



nationalnumeracy.org.uk

Interim report

PARENTAL ENGAGEMENT AND FIRM FOUNDATIONS
FOR ALL

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Signature:

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Date: 01/04/14

Section 1: Aims of the project

There are two inter-related elements: Parental Engagement and Firm Foundations for All. The aims, as agreed by National Numeracy and the Paul Hamlyn Foundation (PHF) are to:

1. Complete an analysis of the need, and develop a clear understanding of current and potential new pedagogical approaches and resources to help low attaining adults to develop their numeracy skills, including an understanding of the potential benefits of, and issues with, using a structured approach to teaching 'number sense' to adults (with findings and recommendations to be documented in a report).
2. A new approach to supporting low attaining adults to develop their numeracy has been developed and trialled, with the impact and efficacy of the approach evaluated and reported on.
3. National Numeracy has completed a review of current resources and support to enable parents to engage more positively in their children's maths education and improve their own attitudes to and understanding of everyday maths as a result (with findings and recommendations to be documented in a report).
4. Promising approaches to support parental engagement in numeracy have been identified and trialled, with the impact and efficacy of the approach(es) evaluated and reported on.
5. Recommendations have been made for how National Numeracy and other organisations can best take forward the most promising approaches identified for helping low attaining adults and parents to develop their numeracy skills, including recommendations for scaling up effective practice.

This interim report covers points 1 and 3, from here on referred to as 'Phase 1'.

Section 2: National Numeracy

2.1 After a very promising inaugural year, National Numeracy grew as an organisation during 2013, expanded its activities and spread its message to yet more audiences. We have developed new partnerships and forms of collaborative working, and launched our first major long-term project designed to have a practical impact on low levels of numeracy – the National Numeracy Challenge – on March 12th 2014.

Below is a summary of our progress and main focuses since applying for PHF funding in July 2013:

Practical projects

- Launched the National Numeracy Challenge; a five-year UK-wide project aiming to improve the numeracy of a million adults. Central to the Challenge is the Challenge Online; an interactive, adaptive programme designed to help adult learners improve their everyday maths confidence and skills.
- Worked with eight schools in the second year of Raising Achievement, a three-year London-based pilot project to improve the engagement and progress of children aged 7 to 9.

Communications and influence

- Continued close contact with officials at Whitehall government departments (BIS, DfE, DWP) and established contact with devolved administrations, with meetings in Glasgow, Cardiff and Belfast.
- Expanded range of contacts in education, business and third sector, increasing interest in the issue of numeracy and bringing in new support for National Numeracy.
- Established a Numeracy Forum, aimed at spreading ideas among all those with an interest in maths and numeracy, and held inaugural meeting.
- Supported the launch of a new All Party Parliamentary Group on Maths and Numeracy, for which we were joint co-secretariat with ICAEW.

Research and evidence

- Increased further the range of research findings available on the website.
- Commissioned and published a third YouGov poll on attitudes to maths and numeracy.
- Began discussions with the Cabinet's Behavioural Insights Team on developing new approaches towards encouraging people to improve their numeracy.
- Worked with Pro Bono Economics to produce a report on the high cost of outcomes associated with low levels of adult numeracy in the UK.

Organisation and funding

- Established a trading arm, National Numeracy Solutions Ltd, which acquired the maths education consultancy, training and school improvement business, National Mathematics Partnership.
- Elected a new Chair, David Frost CBE (formally appointed to the Board and chairmanship in January 2014).
- Been awarded two separate grants totalling £598,000.00 in Challenge restricted funding by the department for Business, Innovation and Skills (BIS).

2.2 As the above summary demonstrates, the activity funded by the PFH is entirely relevant to the current and intended future work of National Numeracy:

The Firm Foundations for All strand directly relates to, and falls under the umbrella of, the Challenge – the 'nationwide drive to improve numeracy skills'.

The Challenge Online best meets the needs of adults working at roughly Adult Skills Entry Level 3 – Level 2. A definition of the skills levels can be found in Appendix 13a. The Firm Foundations for All aims to support those working at below Entry Level 3 in numeracy. We hope that these adults will then be able to continue improving their numeracy with the Challenge Online should they wish to do so.

The Challenge has attracted significant media interest and we expect to reach over a million participants in the next five years, through working with a variety of partner organisations and individuals. The Firm Foundations for All can build on the success of the Challenge and, through already established channels as well as new partners, reach learners who are most in need of support.

The Parental Engagement strand also directly links to the Challenge. We have partnered with a number of schools/online organisations who are/will be offering the Challenge Online to parents/carers. In 2013, we took part in the BBC's CBeebies Summer Roadshow, attended by 123,000 people (parents and children). National Numeracy appeared at all eight venues in England, Scotland, Wales and Northern Ireland and distributed 10,000+ leaflets. We have developed the parents section on the National Numeracy website, and we now version our quarterly newsletters for parents and learners, teachers and tutors/other.

Both strands are complemented by the range of our communication and research activities. We strive to raise the profile of numeracy; key progress recently being the establishment of the Numeracy Forum and acting as co-secretariat of the new APPG on Maths and Numeracy. Through raising the profile of numeracy we attract interest to all of our projects.

Through working with others such as Pro Bono Economics and the Behavioural Insights Team, as well as commissioning polls through YouGov and monitoring other research in the field, we aim to be at the forefront of research surrounding maths and numeracy. These findings inform and affect the direction of our PHF funded work.

2.3 National Numeracy has had a successful 6 months. As a growing organisation, we have increased staff numbers at the headquarters in Lewes, in order to meet increasing demand for our services.

It has been a significant task to secure further Challenge Online funding in addition to that already committed but this has now been achieved in the form of two grants totalling £598,000.00 in Challenge restricted funding from BIS.

2.4 How healthy are the overall organisation finances at the present time?

The overall finances of National Numeracy are considered healthy for a charity of two years old. The core reserves figure stands in the region of £200,000 at the end of 2013. We have proposed unrestricted income in 2014 of £237,000 against proposed expenditure of £110,000. This is in line with our aim of establishing a free reserve of one to two years' expenditure to guard against inevitable fluctuations in funding streams. In addition we have restricted income assigned to specific projects of £675,000 for 2014. We are delighted with the growth the charity has shown in such a short space of time.

