through Train to Gain initiatives. But when you look below the surface, the evidence is less clear cut.

Skills for Life has successfully raised the profile of adult basic skills, and has enabled over three million people to participate in training programmes and achieve a national qualification.

### Box 5: The role of employers

Businesses can benefit from improving their staff's skills, and most employers provide some on-the-job training, as well as sometimes funding employees to go on courses. Since 2006, employers have been able to access funding and services (such as a brokerage service to help them work out which courses are right for their workers) through the government's Train to Gain scheme.

The National Audit Office (NAO) reviewed Train to Gain in 2009.<sup>43</sup> It found that the scheme had *'supported an expansion of employer-responsive training that had reached 1.25 million learners, and had developed a brokerage service with which a majority of employers were satisfied.'* Yet it concluded that *'over its full lifetime the programme has not provided good value for money.'*

The main aim of Train to Gain was to stimulate investment in training from employers. The NAO report found that half of the employers whose employees received training said they would have arranged similar training without the public subsidy, although there is no evidence that the training would have been of the same quality, or would have led to a formally recognised qualification. Train to Gain did allow about 70% of employers (who were already training staff) to train additional staff.

In terms of numeracy in particular, research from the Confederation of British Industry has found that nearly a quarter of employers support the provision of remedial basic numeracy skills training for employees.<sup>10</sup>

One high-profile example of an employer trying to improve its staff's skills is Sainsbury's. In 2008, the supermarket chain announced that it would offer its entire workforce the opportunity to gain qualifications in literacy and numeracy equivalent to a GCSE.<sup>44</sup> This is an admirable undertaking. The training offered was an online programme, which has the benefit of the employees being able to train anonymously. However, this method of teaching may limit its effectiveness at improving skills, as some people cannot or do not want to use computers.

Another way in which workplace learning is promoted is through trade unions. The government has funded training for employees to become 'union learning representatives'—of which there are now 22,000 in the UK—whose role is to promote, broker and help to deliver learning in the workplace.<sup>45</sup> The government also provides the resources for the Union Learning Fund to support union projects that increase learning and skills. Skills for Life is a key component of this learning, but we do not know how much of the work of the representatives and the Fund is focused on helping people to improve their numeracy skills.

Employers have a crucial role in improving skills: they are best placed to understand what skills their employees need, and to provide the motivation for them to improve. However, they must be thoughtful about providing appropriate, high quality training. Putting employees on poor quality courses is a waste of time and money.

A significant factor limiting the government's achievement is the lack of an overarching strategy for improving numeracy skills across different age groups.

Schools and colleges tend to focus on ensuring that students pass exams, rather than helping them to become fully comfortable with using numbers.

One problem is that the government has been focused on setting targets such as exam passes, giving schools and colleges the incentive to focus on ensuring that students pass exams, rather than helping them to become fully comfortable with using numbers. Another problem is that school exams are blunt instruments: they need to be suitable both for low achievers and for future physicists, to test individual achievement, but they also need to assess standards in schools, local areas and the country as a whole.

Given the problems with tests, the government's focus on targets has had some negative effects. The damaging consequence is that the government can claim to have made significant progress, even if standards have not risen as much as the results suggest. This could lead to numeracy falling down the government's agenda despite ongoing problems.

### Children

The Key Stage 2 test results show that the percentage of children obtaining the level expected of them before they leave primary school at 11 has risen from 69% in 1999 to 79% in 2009 (see Figure 6). Although this is encouraging, it means that over one in five children still do not meet the target level. Detailed examination of the data warns against any complacency in the figures, for two reasons.

Firstly, as Figure 6 shows, the proportion of children who are really struggling—failing even to reach the level expected of a seven year old—has stubbornly refused to decrease, hovering around 5–6% since 2001. Also, the largest leap in the proportion achieving the expected level occurred between 1998 (59%) and 1999 (69%)—the year before the numeracy strategy was launched.<sup>5</sup>

Secondly, teachers may be coaching pupils to pass the exams, rather than to understand and apply their mathematical skills. The 2008 Ofsted

report into mathematics teaching expressed concern that standards in using and applying mathematics are low, and found that:

*'as pupils approach Year 6 [the year of Key Stage 2 tests], intervention, 'booster' and revision classes increase in effort to optimise pupils' performance in the national tests. These, and teaching that focuses on the tests, often have a narrowing effect on pupils' experiences of mathematics in Year 6, at the expense of strengthening their understanding of underpinning concepts.'*<sup>9</sup>

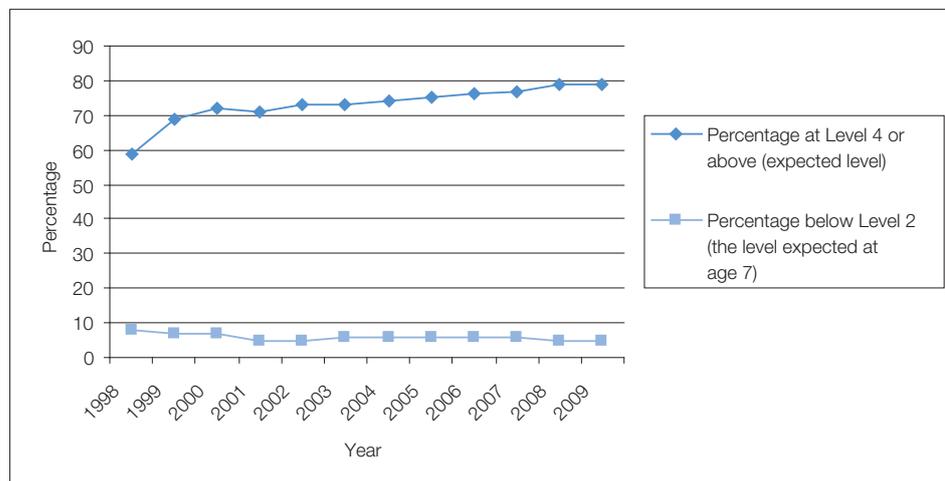
A charitably-funded research programme examining numeracy teaching and skills also found evidence that the impact of the National Numeracy Strategy was not nearly as large as the test results suggest. The Leverhulme Trust funded researchers at King's College London to undertake longitudinal research tracking pupil progress, to understand more about pupils' learning and assess what contributed to any improvements. It concluded the National Numeracy Strategy 'has had at most a small effect on attainment in most areas of numeracy'.<sup>40</sup>

### Adults

Skills for Life has successfully raised the profile of adult basic skills, and has enabled over three million people of working age to participate in training programmes and achieve a national qualification. Adults are assessed at the beginning to determine the correct course for them so that they can then progress to the next level.

However, the government recognises that there are still too many adults who struggle with the basics and need support. It acknowledges that its ambition for numeracy is particularly challenging and will require a major increase in the number of people taking courses, as well as a change in attitudes and culture regarding numeracy. Far fewer people take numeracy courses than literacy courses, and fewer teachers specialise in numeracy.<sup>38, 41</sup>

Figure 6: Mathematics Key Stage 2 results (11 year olds)<sup>5</sup>



The House of Commons Public Accounts Committee published a report in 2009 about the Skills for Life programme's progress in improving skills standards. It pointed out two important areas where the strategy had made insufficient progress.