2.5 National Numeracy has established a number of new partnerships, mainly through the Challenge. For a list of key Challenge partners, see Appendix 13b.

For a list of key partners through Maths4Us, see <http://maths4us.org/partners/>

2.6 We are meeting the objectives of our 2013-2015 strategy. This is attached separately as the format is unsuitable for the Appendix.

2.7 We aim to influence the wider policy context; we have been a part of the creation of a new All Party Parliamentary Group on maths and numeracy. Additionally we have submitted evidence to the Select Committee on Business, Innovation and Skills: Adult Literacy and Numeracy. A copy

can be found in Appendix 13p. Off the back of this, our CEO Mike Ellicock then gave oral evidence. We have also submitted consultation responses to the Department for Education (DfE), and met Parliamentary Under Secretary of State for Education and Childcare Elizabeth Truss regarding the primary national curriculum and GCSE reform.

Section 4: Activities – Parental Engagement

Note re terminology

When we refer to ‘parents’ we mean both mothers and fathers; these include both natural or birth parents as well as step-parents and parents who do not live with their children, but have contact with them and play a part in their lives. ‘Parents’ also includes grandparents, foster parents, and others in significant caring roles.

3.1 The agreed outcome for Phase 1 was:

National Numeracy has completed a review of current resources and support to enable parents to engage more positively in their children’s maths education and improve their own attitudes to and understanding of everyday maths as a result (with findings and recommendations to be documented in a report).

An overview of the findings and recommendations can be found in Appendix 13e

A full analysis of the findings and recommendations can be found in Appendix 13h.

3.2 Activities carried out during Phase 1 in order to meet agreed outcome:

- National Numeracy CEO Mike Ellicock and National Numeracy Solutions Director Lynn Churchman recruited Pedagogy Expert Sue Skyrme to lead on this research, and Independent Consultant Di Hatchett to assist in co-ordinating the project. The biographies of those involved can be found in Appendix 13n.
- Data was collected through desk and field research, as well as the consultation of an expert group.
- Recommendations workshop to review findings and scope out Phase 2.

3.3 Desk research

Sue conducted a thorough review of academic research and current schemes and projects in the field of parental engagement. Bibliography in Appendix 13g.

3.4 Field research – focus groups

We ran focus groups at schools in:

- Isle of Wight
- Birmingham
- Grimsby
- Bristol
- Weston-Super-Mare
- London

We aimed for regional diversity - making sure to reach urban and rural - and to reach those in areas of deprivation. We used the 2010 Indices of Deprivation to pinpoint deprived areas. In Phase 1 we spoke to over 100 parents and we are planning to run two more groups in Phase 2 of the

project. National Numeracy wanted to find out about participants' feelings towards maths, what prevents parental engagement, and what kind of support participants would like to see made available. A summary of focus group findings can be found in Appendix 13f.

3.5 Field research – surveys

We initially designed four online surveys, for parents, teachers, secondary students, and (older) primary students. We had a far higher uptake of the parent and teacher surveys and will focus on these findings within this report. In the parents' survey, we asked parents to answer a number of questions about their engagement with children's acquisition of numeric skills, as well as of their own confidence with this set of basic skills. Questions are in Appendix 13h, and findings are analysed in Appendix 13g.

At the point of analysis for this report, we had received 168 responses by parents. This is not a random sample; we used the following channels to gather responses: Mumsnet, Twitter, Facebook, the networks of our Expert Group members, and the networks of schools with which we have previous interaction. Mumsnet accounted for 75 responses, social media for about 30.

In this survey, we asked teachers to answer a number of questions about their opinions on parental engagement and its' efficacy, as well as their insights into barriers and support wanted. Questions and findings in Appendix 13h. At the point of analysis for this report, we had received 53 responses by teachers. This is not a random sample; the majority of the respondents of this survey are from two schools who are part of the project – either we ran a focus group there or they have a representative on the expert group.

We will continue to distribute these surveys throughout Phase 2, in order to strengthen this aspect of the research evidence.

3.6 Consultation – Expert Group

At the beginning of the project we established the Parental Engagement Expert Group. The purpose of this group is to bring together and learn from a variety of specialisms, interests and experience in parental engagement, in order to inform our thinking behind new resources and approaches that help to support parents in engaging with their child's mathematics education and everyday maths.

We recruited 13 experts, and one more member will be added before the second meeting. A full list of the members and the Terms of Reference for the group can be found in Appendix 13c.

In this period we conducted one expert group meeting. The second took place on March 26th and will feature in the final report. The purpose of the first meeting was:

- To share perspectives on the key issues to be addressed in securing effective involvement in their children's learning for all parents.
- To share participants' experiences of both successful and less successful strategies for parental involvement.
- To share thinking on potential innovative approaches in this area.

Section 4: Outcomes – Parental Engagement

The agreed outcome for Phase 1 was:

National Numeracy has completed a review of current resources and support to enable parents to engage more positively in their children's maths education and improve their own attitudes to and

understanding of everyday maths as a result (with findings and recommendations to be documented in a report).

4.1 At this point in the project, activities have been monitored and evaluated by the Project Manager and Pedagogy Expert, as highlighted in the application.

In order to meet this outcome we aimed to:		We have met these aims in the following ways:
1	Conduct a thorough review of the current parental engagement landscape.	National Numeracy has engaged with a large number of research pieces, resources and support. Members of the Expert Group also suggested research pieces. We have a clear idea of the impact and benefits of parental engagement. We are aware of a variety schemes, websites and projects that operate in the UK and abroad, particularly the US.
2	Conduct field research in a variety of locations in the UK.	Our focus groups have been regionally diverse. In order to ensure that we have spoken to parents outside of England, we have arranged a focus group in Wales for April.
3	Conduct field research with at least 80 parents from a variety of socio-economic groups.	We have spoken to over 100 parents in person and have received over 150 parent surveys. We aim to increase these numbers in Phase 2. We added extra depth to our research by also speaking to children and teachers, and have received over 50 teacher surveys.
4	Consult experts in the field of parental engagement.	We initially set criteria for potential experts to be matched against. We then approached suitable candidates. We plan to make contact with other experts in Phase 2.

4.2 The agreed outcome has been met.

Section 5: Outcomes – Parental Engagement

Focus groups were largely well attended. Good additional data was gained from groups with pupils and talking to staff – this also made travelling long distances more worthwhile as we were able to run two or three sessions per location.

The surveys proved to be useful and allowed us to add quantitative data to the qualitative data collected through focus groups. We were able to develop a clear idea of the demand for parental engagement. Full findings in Appendix 13g. Mumsnet agreed to post the link which increased survey uptake.

We were pleased with the experience and insights of Expert Group members, and consider them to be a great asset to the project.

5.2 What difficulties did we encounter? How did we try to overcome these?

Desk research

Difficulty:

- Very large volume of available research and already established parental engagement schemes.

Attempt to overcome:

- We built a large database from which the Pedagogy Expert could then identify and select most relevant resources. The Pedagogy Expert also made use of parental engagement literature reviews.

Field research

Difficulty:

In organisation of focus groups, schools were at times difficult to get hold of and there was one instance of miscommunication between a school organiser and school receptionist which led to over 70 parents attending a session!

Attempt to overcome:

Ensuring that we were explicit in what we were asking for (including explaining what we did not want), and by speaking to the contact at the school on the phone as well as email to ensure we were on the same page.

Difficulty:

On the opposite end of the scale, there were at times difficulties getting parents to attend focus groups; our lowest turnout was two parents, in Grimsby. It was also difficult to attract the most disengaged parents or the 'hard to reach' – we often ended up talking to parents who already felt fairly confident about maths/engaging with the school.

Attempt to overcome:

- We offered £10 vouchers to participants, and some schools also rang parents to ask them to join the session.
- We ran groups in areas of deprivation in order to try and reach the 'hard to reach'.
- Schools advertised the session as an informal session in order to try and reach those who do feel anxious about maths.
- Creation of the parent surveys

Difficulty:

Parents tended to focus heavily on the barriers caused by the new methods used in school maths.

Attempt to overcome:

Steer the conversation away from heavily focusing on this.

Difficulty:

Due to the restrictions of timetables, we were unable to get as much time face to face with teachers as we would have liked.

Attempt to overcome:

Creation of the teacher surveys.

Difficulty:

Primary schools also often selected the most engaged and articulate pupils to talk to us.

Attempt to overcome:

In secondary we were able to request to speak to lower sets.

Difficulty:

We were disappointed with the uptake of surveys and would have liked to reach more parents. We are also aware that online surveys will not reach those who do not have access to the internet.

Attempt to overcome:

We distributed surveys through all National Numeracy social media channels, the Expert Group, involved schools and other online partners such as Mumsnet and PTAsocial.

Expert Group

Difficulties:

- Managing expectations and quality assurance
- Managing people and organisations that compete in the same space.

Attempts to overcome:

- Clarity with responsibilities and expectations involved with being part of the group, as seen in the Terms of Reference, Appendix 13d. Emphasising these where necessary.
- Emphasising collaboration, in particular on a shared aspiration to engage more parents positively in maths.

Section 6: Planning – Parental Engagement

The agreed outcomes for the end of Phase 2 are.

1. Promising approaches to support parental engagement in numeracy have been identified and trialled, with the impact and efficacy of the approach(es) evaluated and reported on.
2. Recommendations have been made for how National Numeracy and other organisations can best take forward the most promising approaches identified for helping low attaining adults and parents to develop their numeracy skills, including recommendations for scaling up effective practice.

In the work plan that was enclosed within the application we also outlined that we would like to produce a parents' microsite as one approach to be trialled.

6.1 The experiences and progress of Phase 1 have reinforced rather than changed how we plan to conduct Phase 2. We will continue to develop and trial parents' microsite, and findings from Phase

1 have informed the structure and content of this site, and well as informed other non-online approaches.

Off the back of the research findings, we will develop a selection of approaches – universal, targeted and bespoke - that serve to break down barriers to parental engagement in maths, recognising that ‘one size does not fit all’.

We plan to trial these approaches and, at the end of Phase 2, make recommendations for scaling up effective practice.

A full analysis of the findings of Phase 1 and subsequent implications for Phase 2 can be found in Appendix 13g.

6.2 Phase 2 Plan

Aims and outcomes

- Break down barriers to parental engagement
- Make connections to and bring together best currently existing materials/guidance/support
- Parents recognise and implement a number of strategies to improve their engagement
- More parents are actively engaged with their child’s learning of maths
- Pilot schools have developed a plan that includes universal, targeted and bespoke approaches
- Parents who continue to experience barriers related to accessing the school still have access to resources
- Pilot schools have established the routine of the Maths Challenge
- Impact has been measured
- Recommendations for scaling up effective practise have been made

	Key Activities and Outputs	Completed by
1	Microsite (title TBC) to include resources, information, and signposting in relation to effective approaches that break down barriers in parental engagement with maths. - Criteria for resources which are signposted. - Auditing tool to aid partners in choosing approaches suitable for them/their community.	15/07/14 15/04/14 30/06/14
2	Leaflet prototype that schools/community centres etc. can download from the microsite and populate themselves.	1/07/14
3	Weekly Maths Challenge Scrapbook	01/09/14
4	4-8 pilot projects trialling the above outputs	July-December ‘14

- The site will cater for parents and schools/community centres/other organisations working with parents.
- Parents can use the ‘parent section’ for advice on helping their children feel positive about maths, signposting out to explanation of the methods, and ideas for activities both in the home and ‘out and about’.
- The microsite offers support in 3 age groups – 5s and under, 6-9s, 10-13s.

- Supportive resources for parents are split into – conversational, real life activity, online activities.
- Schools/community centres/other organisations can use the ‘school/other section’ (title TBC) to develop a programme of parental engagement matched to the unique nature of their community. The website will include advice for universal, targeted and bespoke support.
- To include recommendations for a ‘parent champion’.
- The Challenge will be signposted to from the microsite.

Leaflet – more information

This will have some locked (uneditable) and some unlocked text/picture areas.

Schools/communities are encouraged to add their logo and also activities that can be done in their town/area.