Firstly, on numeracy in general: *'The Department has made far less progress in strengthening numeracy skills than literacy skills.'*

Secondly, in helping hard-to-reach people who come into contact with government services: *'More of these people are being encouraged to take up courses to improve their literacy and numeracy skills, but the percentage who participate is still relatively small. For example, only one in five offenders with an identified literacy or numeracy need enrol on a course.'*<sup>142</sup>

Following the Public Accounts Committee's report, the government published its refreshed Skills for Life strategy. This should enable job seekers to improve their literacy, language and numeracy skills through the integration of employment and skills services, and may be an incentive for people to enrol on courses.

The National Institute of Adult Continuing Education (NIACE) is currently carrying out a review of adult numeracy learning in the UK, which may influence future policy even further.

An interesting point is that most of the people taking the courses are not middle-aged people wishing to improve their skills, but are young people: in 2004/2005, just over half of people on numeracy courses were aged 16–18 and a further 20% were aged 19–24.<sup>38</sup> It therefore seems that the government has had much more success in getting young people back in the classroom than older adults.

### Where are the gaps?

A significant factor limiting the government's achievement is the lack of an overarching strategy for improving numeracy skills across different age groups. Children and adults are dealt with by different departments, and as a result, the approaches have been disjointed.

Even within departments, there has been a lack of coordination. For example, while there has been the Williams Review and National Numeracy Strategy focusing on primary schools, and the Smith Report of mathematics education for 14–19 year olds, there has not been a corresponding review of mathematics for 11–14 year olds. This is despite concerns from experts that these are important years when pupils can be put off the subject.

While Skills for Life has been successful in improving provision of adult numeracy education, its focus on qualifications and courses has made it difficult to engage hard-to-reach groups that could most benefit from learning new skills. The government has increased the opportunities for people to develop their skills, but has been less successful in influencing attitudes and behaviours to encourage people to take full advantage of these opportunities.

### Lessons for charities

The government's attempts to improve numeracy provide two important lessons for charities.

Firstly, **it is difficult to persuade adults to go on courses to improve their numeracy skills**. Adults with numeracy problems probably did not do well at school, and they are unlikely to have fond memories of classrooms. The experts we spoke to thought that charities could investigate more imaginative ways of encouraging people to improve their skills, for example, getting parents to attend sessions at their child's school, or using supermarkets as venues for recruiting learners. Some suggested that the only way to motivate particularly hard-to-reach unemployed people to improve their skills is to give them a real reason: helping them get a worthwhile job.

Secondly, **changing the culture in schools is difficult**. The National Numeracy Strategy encountered resistance from teachers, although NPC has seen examples of some schools being more welcoming to initiatives provided by charities than to programmes enforced by the state.

It is difficult to persuade adults to go on courses to improve their numeracy skills.



Photo supplied by Catch Up Numeracy.

# The role of charities

Teaching and promoting numeracy is primarily the job of schools, colleges and government departments. But charities also play a vital role—a role that only they can fill. They can make a difference by developing innovative ways of helping people to learn, supplementing the efforts of teachers through volunteers, or lobbying the government to improve the situation.

Charities can work in partnership with schools, without telling them what to do, and they are able to provide services that are more flexible than government provision, which can be regimented and uniform. Charitably-funded initiatives can also take the time to think carefully about how to develop a project that will really make a difference, and collect the evidence to prove this, rather than being under pressure to demonstrate the immediate success of every initiative.

Yet few charities focus on numeracy, and where they do, the work is fragmented across different organisations. If charities and charitable funders were to work together more in this area, it could significantly benefit society.

## Charities addressing numeracy

Few charities concentrate on developing numeracy skills, particularly when compared to the similar field of literacy. In our recent research into charities working to improve children's literacy, we found hundreds of charities running reading clubs, going into schools to provide extra tuition, and matching volunteers with children who need help.<sup>46</sup>

The numeracy field is far less developed. Through our reviews of research and discussions with experts and funders, we found only a handful of charities running dedicated numeracy programmes. For many other charities, such as centres for homeless people, refugee charities and youth organisations, numeracy is just a small part of their activities.

We conducted a search of GuideStar UK's basic information on registered charities in England and Wales. It found 398 charities with the word 'numeracy' somewhere in their profile, compared to nearly 1,000 with 'literacy' in their profile.<sup>47</sup> However, the information GuideStar collects is only indicative of the work charities

do (it mostly outlines charities' objectives and basic activities), and our research suggests that it is a significant overestimate of the scale of numeracy work.

We also found that charitable activity to improve numeracy is very fragmented—the work is scattered across a range of charities, most of which are small. Funding is similarly patchy: there are very few significant foundations for which improving numeracy is a core aim, and the funders of this report make up most of the main funders interested in numeracy.

## What is distinctive about charities?

Charities have three particular advantages over the government and the private sector.

**Firstly, charities can be innovative, patient and can collect evidence of their achievements.** In contrast, government—at least central government—is often quite constrained as to what it can do, and can find it hard to think radically. If it does launch a new initiative, there is often pressure to roll it out and declare it a success quickly, without taking the time to assess its effectiveness.

**Secondly, charitable services are attractive to hard-to-reach individuals.** Charities report that government services are often seen as off-putting and part of 'the authorities', whereas charities' services are seen as more approachable, friendly and confidential. They argue that, for example, former drug addicts are more likely to go on a course at their local charitably-run community centre than at the Jobcentre.

Similarly, charities are able to provide a more 'holistic' and flexible service than other agencies. Rather than just providing numeracy courses, for example, they could also be helping learners to develop their confidence and deal with other issues affecting their lives. It is difficult to prove these notions but, if true, they mean that charities might be better at changing some people's attitudes and behaviour.

**Thirdly, charities can tailor their support to particular schools and colleges,** rather than relying on standardised 'top-down' initiatives from government. This may make them more suited to improving practice in some schools and colleges that can struggle with the many demands of central government. Again, this is a difficult concept to prove.

Few charities focus on numeracy, and where they do, the work is fragmented across different organisations.