Weekly Maths Challenge Scrapbook – more information

Distributed through partners, the scrapbook will contain weekly challenges that encourage parents and children to work together to solve everyday maths problems. The problems are linked to significant events on the school calendar. This scrapbook also contains some of the information from the leaflet.

Pilot projects - more information

Within the pilot National Numeracy will help schools/community centres/online (e.g. PTAsocial)/other organisations to set up their own parental engagement in maths programme. We will source these pilot partners through schools who have been involved in the research phase/got in touch expressing a wish to be involved in the pilot/recommendations of willing participants from colleagues.

6.3 Measuring impact

We will administer surveys at the end of the project, as well as interview partners and parents. As outlined in the application, the Pedagogy Expert will continue to monitor and evaluate the projects, rather than incorporate external evaluation at this stage.

Section 7: Activities – Firm Foundations for All

The agreed outcome for Phase 1 was:

National Numeracy has completed an analysis of the need, and developed a clear understanding of current and potential new pedagogical approaches and resources to help low attaining adults to develop their numeracy skills, including an understanding of the potential benefits of, and issues with, using a structured approach to teaching ‘number sense’ with adults.

An overview of findings and recommendations can be found in Appendix 13j.

A full analysis of the findings can be found in Appendix 13m.

7.1 Desk research

The Pedagogy Expert conducted a thorough review of research in the field of adult numeracy. Bibliography in Appendix 13m.

7.2 Field research - focus groups

We ran three focus groups with low attaining learners:

- A group of bottom set year 11s at an East Sussex High School.
- A group of young people enrolled on Prince's Trust programmes in Chatham, Kent.
- A group of prisoners (who were also teaching assistants) at HMP Oakwood, Wolverhampton.

We ran another session on March 27th, with a group of adults enrolled on an Adult Numeracy course at an independent adult education organisation - the Friends' Centre, Brighton. Findings from this will be outlined in the final report.

We also conducted a session with a group of Citizen's Advice Bureau Financial Capability tutors.

We ran learner focus groups using an initial statement sorting activity to draw out participants' feelings and opinions around competence and confidence with maths, attitudes to maths, and understanding of the relevance and value of maths.

Focus group questions can be found in Appendix 13k. A focus group findings summary can be found in Appendix 13l.

7.3 Expert Groups

At the beginning of the project we established a Firm Foundations for All Expert Group. The purpose of this group is to bring together and learn from a variety of specialisms, interests and experience in adult numeracy, in order to inform our thinking behind new resources and approaches that help to support adults in developing conceptual understanding in mathematics.

We recruited 10 Experts initially, and another 1 was added before the second meeting. The group comprises of those who work with adult learners, those with expertise/experience of using structural apparatus, and those who have conducted academic research on maths pedagogy or adult's experiences of learning. A full list of the members can be found in Appendix 13i.

In this period we conducted two expert group meetings. The theme of the first meeting was:

- To share perspectives on the key issues to be addressed for adults who lack core skills in numeracy.
- To share initial thinking on strategies to be explored in terms of developing our thinking on fit for purpose pedagogy for adult learners in numeracy.
- The theme of the second meeting was:
- To review resources in relation to experience of their impact on adults with very low levels of competence in numeracy.
- To discuss how structural imagery how could be used with adults.

7.4 The research phase has run as outlined in the original application and work plan.

Section 8: Outcomes – Firm Foundations for All

The agreed outcome for this point in the project was:

National Numeracy has completed an analysis of the need, and developed a clear understanding of current and potential new pedagogical approaches and resources to help low attaining adults to develop their numeracy skills, including an understanding of the potential benefits of, and issues with, using a structured approach to teaching ‘number sense’ with adults.

Note re terminology: Number sense is developed when learners have opportunities to explore number in a variety of contexts, visualise numbers using different representations and develop relational understanding of number.

8.1 At this point in the project, activities have been monitored and evaluated by the Project Manager and Pedagogy Expert, as outlined in the application.

In order to meet this outcome we aimed to:		We have met these aims in the following ways:
1	Conduct a thorough review of the current adult numeracy landscape.	National Numeracy has engaged with research pieces, and investigated available resources and support. Members of the Expert Group also suggested research pieces.
2	Conduct field research in a variety of adult learners.	Our focus groups have been diverse; we have been able to speak to learners from a variety of backgrounds.
3	Consult experts in the field of adult numeracy.	We initially set criteria for potential experts to be matched against. We then approached suitable candidates. We plan to make contact with other experts in Phase 2.

Section 9: Learning – Firm Foundations for All

9.1 What went well?

Research, focus and expert groups have all complemented each other, reinforcing the need for innovation within the space of adult numeracy, and giving clear direction for the next stages of the project.

We have been able to speak to a variety of learners - aged 15-70+ - and feel we have gained good insights.

9.2 What difficulties did we encounter? How did we try to overcome these?

Difficulty

The disappointing lack of research and resources in adult numeracy.

Attempt to overcome

We have tried to overcome this by conducting thorough searches for pertinent research and resources, and asking other experts to recommend relevant research.

Difficulty

The lack of research and resources is reflected in the lack of experts in adult numeracy. This affected the recruitment for the expert group; initial response to invitations was disappointing. Additionally, some potentially very valuable people were unable to join due to limitations to their availability. This is particularly true of the representation of technology and education experts on the group.

Attempt to overcome

We tried to overcome this by offering to arrange a one off meeting with the technology expert in question, however this offer was not accepted.

We will continue to try to overcome this in the next phase by arranging a one-off 'Think Tank' made up of different people to the Expert Group (although there may be some overlap), and including experts on technology and education, who can specifically offer advice in terms of resources.

We will also consider contacting overseas experts e.g. Jo Boaler to get feedback on the direction of the project.

Difficulty

We have only been able to talk to low attaining adults who are already enrolled in training, learning, or are in prison. It is difficult to access low attaining adults whose anxiety or views on the value/relevance of numeracy have so far prevented them from engaging in learning.

Attempt to overcome

We will try to overcome this by organising an additional focus group in a workplace. We hope to approach Union Learning Reps who have identified colleagues with low numeracy levels.

Difficulty

Addressing issues of low numeracy in prisons - while we are very interested in this area, we are also very restricted in terms of materials allowed on site.

Attempt to overcome

We have tried to overcome this by furthering our understanding of the situation in prisons by conducting a focus group in HMP Oakwood, and also talking to prison tutors, a prison education co-ordinators, and a member of the Business Development Group at the National Offender Management Service.

We will continue to try to overcome this by including in our recommendations resources that could be used in prisons – i.e. paper/computer (but not internet) based.

Section 10: Outcomes – Firm Foundations for All

The agreed outcome for the end of Phase 2 is.

1. A new approach to supporting low attaining adults to develop their numeracy has been developed and trialled, with the impact and efficacy of the approach evaluated and reported on.

2. Recommendations have been made for how National Numeracy and other organisations can best take forward the most promising approaches identified for helping low attaining adults and parents to develop their numeracy skills, including recommendations for scaling up effective practice.

In the work plan supplied with the application we outlined that Phase 2 was likely to include the development of new digital and concrete resources.

10.1 The experiences and progress of Phase 1 have slightly changed how we plan to conduct Phase 2.

As a result of the research findings, we still aim to develop a new approach, however this may not at this stage involve the development of new resources. Adult numeracy learning is complex; adults are likely to have a range of anxieties related to maths and learning, and emotions can be just as much of a barrier as low skills.

For this reason, we do not want to jump into developing new resources without properly testing currently available structural apparatus and imagery. Instead, we aim to create a toolkit that brings together the best currently available structural apparatus and currently available digital resources that use structural imagery. We will develop new approaches for using these resources with adults. This toolkit will be piloted as part of Phase 2.

We look to explore the hypothesis that the use of structural apparatus and structural imagery, either physical, digital or both, and the associated pedagogy will be effective in supporting low attaining adults to develop their numeracy and number sense. On the assumption that this proves to be the case, we expect to make recommendations for new (digital and/or concrete) resource(s) at the end of the project.

A full analysis of the findings of Phase 1 and subsequent implications for Phase 2 can be found in Appendix 13m.

10.2 Phase 2 Plan

Aims and outcomes

- We have explored the hypothesis that the use of structural apparatus and structural imagery, either physical, digital or both, and the associated pedagogy will be effective in supporting low attaining adults to develop their numeracy and number sense.
- Impact has been measured through piloting our toolkit.
- By the end of the project, we have made recommendations for new (digital and/or concrete) resource(s).
- Recommendations for scaling up effective practice have been made.
- We have explored how the two projects support each other and the broader work of National Numeracy.
- We have begun to break down some of the barriers that adult learners face in terms of improving their numeracy.
- We have begun to raise the profile of adult learning of early number understanding and number sense.

Key Activities and Outputs		Completed by
1	Think Tank on support materials	End of May
2	Toolkit and supporting materials	End of June
3	Pilot projects trialling toolkit and supporting materials	July-December '14

Think Tank – more information

As the Expert Group has not met some expectations, we will arrange a one-off Think Tank in May. This will be made up of experts on technology and education, who can specifically offer advice in terms of resources and supporting materials. This may include a representative from Beluga maths.

Toolkit and supporting materials – more information

We propose to put together a toolkit of the best currently available structural apparatus (e.g. Numicon shapes, Cuisenaire, Base 10, Dienes) and currently available digital resources that use structural imagery (e.g. Numicon whiteboard software – although this has limitations in terms of responsiveness, and potentially elements of Beluga Maths, MyMaths, ARK/Singapore digital resources).

Pilot projects - more information

Multi-site pilot to be conducted in a variety of settings, with a variety of learners. We will primarily recruit pilot partners through those with whom we have already conducted research. We have already planned a pilot at Leeds City College through Judy Aveyard (Expert Group member), who will, as a result of her own work as well as this project, be focusing on trialling Numicon with lower attaining adult learners.

10.3 Measuring impact

We will administer surveys at the end of the project, as well as interview tutors and students. As outlined in the application, the Pedagogy Expert will continue to monitor and evaluate the projects, rather than incorporate external evaluation at this stage.

Section 11: Dissemination

After review by PHF, the report and recommendations will be shared with our Expert Groups and we are happy for this to be shared among relevant individuals and organisations but we do not currently envisage a dissemination event or 'glossy report'.

We see this Phase 1 work as the first 'groundwork' stage of a significant attempt to both improve approaches to adult numeracy for those that are struggling the most and also strengthen parental engagement across the UK. We therefore expect to be able to share learning and evidence of impact more in future stages.

A short overview of the findings and next steps will be disseminated to stakeholders through our networks and channels. A copy will be published on the National Numeracy website.

Section 12: Finance

12.1 The major difference between the original budget and the budget to date has been the sharply reduced costs of the expert groups and focus groups.

- a) In an effort to be as efficient in our use of PHF money as possible we invited participants to join the expert groups without initially offering to pay them; as a result, only 2 experts have been paid for their time. The others have given of their time for free (or the organisations they work for have allowed them to do so). This is a significant indicator of the importance given to the work we are doing and the regard awarded to National Numeracy as an organisation.
- b) the size of the voucher offered to those participating in focus groups was revised to £10 to match that offered to participants in previous NN focus groups.
- c) now that NN has acquired NNS there will no longer be VAT payable on the services of Lynn Churchman. However, the budgeted time for LC changed from 10 days to 15 days.
- d) Sarah-Jane's time has been less than budgeted for initially during this phase but have left total sum in to cover increased time if necessary in later phase.

12.2 The major changes to the budget going forward are:

- a) it does not include the sum for the development for the physical resource but does include a sum for the design and production of the toolkit. As yet there is not a detailed budget for this element of the project but it may be different from the original estimate.
- b) we have instituted a further piloting stage to the FFfA element and have added £2,000 to this strand to cover the cost of J Aveyard as a consultant at £200 per day.
- c) we have increased the budget for S Skyrme to cover an estimated extra 11 days at £350 a day for anticipated extra time needed in the second phase of the project.
- d) an original £6,000 admin and contingency allowance was not initially included in the budget due to an formula error. This has been reinstated into the first section of the budget.