**Box 6: Mairi's story**

Mairi was eight years old when the school she'd just moved to realised she was having problems with maths. There were lots of gaps in her knowledge and she had little confidence. Her mum, Dorothy, had also noticed that Mairi was finding maths difficult: *'I could tell she was struggling. She was reluctant to sit down and do her work and I really didn't know what to do.'*

Mairi's school started to help her using the Catch Up Numeracy scheme. The assessments showed that her basic knowledge was poor, causing her problems as numeracy lessons moved on to cover new areas. Angela, a teaching assistant, started working with Mairi in fifteen-minute sessions, twice a week. Angela had been trained by Catch Up Numeracy and used the sessions to play lots of 'numeracy games' to make the work fun and build Mairi's confidence. *'When we started the sessions, Mairi really didn't like maths at all. She wouldn't get on with her work and she was very unhappy about it. I found that she had a lot of gaps with her maths facts and there were a lot of areas that needed improvement. She was also very disengaged and had no enthusiasm.'*

After only three months of working with Angela, Mairi's numeracy skills had improved so much that she jumped from a National Curriculum level 1 to a level 2—three times the expected rate of progress. Mairi so enjoyed the sessions with Angela that she asked if she could carry on. Angela says the difference in Mairi is amazing: *'She's now a very confident young lady who will have a go at anything. She's happy to work independently, will put her hand up in class, and really smiles when she gets it right.'*

Mairi says she likes maths now and finds it fun: *'I used to find maths very hard and I felt I was going to get told off if I couldn't do it. I've got a lot better and I can do my five and ten times tables. My teachers and my mum think I've done really well and it makes me very happy.'*

Mairi's mum Dorothy is also delighted with the change in her daughter. *'I don't want Mairi to struggle with maths because you need it when you go out in the real world. Mairi now has the confidence to sit down and have a go and we know the support is there if she's struggling.'*

**How charities are improving numeracy**

Although there is not much large-scale work in the charitable sector focused on numeracy, there are a few examples of mostly small-scale initiatives (see Appendix for more detail of some of the programmes described in this section). The work that charities do to improve numeracy includes:

- developing programmes for schools;
- using volunteers to improve children's numeracy skills;
- developing programmes outside schools;
- working with families;
- improving the skills of hard-to-reach adults; and
- improving financial literacy.

Charities could play a greater role in creating high quality, free, innovative materials for teachers to use, especially in deprived areas.

**Developing programmes for schools**

While it is clearly the job of schools to teach numeracy, charities can help by developing new ways of training specialist teachers and teaching assistants to help children who are struggling. They can take the time to do a thorough review of what works, and develop and test new initiatives.

Two such programmes are **Every Child Counts**, which trains specialist teachers to provide intensive support for the very lowest-performing children, and **Catch Up Numeracy**, which trains teaching assistants to provide support for struggling children (see Box 6). Both have used charitable funding (although Every Child Counts was also supported by the government) to develop tuition programmes for children who are falling behind in their maths work. They also collected significant evidence of their impact.

Both programmes now rely on schools, local authorities and the government to fund ongoing provision wherever they can. This is sensible, as charitable funding can only go so far, and it is rarely able to fund the delivery of programmes at a large scale. Furthermore, the fact that schools are willing to pay for the services is further evidence of a programme's effectiveness.

Another way that charities can improve performance in schools is to develop materials for mathematics teachers to use. One particularly interesting recent, large-scale example of this is **Bowland Maths**. Funded by The Bowland Charitable Trust and the government, it gathered ideas from the public that could form the basis of mathematically-testing, but fun, 'case studies', many of which involve computers. Teachers can use these case studies in lessons, and they are available to schools for free. The work of Bowland Maths is targeted at 11–14 year olds, based on the project's preliminary research, which found that it is hard for teachers to engage children of this age group, and that this is an important age at which many pupils begin to find maths difficult or uninteresting.

The government and private companies also develop a wide range of resources for teachers and schools to use in their education. NPC believes that charities could play a greater role in creating high quality, free, innovative materials for teachers to use, especially in deprived areas. However, in order to differentiate their materials from those sold by profit-making companies, or given to teachers by the government, they have to be very clear about the value they add, and what particular problem they address. Otherwise, it is difficult to say why a charity should be putting effort into this, rather than leaving it to a company with experience of developing such resources.

## Using volunteers to improve children's numeracy skills

Many charities use volunteers to help schoolchildren, for example, helping them with their reading, providing mentoring or offering counselling. There is some such work focused on numeracy. The leading charity here is **Tower Hamlets Education Business Partnership** (THEBP), which sends volunteers from local businesses into schools in deprived London boroughs to be 'Number Partners' for children who are struggling or who could benefit from being challenged more.

THEBP works with other organisations to promote the model across the country. There could be benefits to scaling up such work. Bringing in inspirational volunteers to teach fun number lessons could be effective at influencing children's attitudes to numbers. However, in order for volunteers to have a real impact on children's numeracy skills, most experts agree that they need substantial training.

## Developing programmes outside schools

As well as working within the school system by providing professional or volunteer support for children, a number of charities and community organisations provide academic support—such as homework clubs—outside of school. However, most of these do not have maths or numeracy specialists who are able to provide professional support to struggling learners.

One charity that does provide specialist help is **IntoUniversity**, which runs academic support programmes after school and during holidays at its centres across London. It uses both tutors and trained volunteers to help disadvantaged children to succeed at school, and works with children of both primary and secondary school age. It undertakes thorough assessments of children's mathematical skills when they begin to attend the centre, and if children are falling behind their peers, tutors then work with them to improve their numeracy, focusing on the aspects that they struggle with in particular.

## Working with families

There is much interest in the possibility of involving parents in children's numeracy learning as a way to help children with their school work, while also giving their parents the opportunity to improve their own skills. This is quite a compelling idea: it addresses the problem that adults often do not have motivation to do formal courses, by linking their own learning with their children's. It has also been shown that improving skills in adulthood has a positive effect on children's skills too, which may help to break the inter-generational challenge of poor skills being passed from one generation to the next.

Although there is some evidence to support the value of family learning, most of the work has been done in the literacy field and more research is still required.<sup>48</sup> However, it is not unreasonable to suppose that many of the findings would also apply to family numeracy.

One charity that uses parental involvement is **Ocean Maths**. It has developed a programme in east London, whereby parents come into school for fun, interactive whole-class maths (not just numeracy) workshops, and teachers give the children homework that they have to do with their parents (or another adult). It now has ambitions to roll out its approach to other areas.

Ocean Maths' work is very well respected, and it collects compelling local evidence of its impact (such as school-wide improvements in maths results), but it struggles to collate this information. It will find it harder to evaluate its impact as its work grows, as the model is changing at the same time. It could therefore benefit from support to assess its effectiveness, which might then help it to scale up its activities.

## Improving the skills of hard-to-reach adults

Our previous research has shown that charities in many different fields, such as tackling homelessness, working with prisoners and ex-offenders, and improving the lives of refugees, undertake work aimed at raising the skills and confidence of disadvantaged, hard-to-reach groups. Occasionally, this involves opportunities to improve numeracy skills.

For example, a review of 'day centres' that provide basic support for homeless people found that 70% provide support around employment, education or training, which sometimes includes numeracy classes.<sup>49</sup> **Crisis** is one charity for homeless people that has dedicated learning centres where people can take accredited numeracy qualifications. It receives no statutory funding for this.

The Moser Report of 1999 discussed the importance of such work:

*'Unless community-based provision is enormously expanded, we will not be able to reach hundreds of thousands of people who have real needs but don't want to go to a college. The role of voluntary organisations and community schools is crucial.'*<sup>14</sup>

Sometimes charities run courses that lead to accredited qualifications. More often, teaching is at a lower level, focusing on improving people's confidence, motivation and attitudes, with the aim of then encouraging them to enrol at colleges to take their learning further, or—even better—getting them into a job that will provide training.

Charities should focus on preparing disadvantaged adults for learning, rather than providing courses themselves.

This is sensible: charities should focus on preparing disadvantaged adults for learning (something that most colleges struggle to do), rather than providing courses themselves (which colleges are specialists at, and receive substantial funding to do). Given how difficult it is to teach numeracy to adults, we would not encourage charities to make this a core activity. They are better placed to build the confidence and motivation of the people they work with, and develop a partnership with a local college to provide the actual teaching once their clients are ready to progress to that stage.

It is also expensive to develop teaching skills, and charities struggle to receive statutory funding for it unless their clients are passing qualifications—a difficult task when working with particularly disadvantaged people. We encourage charities to discuss numeracy opportunities with their clients, and to challenge the notion that learning numeracy is ‘not for them’ or that it is ‘ok’ to be bad with numbers. Charities can make numeracy seem fun, important and something that they can learn.

### Improving financial literacy

There is much charitable activity that borders on numeracy work when it comes to tackling financial exclusion—the situation of people who cannot or do not access and use appropriate financial products and services, such as bank accounts, affordable loans and insurance. Financial exclusion is made worse if people do not have the skills, knowledge or understanding to make the most of their money—that is, if they have poor financial literacy.

Charities such as **Credit Action** and **pfeg** (the Personal Finance Education Group) often address numeracy problems to help people develop one element of their financial skills. However, people can be highly numerate but still have trouble managing their money, so numeracy alone is not the answer here. NPC’s report on financial exclusion discusses the issues in more detail.<sup>50</sup>

### Where are the gaps?

There are some interesting and effective charitable projects focusing on improving numeracy, but this work is small-scale, fragmented and underdeveloped. Charities could be having more of an impact on the nation’s numeracy skills, although it is important to remember that charities should not take on roles that are the state’s responsibility. In particular, charities could help by:

- lobbying government;
- improving attitudes;
- improving coordination of numeracy work;

- developing innovative solutions for secondary schools; and
- boosting the number of specialist teachers.

### Lobbying government

If supported by private funders, charities could play a crucial role in holding the government to account with regard to its efforts to improve numeracy, and lobbying for better policies. As mentioned, the government may be overstating its claim—based on exam results—that its policies have been effective at raising standards, when there is still much more to be done. Charities should make sure that numeracy is kept on the political agenda, and that nobody, especially children who are struggling the most and the most disadvantaged and hard-to-reach adults, falls through the government’s net.

There are already some players in this field, such as the Advisory Committee on Mathematics Education, based at the Royal Society, and the Association of Teachers of Mathematics. These organisations provide advice and guidance on issues relating to the curriculum, qualifications, teaching and assessment. Although they only focus on school mathematics, children’s and adults’ numeracy problems are linked: the main reason adults are bad with numbers is because they did not do well at school, and adults can pass on their attitudes to children. Standards will only rise significantly if charities and the government have a coherent, overarching strategy.

There is no obvious charity that is well-placed to take on this coordinating role. The largest charity in the field by far is **NIACE** (the National Institute of Adult Continuing Education), which aims to promote adult learning. It receives some government funding, and aims to have an influence on, and work with, government, colleges, charities and learners. It undertakes a range of work, including running campaigns (such as Adult Learners’ Week), undertaking research and providing support to the adult education sector. While NIACE is the only charity focusing on this issue, playing an important role, there is still much more lobbying that needs to be done, focusing on both children’s and adults’ poor numeracy skills.

Funders interested in taking this forward may wish to create a small organisation focused on lobbying the government about numeracy, or perhaps create a coalition of organisations who can campaign together.

### Improving attitudes

People’s poor attitudes to numeracy are a significant barrier to improving the nation’s skills. Numeracy is seen as frightening and difficult to learn, something that you are either good or

bad at. Furthermore, while it is common and acceptable for adults to attend courses that further their hobbies or stretch their minds, there is a stigma attached to adult learning if it is focused on basic skills that ought to have been picked up at school. People with poor skills may feel embarrassed about it, and lack the confidence to seek out and attend classes.

Government publicity has attempted to make maths and science seem attractive and exciting to school pupils, and to make adult learners realise that classes can help them even if they did not do well at school. Charities could help by influencing the people they work with directly, helping them to see numeracy in a different light, and encouraging adults to attend local courses.

Charities could also have a much larger impact by running campaigns to change attitudes. They should focus on hard-to-reach groups that government schemes have overlooked, which charities are better at working with, such as the unemployed, homeless people and migrants. Numeracy charities could learn from the recent attempts by the National Literacy Trust to improve attitudes to reading among low-income families. They could also raise awareness of numeracy among charities that work with people who could benefit from improved numeracy. These organisations should be encouraged to influence their clients so that they can embrace the opportunities to improve their skills.

However, running campaigns is difficult and expensive. Charities would need to think carefully about the aims of the campaign, and how best to carry it out. They would also need to raise sufficient funds to ensure that the campaign has the resources necessary to have an impact. NPC's report about social campaigning, *Critical masses*, includes a tool for planning and monitoring campaigns.<sup>51</sup>

### Improving coordination of numeracy work

There is some interesting charitable work going on across the country to improve numeracy skills. But many of the initiatives are local and struggle to expand. A charity could coordinate and map the work, for example, by sharing best practice, comparing approaches, and helping schools and colleges to understand which charitable intervention best suits their needs. It could also promote numeracy work, and raise its profile within the charity sector.

### Developing innovative solutions for secondary schools

We have been struck by the comparative lack of attention that charities pay to the numeracy education of secondary school pupils. We have come across few interesting and effective

initiatives for this age group, despite it being widely accepted that this is an important age—it is where maths turns from being fun and tactile to becoming abstract and less engaging. **Bowland Maths** and **IntoUniversity** run the only initiatives we came across that are specifically designed to make maths fun for secondary school pupils.

If more could be done to ensure that secondary school pupils are excited by mathematics and understand its relevance, they will leave school better placed to deal with numbers in the real world. The government is trying to build 'functional skills' into the secondary curriculum; charities could do more to help with this by developing innovative ways of helping pupils to learn functional numeracy.

However, the models used in primary schools may not work as well in secondary schools. For example, primary school pupils can relatively easily slip out of lessons for one-to-one tuition, but this is much harder for secondary school pupils—for practical reasons, and because of the embarrassment of needing extra help. However, there may be undeveloped opportunities in secondary schools, perhaps using a 'hook', such as sport. Funders may wish to explore whether there is potential for work to help struggling learners in secondary school. Speaking with teachers, head teachers and educational experts could help them to understand which initiatives could add value to the existing teaching of this age group.