Section 13: Appendices

13a: Definition of the Adult Skills Levels

Levels provide a comparative measure of adults' skills. Across the regions of the UK, this measure is yet to be standardised. In England, the Adult Literacy, Language and Numeracy sector uses a five-level system to categorise adult skills. Starting at the bottom, these are Entry Level 1 to 3, Level 1 and Level 2. Wales has taken a similar approach to measuring basic adult skill levels. Scotland and Northern Ireland have, on the other hand, chosen to use international levels as the basis of measuring adult skills. The chart below presents the measures of adult skills together with school and vocational levels used by different parts of the UK:

National Standards for adult literacy and numeracy	School Academic Equivalents		Vocational Equivalents			Approximate International Levels (PIAAC, IALS, ALL)
	England, Wales and Northern Ireland	Scotland	England and Northern Ireland (NQF)	Wales (CQFW)	Scotland (SCQF)	
Level 2	GCSE A*-C	National 5	Level 2		Level 5	Level 4
Level 1	GCSE D-G	National 4	Level 1		Level 4	Level 3
Entry Level 3	Standards expected of young people at ages	9 to 11	Entry Level		Level 3	Level 2
Entry Level 2		7 to 9		Level 2	Level 1	
Entry Level 1		5 to 7		Level 1	Below Level 1	
Pre-entry level				Pre Entry		

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From this, it can be seen that, for example, adults at Entry Level 3 have the skills equivalent to the standard expected of children in the last two years of primary school, i.e. aged 9-11.

For the National Standards for adult numeracy the skills and understanding expected at each level are described thus:

Entry Level 1: Understanding information given by numbers and symbols in simple graphical, numerical and written materials. For example, recognising and selecting coins, or ordering and comparing numbers up to 10. Adults below Entry Level 1 may not be able to select floor numbers in lifts.

Entry Level 2: Understanding information given by numbers, symbols, simple diagrams and charts in graphical, numerical and written material. For example, calculating costs and change, or adding and subtracting two-digit whole numbers. Adults below Entry Level 2 may not be able to use a cash point to withdraw cash.

Entry Level 3: Understanding information given by numbers, symbols, diagrams and charts for different purposes and graphical, numerical and written material in different ways. For example, dividing two digits by one digit and interpreting remainders, or comparing weights using standard units. Adults with skills below Entry Level 3 may not be able to understand price labels on pre-packaged food or pay household bills.

Level 1: Understanding straightforward mathematical information used for different purposes and being able to independently select relevant information from given graphical, numerical and written material. For example, doing simple percentages or converting units of measure. Adults with skills below Level 1 may not be able to check the pay and deductions on a wage slip.

Level 2: Understanding mathematical information used for different purposes and can independently select and compare relevant information from a variety of graphical, numerical and written material. Adults with skills below Level 2 may not be able to compare products and services for the best buy, or work out a household budget.

13b: Key Challenge Partners

Nationwide Building Society

Nationwide Building Society is a founding, funding partner of National Numeracy, after establishing a four year partnership to support the charity from 2012.

Nationwide has four key aims in relation to its partnership with National Numeracy:

1. To help to raise visibility of the issue of low numeracy levels in the UK
2. To address some of the root causes which lead to poor financial capability
3. To give our staff and members the opportunity to improve their everyday number skills
4. To encourage them to be champions of the cause and to spread the word

Merseytravel

Merseytravel is the operating name of the Merseyside Integrated Transport Authority and Passenger Transport Executive.

“As an organisation committed to learning, Merseytravel is delighted to be involved in the National Numeracy Challenge. We recognise the benefits that good numeracy skills can bring in terms of building staff confidence and increasing the organisation’s efficiency.”

Councillor Mary Rasmussen Elected Member ‘People’ Merseytravel

Nottingham University Hospitals NHS Trust

Peter Homa, Chief Executive of Nottingham University Hospitals NHS Trust, said:

“Nottingham University Hospitals NHS Trust is proud to support the National Numeracy Challenge. Excellent numeracy skills plays a vital role in delivering good patient care, as our staff are required on daily basis to understand math and measure data. By promoting this challenge through the Trust, it will empower staff to assess their own numeracy skills and provide the tools to improve them. By changing attitudes to maths and numeracy, people can change their lives.”

Portsmouth City Council

“Reflecting our shared commitment to numeracy, the council and its partners at Shaping the Future of Portsmouth worked closely with National Numeracy as it developed and piloted the Challenge

and the city was delighted to accept when National Numeracy invited Portsmouth to become the launch city for the Challenge”.

The Portsmouth Numeracy Challenge will officially launch in June 2014 to coincide with Volunteers' Week.

Julie Dean, Communications Officer

Unionlearn

Numeracy helps everyone lead more fulfilling lives and get better jobs. That's why unionlearn are supporting the National Numeracy Challenge. Union learning reps and maths champions will be having a go and spreading the word in their workplaces.

Workers Education Association

The WEA welcomes the launch of the National Numeracy Challenge because it highlights the vital role of everyday maths and will encourage more people to take the next steps to improve their numeracy skills.

Sebastian Hanley, Marketing & Publicity Manager

13c: Parental Engagement: Expert Group members and Terms of Reference

Purpose of the group:

- To share expertise and experience relevant to strengthening Parental Engagement in children's learning in mathematics
- To provide advice to National Numeracy on the scope and direction of the Parental Engagement project.
- To receive and provide feedback on project proposals and reports.

Membership:

- The current period of membership is from December 2013 to Feb 2015 (date of final report). However, we hope that this is just the beginning of the Parental Engagement project and that there will be further opportunities for involvement in the future.
- We have sought to bring together experts with varying experience and specialisms. As of 07.03.14, the members are:

	Name	Role: Organisation
1	Jan Tallis	CEO, School-Home Support.
2	Pinder Singh	CEO, Ocean Maths
3	Juliette Collier/Tricia Hartley	Deputy Chief Executive/CEO, Campaign for Learning
4	Alexandra Fitzsimmons	Creative Producer, Maths on Toast
5	John McKee	Deputy Head, Patcham High, Brighton
6	Sara Santos	Director, Maths Busking

7	Rosemary Russell	Consultant and author 'Help Your Child with Numeracy' Ages 3-7, 7-11
8	Sue Southwood	Programme Manager, NIACE
9	Sue Sutcliffe	Primary Mathematics Consultant, Every Child Counts Teacher Leader
10	Lynn McDonald	Founder, FAST – Families and Schools Together
11	Rachel Nunns	Deputy Head, Pound Hill Junior School, Crawley
12	Christine Rogers	Coach, Achievement for All
13	Margaret Lochrie	Director, Capacity Consultants
14	Lynn Churchman	Director, National Mathematics Partnership (part of National Numeracy)
15	Carole Coulon	Director of Programme Delivery, Mayor's Fund for London

Accountability: National Numeracy:

Project Manager, Sarah-Jane Gay

Sarah-Jane is responsible for reporting meeting minutes, next steps and any other relevant documents to group members, and organising subsequent meetings and project based events.