### Boosting the number of specialist teachers

The 2004 government-commissioned independent inquiry into mathematics education for 14–19 year olds, the Smith Report, highlighted the shortage of specialist mathematics teachers. It estimated that there is a shortage of around 3,400 specialist mathematics teachers in state secondary schools in England.<sup>56</sup>

It is thought that many adult numeracy teachers teach other courses, such as literacy or a vocational course, with numeracy forming a smaller part of their work. In 2008, 30% of 24,782 Skills for Life teachers were numeracy teachers, whereas 40% were literacy teachers.<sup>41</sup>

The government is trying to boost the number of adult numeracy teachers through bursaries for people training to be mathematics teachers, and new qualification requirements for adult numeracy teachers. There is also a programme to fund maths specialists in primary schools, as recommended by the Williams Review, but it is not yet clear whether there will be enough people applying for the jobs.

In the United States, a nonprofit organisation, **Math for America**, has been founded to address similar issues. It tries to encourage ‘*mathematically sophisticated individuals*’—whether graduates or mid-career professionals—to teach mathematics in state schools in several cities. It provides recruits with funding for teacher training, and a significant stipend of up to \$100,000 over five years, on top of their teachers’ salary. The work is funded by a number of charitable foundations.<sup>52</sup>

We have considered whether such an initiative could be set up in England. While there is undoubtedly a need to recruit more skilled mathematicians into teaching, NPC believes that this should primarily be the government’s role. A scheme like Math for America is expensive, and charitable funders’ money could stretch further, and have a wider impact, by supporting some of the other initiatives suggested in this section. Also, while more maths teachers are needed, it is for mainstream education, rather than for helping children and adults who are struggling, which is where charities usually focus. Having said this, more and better maths teachers may result in fewer children struggling.

### Learning from the literacy sector

Everyone agrees that literacy and numeracy are both essential skills. Yet the charity sector has a much more developed approach to literacy than numeracy.

Some of the recent charitable numeracy initiatives have been developed off the back of literacy interventions—Every Child Counts and Catch Up Numeracy are both younger siblings of schemes to help children with their reading and writing. But there are still a great many more literacy-focused charities than numeracy ones.

For example, **Volunteer Reading Help** is a national charity that sends adult volunteers into 1,200 schools to have one-to-one reading sessions with struggling children to build their skills and confidence. Although there is a national initiative run by a consortium of businesses and community groups to encourage local partnerships to run ‘Number Partners’ programmes, they are much less common than literacy volunteering projects, and there is no national charity like Volunteer Reading Help. As already discussed, sending trained volunteers into schools could help to improve children’s attitudes to numbers and, potentially, increase their skills and confidence.

Another interesting literacy organisation is the **National Literacy Trust** (NLT). Founded in 1993, it plays a range of roles in promoting and improving the country’s literacy skills, from running projects with partners (such as libraries and prisons), to campaigning to improve public attitudes to literacy. It also shares research and

news about the literacy field with organisations and professionals working to improve literacy.

NPC has been particularly impressed by NLT’s success in reaching out beyond its core audience of literacy professionals, who are mostly teachers and librarians. NLT realised that its ‘target market’ must include people with poor literacy skills and attitudes if it is to have a substantial impact on the country’s reading habits.

So NLT started to target new audiences with poor attitudes to reading, such as white working class boys and Bangladeshi children. It realised that although the government—and even charities—often struggle to influence such groups, companies do not. NLT teamed up with brands that are well known among the target market, including Marmite, Iceland and Haven Holidays. For example, staff at Haven Holidays sites ran fun reading activities with families, and parents could pick up free children’s books at Iceland.

NLT began using this marketing approach in the National Year of Reading 2008, and has some impressive evidence of its impact. Surveys show that:<sup>53</sup>

- 70% of the target audience are now library members, up from 58% at the start of the campaign.
- 20% of parents from low-income households now read to their child every day, up from 15%.
- Over a quarter of fathers who read to their children now say that they read every day, up from 19%.

This approach could have a similar impact on people’s attitudes to numeracy, but it is not an easy task. NLT worked hard and invested considerable resources into analysing its market and building partnerships with the companies. And the charity dedicates much more resources to literacy than any one charity does to numeracy: its annual expenditure is around £3.7m.

### A National Numeracy Trust?

The numeracy sector lacks a unified campaigning voice focused on improving the numeracy of children and adults. Bringing together experts in the sector could create a powerful force to lobby government and influence policy. There is also a need to improve attitudes, and the sector could benefit from better coordination and sharing of best practice between different projects and initiatives.

Should a National Numeracy Trust be created to take on these roles? There is clearly a need for it. But the very nature of the sector—small, undeveloped and fragmented—means that there is no obvious charity to take on the role. If this new idea is to happen, it will need the support of experts and funders in the field. It is to funders that the next section turns.

The numeracy sector lacks a unified campaigning voice focused on improving the numeracy of children and adults.

# What can funders do?

Charities have a particularly important role to play when it comes to addressing improving numeracy skills, but there are few charitable initiatives that donors can choose to support, and even fewer that are likely to bring about the step change in the level of numeracy skills we need. Nevertheless, there are gaps where charitable funding could make a real difference.

## Priorities for funding

Few charities focus on numeracy, and where they do, the work is fragmented across many different organisations. If charities do need private funding for their work, they must be clear what it will be used for—for example, to further develop the initiative, to pay for an evaluation to document the impact of the project, or to help to provide services where schools cannot afford them.

It is important that charitable funding is not wasted on activities that should be supported by statutory bodies. For example, specialist tuition in schools is clearly the responsibility of the government and schools. Even if charities help with innovation and provision, the bulk of the funding should come from the government.

Yet there could be significant benefits if charities and charitable funders were to work together more in this area. Funders could help to:

- **Create more innovative ways to teach numeracy to secondary school pupils and adults:** There has been good progress when it comes to primary school children, but more thought needs to be put into engaging older children and adults. In particular, funders may wish to investigate what more could be done to ensure that pupils consolidate the numeracy skills they hopefully developed in primary school, and do not get put off maths when they enter secondary school.
- **Change attitudes and behaviours:** Many people need to be more motivated to improve their numeracy skills, especially if they have additional needs and are hard to reach, such as homeless or unemployed people.

- **Build a stronger and more coherent lobbying voice:** It is important that numeracy stays high up on the government agenda, and that provision for children and adults is better coordinated. It is also vital to bring about a shift in public attitudes so that people no longer see it as acceptable to be bad at maths. Otherwise, attempts to make a significant improvement in numeracy skills will probably fail.
- **Support targeted and local interventions:** The numeracy sector may not be well developed, but there are some existing efforts to build numeracy skills. Funders could support these charities to measure their impact and demonstrate more clearly the value they bring to society, which may help them to improve their work and to attract additional funds and grow.

## Building a new National Numeracy Trust

The greatest need in the sector is for a national campaigning voice and coordinating body focused on improving the numeracy of children and adults. Supporting the priorities above, enlightened funders could bring together experts in the numeracy to build a National Numeracy Trust, learning lessons from the literacy sector and following in the footsteps of the National Literacy Trust.

This new organisation could lobby government, hold government to account, and take on the challenge of changing attitudes towards numbers.

Funders should be aware that creating such an organisation would require considerable effort and resources, and they would need to be prepared to commit funding for at least three years to give it the opportunity to overcome any teething problems. It would also take some time to establish it as a legitimate, authoritative, representative voice.

But it would have the potential to bring about a step change in numeracy skills and transform people's skills and lives.

The greatest need in the sector is for a national campaigning voice and coordinating body focused on improving the numeracy of children and adults.



Photo supplied by Crisis.

# A final word

Poor numeracy makes people's lives more difficult and is damaging to the economy and to wider society. It can make people feel embarrassed and ignorant, unable to help their children with their homework or progress in their work. It has also been associated with school exclusions, truancy, crime, and other social, emotional and behavioural difficulties.

Yet around a fifth of adults in the UK do not even have basic numeracy skills, and negative attitudes towards numbers are widespread. People are happy to admit if they dislike maths and struggle with it, and this is a significant barrier to improving skills.

There is a great need to improve the country's numeracy skills, including changing people's negative attitudes towards maths and numbers. The government has started to address the issue, but its actions do not yet go far enough.

Charities have an important role to play, but the charitable numeracy sector is small, undeveloped and fragmented. There are few initiatives that funders can choose to support, and even fewer that are likely to bring about the step change in the level of numeracy skills we need. Nevertheless, there are gaps where charitable funding could make a real difference. In particular, there is a need for a new National Numeracy Trust to campaign about the issues and coordinate the sector.



Photo supplied by Ocean Maths.

# Appendix: Charities working to improve numeracy

## Every Child Counts

Every Child Counts is the best known charitable initiative in the numeracy field, working in schools to provide specialist teaching for young children struggling with numbers. It is a project of the Every Child a Chance Trust, a charitable trust supported by a range of businesses including The KPMG Foundation and Man Group plc Charitable Trust. It is also a partnership with the government and Edge Hill University.

Every Child Counts follows on from the Every Child a Chance Trust's success at developing a project for struggling readers, which the government has since provided funding to expand.

Every Child Counts sets out to help the bottom 5–6% of primary school children aged six or seven, whose mathematics skills have not improved, despite the National Numeracy Strategy. Its focus is on numeracy in its strictest sense: understanding number concepts and how to calculate with numbers, with a focus on applying these skills in different situations.

The project began in 2007, with a review of the existing initiatives to improve numeracy. It trialled a range of these in different local authorities and schools, then developed its Numbers Count intervention, by learning which elements made a difference. It tested this in 218 schools, and gathered evidence of its effectiveness.

## Content

Numbers Count is delivered by specialist, trained teachers who provide 30 minutes of one-to-one tuition every day for approximately 12 weeks, to six and seven year olds (year 2 in primary school) who have very poor numeracy skills. The work is done in a room dedicated to numeracy, with lots of games and resources to help with the teaching: a shopping area, counting beads, percussion instruments for playing while counting, number charts and so on.

The teachers who become Numbers Count tutors receive ten to twelve days of training in their first year, and five days in their second. They also receive regular coaching visits from specially trained staff based in the local authority and go on visits to observe Numbers Count teachers in other schools. Teachers work across one or two schools, focusing on delivering Numbers Count to the children who are really struggling, as well as sharing best practice across the whole school.

## Results

Throughout its development, Every Child Counts has prioritised the evaluation of its work. It measures both the change in the child's 'Number Age' and score in a numeracy test, and the change in children's confidence and attitudes. The results of the scheme are impressive:<sup>54</sup>

- Children's Number Ages were an average of 10.6 months behind their calendar ages when they began. After 2.9 months of extra tuition, the children made an average Number Age gain of 13.5 months—4.7 times the improvement that would be expected over this period.
- There was improvement in 91% of children's attitudes towards mathematics.
- There was evidence that children continued to make progress after completing their Numbers Count programmes. Six months after exit, their average Number Age had progressed by 7.5 months.
- Numbers Count is aimed at children who are unlikely to achieve their expected level without intervention, and 72% of children who completed their Numbers Count programme achieved the target when assessed.

The data collected is quite sophisticated: it can show differences in progress for different groups (for example, it works best for those starting with particularly poor numeracy problems), and it can show

the impact of the quantity of support (the number of lessons is correlated with greater gains up to a ceiling of about 45 lessons, or roughly nine weeks).

As well as this internally collected data, the Every Child a Chance Trust has advised government on commissioning an external evaluation from the Universities of York and Durham. This will, among other things, compare the difference between pupils on the programme and control groups of children receiving different support in pairs or threes, or receiving no support at all. The Trust is also investigating the impact of using less intensive programmes alongside the expensive one-to-one tuition from specialists.

Over 2,500 children received Numbers Count tuition in the pilot year (2008/2009), across over 200 schools and 27 local authorities. The programme is expected to reach a total of 15,000 children between 2008 and 2010.

## Funding

The Every Child Counts research and development phase, running to September 2010, has been supported with charitable funding raised by Every Child a Chance Trust from businesses and donors (around £5m). The Department for Children, Schools and Families (DCSF) budget for the research and development phase was £18m.

Schools have been able to match-fund this external investment, but securing match-funding is becoming more difficult as budgets tighten, so the Trust is trying to link schools to philanthropists and local businesses to provide funds and enhance the programme to promote parental involvement.

The ongoing cost is likely to be very high: the Trust estimates that it will cost schools and local authorities (who use their funding from central government) around £2,600 per child. DCSF cannot corroborate this figure, although NPC does not know what the DCSF calculations show. In spite of the high cost, the Trust believes the investment is justified because of the costs associated with poor numeracy skills: it estimates that the total lifetime costs of a cohort of 35,843 children with very low levels of numeracy could be up to £2,389m compared with a cost of £89m to provide them with additional support (see Box 3 in Chapter 1).<sup>14</sup>

In October 2009, the DCSF announced that it would continue to support the project, to allow it to reach 30,000 of the lowest achievers each year (which is roughly 5% of the year group) from September 2010.<sup>5</sup>

## Catch Up Numeracy

Catch Up Numeracy is another well-documented charitable intervention in schools, which, like Every Child Counts, trains staff working in primary schools to deliver support to pupils, but through a less-intensive intervention.

Catch Up Numeracy is a project of a charity called Catch Up (registered as the Caxton Trust). Similarly to Every Child Counts, the programme was developed after the charity's success in creating a reading intervention, Catch Up Literacy.

The charity secured funding from the Esmée Fairbairn Foundation to fund the initial research and development of the initiative, and formed a partnership with the Oxford academic, Ann Dowker, whose research has focused on helping children with numeracy difficulties.

Dowker's research had found that people are not just 'good' or 'bad' at arithmetic. There are lots of different components of arithmetic ability, including counting, memory for number facts, use of written arithmetic symbols, and estimation. Children can have weaknesses in one or more areas, but be able to cope with other areas.<sup>13</sup> To help struggling learners, tutors therefore need to work out which components children can and cannot do, and target their weaknesses.