Pedagogy Expert, Sue Skyrme

Sue is responsible for conducting desk and field research, as well as reporting the progress of the Parental Engagement project to group members.

Consultant and Chair of Expert Group, Di Hatchett

Di is responsible for chairing Expert Group meetings.

Meetings:

- Two and a half hourly meetings to be held four times over the course of the project, at a Central London venue. Initial meeting three hours.
- Agendas and papers to be generated by National Numeracy, agreed by the Chair and circulated by e-mail at least one week in advance of each meeting.
- In order to ensure optimum efficiency of the meetings, members are expected to read through any relevant papers in advance of each meeting.
- We intend the meetings to be interactive and discursive.
- Members will be asked to observe confidentiality of papers/discussion as appropriate.

Note re terminology

When we refer to 'parents' we mean both mothers and fathers; these include both natural or birth parents as well as step-parents and parents who do not live with their children, but have contact with them and play a part in their lives. 'Parents' also includes grandparents, foster parents, and others in significant caring roles.

13d: Parental Engagement: Findings & Recommendations Overview

Barriers

Cultural barriers: Attitudes to school, attitudes to maths; cultural norms and expectations, aspirations, some parents don't realise that education doesn't just happen at school, 'hard to reach' parents, parents feeling stigmatised if they ask for support.

Socio-economic barriers: Digital divide, work commitments, time restraints

Anxiety related barriers: Lack of confidence, bad memories of school maths, worried about own numeracy levels, put off by other parents, bad experiences/feeling stigmatised if they ask for support

School based barriers: Failures in the system, methods, children unhappy at school, sustainability of projects, teachers lacking of time and understanding definition of role with regards to parental engagement.

Skills barriers: Low levels of numeracy, ESL, mathematical language, IT skills

General

- Most parents felt maths is important – to get a good job, as well as in everyday life - and most are keen to improve their own and children's maths.
- It is the support of learning within the home environment that makes the maximum difference to achievement.
- Parental involvement is different to parental engagement – where activities are not directly connected to learning, they have little impact on pupil achievement.
- There is a proven relationship between improved parent engagement and improved attendance, behaviour and achievement.
- Effect of parental engagement at home found to be stronger than that of either socio-economic status or parents' level of education.
- Fathers' involvement is particularly important for boys and for disadvantaged children.
- Some research states there is not enough robust evidence that any parental involvement intervention actually increases attainment i.e. not necessarily a positive impact.
- Communicating with parents about children's learning can improve attainment. Parents who were viewed as 'hard to reach' often viewed the school as 'hard to reach'.
- Many types of parental involvement that are associated with better student performance in PISA require relatively little time and no specialised knowledge.
- Parents are considered to be the 'first teachers', and schools second; children of engaged parents are more motivated to learn for learning's sake.

Recommendations

- A microsite (title TBC) to include resources, information, and signposting for parents, schools and other organisations in relation to effective approaches that break down barriers in parental engagement with maths. This to include recommendations for a 'parent champion'.
- A leaflet prototype that schools/community centres etc can download from the microsite and populate themselves.
- A Weekly Maths Challenge Scrapbook to encourage mathematical conversations and activities, as well as promoting positive attitudes towards maths
- 4-8 pilot projects trialling the above outputs

13e: Parental Engagement: Focus Group Questions

During parent focus groups, we asked some or all of these questions:

Your general opinions about maths and numeracy

- How do you feel about maths?
- What do you understand to be the difference between maths and numeracy? Which word do you feel most comfortable using?
- Do you think maths is an important subject? Why?
- Do you think it is something that we need to use on a daily basis?
- Are you positive/negative about maths around your child?
- Do you think this has an impact on how your child feels about maths?

How you engage with your child's learning of numeracy

- Do you think maths is something that every child can learn and do?
- Do you encourage your child to take an interest in maths? How (activities, games, songs etc.)?
- Does your child use maths outside of school?
- Is your child aware of when you use maths on a day-to-day basis? For example when you cook, go shopping etc...
- What, if anything, stops you from feeling able to help your child with their maths homework/develop their maths skills?

What kind of support would you like for you and for your child?

- What kind of support would you like? What could National Numeracy or your school do to help you feel more comfortable helping your child with maths?
- Would you like help and support with your own learning of maths?
- What do you think would encourage parents to attend maths workshops at schools?

During primary focus groups, we gave children the following activity and used it to spark discussion:

1	Do you think anyone can learn maths? (circle one) <i>Yes No Not sure</i>
2	Is maths important? (circle one) <i>Very A bit Not at all Don't know</i>
3	How do you feel about maths? <i>Draw smiley faces (1 if not happy up to 3 if very happy)</i> What do you like about maths? What don't you like about maths?
4	How often do you use maths out of school? (circle one) <i>Lots Sometimes Not at all</i>
5	How do you use maths outside of school? (you can circle more than one) <i>Using Money Measurements Cooking Games Time Other</i>
6	Do you talk to anyone at home about maths? (circle one) <i>Lots Sometimes Never</i> How does this make you feel? (circle one) <i>Happy OK Sad</i>
7	Do you want your parents/carers to talk with you about maths? (circle one) <i>Yes Not sure Not really</i>
8	Does someone at home help with your maths homework? (circle one) <i>Often Sometimes Never</i> Do ask anyone to? (circle one) <i>Yes No</i>
9	Do your parents/carers ever say that they are not good with numbers? (circle one) <i>Lots Sometimes Never</i> Does this make you feel like you can't do it too? (circle one) <i>Yes No</i>
10	Who do you like doing maths with? (you can circle more than one) <i>Friends Parents/carers or other adults at home People in your class On your own Other</i>
11	Would you like you parents/carers to help you more with maths? (circle one) <i>Yes No Sometimes</i>
12	What kind of maths activities would you like to do with them? (write whatever you like) Would you like it if they came to school to do maths activities with you? (circle one) <i>Yes Not Sure No</i>