## Content

Dowker and Catch Up developed a training programme for children aged between seven and eleven who are struggling to keep up with mathematics, based on the principles that:

- Different children have strengths and weaknesses in different elements of numeracy.
- With sufficiently comprehensive training and framework, teaching assistants (or teachers) can assess children's skills.

- If trained teaching assistants follow a well-designed programme, they can improve children's numeracy skills almost as well as a specialist teacher. This is a controversial assertion in the field of mathematics education, but one that the charity would like to investigate in more detail when funding is secured.

The charity trains teaching assistants and teachers in how to assess and teach children numeracy. A key part of the training is practising: the training is ideally over three consecutive mornings, with the idea that the participants begin to apply their new skills in the afternoon. The training is accredited, and therefore counts towards their professional development.

Children receive individual teaching from trained staff in their school, in 15-minute slots, twice a week, for one term or more if they need it. Each staff member supports around five children. The sessions include games and activities targeted at improving the skills they struggle with, and are designed to make use of readily available materials and resources.

## Results

When testing the intervention, Catch Up collected data on pupils' performance before and after teaching, and also tested two control groups: one of pupils receiving the same amount of one-to-one individual maths work, focusing on what had been done in class; and one of pupils receiving no intervention. The mean 'ratio gain' is calculated from the average increase in numeracy skills of the group, compared with what would be expected:<sup>13</sup>

- Catch Up intervention children showed a ratio gain of 2.2.
- Those who received a matched time intervention showed a ratio gain of 1.47.
- The children who received no intervention showed a mean ratio gain of 1.25.

This shows that, as expected, any individual attention—and even just being part of a study—has some effect on achievement. But children receiving the Catch Up intervention made over twice the expected progress. This is not as high as the progress by Every Child Counts (4.7), but is impressive for a much less intensive programme.

## Funding

The Esmée Fairbairn Foundation put £300,000 towards the initial development of the project, which Catch Up subsidised with its profits from the literacy scheme. The charity now sells the training: schools or local authorities pay for their staff to be trained to deliver the intervention: it costs £299 per trainee. The charity is looking for more charitable funding to further test and improve the product.

It has so far trained over 2,000 teachers and teaching assistants across 38 local authorities.

It estimates that the cost per child per year is £60 for the first year, and negligible in subsequent years. While this includes all the training costs, it does not cover a proportion of the teaching assistant's salary. Including a teaching assistant annual salary of around £10,000, we estimate that the total cost would double to around £120 per child.

Catch Up Numeracy is committed to improving the programme and increasing its evidence base. It is therefore hoping to do further studies to work out what works best, for whom, and why. For this, it needs funding.

## Tower Hamlets Education Business Partnership

For over ten years, the charity Tower Hamlets Education Business Partnership (THEBP) has been sending employees from local businesses into schools to help children with their maths, through its Number Partners programme. Over 500 volunteers currently visit over 40 schools (mostly primary, but some secondary) across the deprived London borough of Tower Hamlets.

## Content

Volunteers receive 90 minutes of training at their office. This covers both general lessons about working with children, and training on how to deliver the Number Partners programme. Volunteers then visit local schools for half an hour every week, to play numbers games with children. The school decides which children would benefit most from the volunteers' time: some focus support on those who are struggling to keep up or who need their confidence boosted; others use it as an opportunity to push children who are doing well in the classroom.

## Results

THEBP does not collect data about the impact of Number Partners. In 2002, one of its funders, SHINE Trust, paid for an evaluation to try to assess the project's impact. The evaluator struggled to collect the data needed to say anything definite about impact, but there was some evidence of numeracy improvement, as well as improved levels of attendance amongst pupils with business partners. The charity does have plenty of anecdotal evidence from teachers at the schools, who believe that the work is making a difference. As one school teacher reported:

*'For me, the benefits are as much to do with motivation, communication skills, broadening of horizons as with skills as such, but there are definitely improvements in all areas.'*

## Funding

Number Partners receives funding from a range of sources, including employers, grant-making trusts and some from statutory funders.

Other education/business partnerships across the country run similar schemes. In 1991, a consortium of organisations—including THEBP, Business in the Community and several companies—launched National Number Partners to promote the development of similar schemes across the country. It runs a website providing advice on running a programme, and provides resources for volunteers to use with children.

## Crisis

Crisis is a charity that works with single homeless people. One of its aims is to improve the learning and skills of homeless people. From two buildings dedicated to learning—the Skylight centres—in London and Newcastle, it provides a range of activities, such as drama, gardening and bike maintenance.

Crisis also offers accredited qualifications in some basic skills, including numeracy. The courses are delivered in the centres by the charity's own tutors, in small groups of up to ten people. The charity finds it hard to attract people to its literacy and numeracy courses, but around 40 people took the numeracy course in its London centre in 2009.

The tutors focus the course, called Maths for Life, on everyday numeracy skills. Within classes, they try to personalise the course towards individuals' needs. For example, if someone is doing Maths for Life with a particular vocational course in mind, teachers will try to make sure that they are focusing on the aspects of numeracy that are most relevant for that learner.

Given that Crisis works with vulnerably-housed people in inner cities, it is no surprise that a large number of its learners are learning English as a second language. They may be attending numeracy classes not to improve their numeracy skills, but to learn numeracy in English.

Crisis also lobbies government and undertakes research about issues facing homeless people. In 2006, it published a research report, *Missed opportunities*, which made the case for investing in the skills of homeless people, and highlighted the difficulties charities face in trying to get statutory funding for delivering classes to homeless people.<sup>55</sup> Crisis funds its numeracy work with fundraised income.

## Ocean Maths

Ocean Maths is an interesting charity that helps schools to involve parents in pupils' maths education. It grew out of a regeneration project in the Ocean Estate in Stepney, east London. The local schools were concerned about improving their pupils' maths results, and wanted to increase the involvement of parents (or other guardians) in their children's education.

## Content

Ocean Maths was developed in 2001 to meet both these needs. It now offers a range of services to schools, but its original model was to provide:

- **Maths workshops involving parents:** Parents of a whole class or even year group of children (mostly primary school or early secondary) are invited to attend a workshop of maths games in school, led by a maths teacher or Ocean Maths worker. Attendance by parents is high (though the charity and schools have had to work hard at this), and the events are fun and exciting.

- **Homework resources:** After the workshop has engaged parents' attention, Ocean Maths provides teachers with a range of homework materials that are designed to be shared by pupils with their parents.
- **Training for teachers:** In order that the impact of Ocean Maths' work is long lasting, it trains teachers to be able to continue to deliver the work.

Ocean Maths aims to improve both children's and their parents' maths skills, and to increase parents' engagement in their children's education.

The model is designed to be flexible enough to take into account individual children's situations: if they cannot get a parent or other adult to attend the workshop, children just team up with each other. If they cannot find a guardian willing to do their homework with them, they can take it to the school's homework club.

When Ocean Maths was first set up, schools received quite intensive support from the charity—Ocean Maths would not only run the workshops, but also monitor which children attended the workshops, sometimes get in touch with parents who were not attending, and even assess their homework to see if they were making progress. Now the charity sells a range of services to schools and local authorities, ranging from the full model, to just providing training for teachers to deliver it themselves, depending on what they need and can afford. For example, some secondary schools wanted to motivate their GCSE pupils who were performing poorly but thought capable of achieving better grades.

## Results

Ocean Maths is renowned for its success at engaging parents and improving maths results in the schools in which it works in east London. For example, several of the schools have seen substantial increases in the maths results of pupils after Ocean Maths started working with their pupils and families. One primary school saw the number of 11 year olds reaching the expected standard rise by 45%.<sup>56</sup> There are, as usual, difficulties in assessing to what extent this improvement is the result of Ocean Maths' work and not other initiatives. But the teachers themselves think that Ocean Maths has been an important contributing factor. Understandably, it is not able to systematically measure progress in parents' skills, but it has anecdotal evidence of their increased engagement in their children's education.

The initial success of Ocean Maths is particularly impressive given the disadvantaged area where the project was developed: the Ocean Estate has widespread unemployment and very low educational attainment, and 90% of the population are of Bangladeshi origin.

Since the project has started to establish itself as an independent charity having to raise its own income from a range of sources, rather than a local government-funded project, it has found it harder to assess its overall impact. It has several evaluations from the past few years, but these often describe the original incarnation, where schools were receiving intensive support from Ocean Maths for free. For example, its workers used to monitor the attendance and progress of each pupil participating, but they are often no longer able to be involved as intensely, and they now rely on training the school teachers to monitor impact instead. The charity could benefit from help to evaluate whether its less-intensive approach makes as much of a difference as its earlier work.

However, it does have clear evidence that its recent, specialist projects are having a measurable impact. Since 2008, the SHINE Trust has been funding Ocean Maths to work intensively with very poorly-performing primary school students and their parents. In Year 4, none of the group of students was initially reaching the expected level in numeracy, but by the end of the year, 72% were at or above the expected standard. Also, its work with GCSE students who were predicted to get grade Ds resulted in two thirds of them achieving grade Cs and above.

Ocean Maths is a very small charity, working in around 30 schools a term, mostly in London. It is keen to expand its work to other areas.

## Bowland Maths

The Bowland Charitable Trust has created a programme of exciting case study problems for teachers to use to teach mathematics to secondary school pupils.

The Trust wanted to improve the population's mathematics skills, so it recruited a former civil servant with experience in education to review the issue. He identified that many pupils lose interest between the ages of 11 and 14, partly because mathematics teaching becomes more abstract and less engaging, and teachers struggle to make maths exciting at that level.

The Trust decided to develop some new teaching materials to inspire children. It placed an advert in The Times Educational Supplement and the New Scientist asking for ideas that could form the basis of in-depth case studies to teach maths in the first years of secondary school. The response was impressive, and 250 people submitted their ideas. With matched funding from the DCSF, the Trust supported the development of 18 case studies that can be seen on its website ([www.bowlandmaths.org.uk](http://www.bowlandmaths.org.uk)).

The Trust put a lot of effort into ensuring that the case studies are high quality (they look like computer games), and that they work in the classroom. The case studies require pupils to solve maths problems in real life situations where maths could be used. For example, in one case study, pupils play the role of workers at an international aid agency, working out levels of water availability per capita in a range of countries to determine which countries need the most help.

The Bowland Maths case studies are designed to be taught over several lessons, and test different elements of mathematics. They were launched in 2008. Almost every local authority across the country has ordered free copies for their schools.

Although they have only been available for just over a year, the Bowland Maths case studies are already very well known and much talked about. As yet, there is no formal data about usage and impact, so the Trust is commissioning a survey to assess how many people are using them, and how they are changing mathematics teaching.

The case studies cost over £3m to develop, because the Trust was keen to ensure that they were very high quality, so substantial efforts were put into developing and testing the software. The Trust initially came up with the idea and the funding, and was successful in securing match-funding from the government to support the project.

The Bowland Charitable Trust is now keen to develop further case studies (such as one about sport, which will be a common theme in schools with the Olympics coming up in 2012), and is also developing programmes that can help teachers to assess pupils' skills in a fun, engaging way.

## Companies selling services and resources in this field

As well as charities, private sector companies help schools and colleges to improve how they teach numeracy. They sell textbooks, resources, tools and services to teachers to use as part of their lessons. These include:

- **Computer interventions:** For example, RM Maths is a computer programme that gives pupils 15 minutes of individualised maths support a day. Manga High is a new set of games developed for use in the classroom that challenge pupils' maths skills.
- **Multi-sensory apparatus:** For example, Numicon Maths Shapes, which pupils play with to make patterns and understand how numbers fit together. A term-long programme for helping struggling children using Numicon has been developed as part of the Every Child Counts programme.
- **Sports and dance:** For example, Dance Equation is a company that uses dance to bring numbers to life.

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# Other NPC publications

## Published research

Research reports are focused on specific areas of charitable activity in the UK unless otherwise stated.

### Community

- **Trial and error:** *Children and young people in trouble with the law (2010)*
- **Breaking the cycle:** *Charities working with people in prison and on release (2009)*
- **Short changed:** *Financial exclusion (2008)*
- **Lost property:** *Tackling homelessness in the UK (2008)*
- **Hard knock life:** *Violence against women (2008)*
- **When I'm 65:** *Ageing in 21<sup>st</sup> century Britain (2008)*
- **Not seen and not heard:** *Child abuse (2007)*
- **A long way to go:** *Young refugees and asylum seekers in the UK (2007)*
- **Home truths:** *Adult refugees and asylum seekers (2006)*
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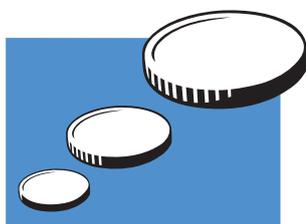
### Improving the charity sector

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# New Philanthropy Capital

New Philanthropy Capital (NPC) is a consultancy and think tank dedicated to helping funders and charities to achieve a greater impact.

We provide independent research, tools and advice for funders and charities, and shape the debate about what makes charities effective.

We have an ambitious vision: to create a world in which charities and their funders are as effective as possible in improving people's lives and creating lasting change for the better.

- For charities, this means focusing on activities that achieve a real difference, using evidence of results to improve performance, making good use of resources, and being ambitious to solve problems. This requires high-quality leadership and staff, and good financial management.
- For funders, this means understanding what makes charities effective and supporting their endeavours to become effective. It includes using evidence of charities' results to make funding decisions and to measure their own impact.

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## New Philanthropy Capital

3 Downstream 1 London Bridge London SE1 9BG

t: +44 (0)20 7785 6300 f: +44 (0)20 7785 6301

w: [www.philanthropycapital.org](http://www.philanthropycapital.org) e: [info@philanthropycapital.org](mailto:info@philanthropycapital.org)

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