For focus groups in secondary schools, we gave them these statements and asked them to sort into 'agree', 'disagree' and 'maybe'. We used their answers to spark discussion:

STATEMENT

Everyone can do/learn maths.	I ask my parents/carers for help with maths.	I use maths a lot in my everyday life.	My parents/carers understand the maths that I learn at school
It's ok to say "I can't do maths".	If my parents/carers don't understand my maths homework, we try to figure it out together.	Maths is fun!	Maths is an important subject
I like it when my parents/carers help me with my maths homework.	I prefer to talk to my mum/a female about maths.	I achieve more with my parents help.	My parents/carers have taught me that maths is important.
My parents/carers would welcome support with their own maths.	I prefer to talk to my dad/a male about maths	I never share maths with my parents/carers.	Boys are better at maths than girls.

13f: Parental Engagement: Focus Groups Findings Summary

To help us to understand how parents, teachers and children feel about parental engagement with maths, we ran a variety of focus groups. Focus groups took place at schools in: the Isle of Wight, Birmingham, Grimsby, Bristol, Weston-Super-Mare, and London. We aimed for regional diversity and also to reach those in areas of deprivation. We are planning to run two more groups in phase 2 of the project. We wanted to find out about participants' feelings towards maths, what prevents parental engagement, and what kind of support participants would like to see made available.

Parents' focus groups key findings:

- High levels of anxiety – many have bad past experiences of maths, and feel confused by the new methods used in schools today.
- A strong value of maths, particularly around importance for everyday life and work opportunities in the future.
- Of those who were anxious, most didn't want their children to "be like them".
- Some parents avoided talking to their children about maths, or were negative about the subject.
- Most said they tried to be positive, and there was a general feeling that some parents are too hard on themselves, and are actually doing lots of maths with their children without realising.
- There appeared to be a lack of communication between some parents and schools - some parents didn't know which set their children were in/who their teachers were.
- Parents often reported feeling intimidated by the school, teachers and other parents.

- One parent compared being unengaged to being unemployed – the longer you stay away, the harder it becomes, but after taking the initial step fear can be overcome - ‘they don’t come [to school] because they’re scared – as soon as they come they’re not scared anymore’.

What parents want, ideas included:

- Support, but not to be ‘told off’ - ‘Parents are bored of feeling like they’re doing everything wrong. Don’t say – It’s really important that YOU DO THIS. It’s better if you say – It’s fun if you do this’.
- A guide to talking to teachers
- Examples of how to solve a maths problem going home with homework
- Comparison of methods (and reasoning behind why they are taught), using simple language,
- Workshops (including workshops where parents teach other parents/‘bring a friend’ sessions),
- Maths volunteers
- Better communication with the school about learning,
- Promotion of ‘the carrot’ – your child’s life chances will improve if you do this.
- Simple advice and clear information; ‘here are the facts, here’s what you can do’.
- A mixture of online and paper based support. They mentioned Facebook and texting as good forms of communication.

Pupils groups:

- Maths at home ends up in a fight
- It was easier to talk to parents about maths when they were in primary school
- Maths is more peaceful without parents.
- Many seemed unconfident that their parents could help them with maths (particularly in secondary).
- Students did not feel that boys were innately better at maths, but they did feel that people who are successful in maths – teachers, scientists etc are more likely to be male than female.
- Primary school pupils were much more positive about maths generally, however we suspect that some schools presented us with only the most positive and engaged students.

What pupils want, ideas included:

- Maths at home to be less stressful.

- Some pupils (and parents) suggested joint parent/child homework: 'it would bring the parents and children closer together and learn more maths'.
- Some were keen on parent/child workshops: 'it's a massive confidence boost having your mum or your dad there'.

Teachers: Sadly we were only able to talk to a handful of teachers as workloads and timetables meant that teachers were largely unavailable during our school visits. We were able however to gather some data using surveys, which is analysed in detail in Appendix 13g.

13g: Full analysis, recommendations and bibliography - Parental Engagement

Main themes

The main themes of the Parental Engagement strand are to support parents/carers in engaging with their children's (maths) education; promote positive attitudes – no more 'I can't do maths' and provide support to parents/carers who wish to improve their own numeracy. To develop the project appropriately, extensive desk research has been completed and supported by focus groups (field research) and expert group meetings. Key areas to emerge from these have been the existing barriers to parental engagement, views of the key stakeholders – children, parents and schools, current strategies to engage parents, division between classroom maths and everyday maths, and the potential impact of parental engagement on achievement.

The UK is still one of the advanced nations where it is socially acceptable - fashionable even – to profess an inability to cope with maths.¹ This in turn can have a huge impact on children's attitudes towards the subject and parents' ability or willingness to support their children's learning. One cause of this downward spiral is that parents - and many children – only perceive mathematics as computation and calculations, usually in written form. There is also great emphasis placed on getting the correct answer rather than applying reasoning, thinking and perseverance. The distinction between classroom maths and 'real' everyday maths is one of the main themes recurring through this research.

Analysis of desk research

Barriers to parental engagement

Generally, it is recognised that parental engagement has a large and positive impact on children's learning. "It is support of learning within the *home environment* that makes the maximum difference to achievement".² However, a commonality across all research were the wide and varying barriers to parental engagement which exist.

As discussed, there is a wide and public acceptance of difficulties and dislike of mathematics and this remains the most cited barrier to parents engaging with their children's learning in this subject. However, as well as those parents who have difficulty engaging with education, there are also

¹ *The Independent Review of mathematics teaching in Early Years settings and Primary schools* DCSF 2008

² *Engaging parents in raising achievement – do parents know how they matter?* DCSF 2007 p1

“41% of parents who cited work commitments as the main barrier to engaging with their children's learning”.³ Time is an issue for parents, particularly those who are absent or 'weekend only'.

Language may be a barrier – both first language at home and specific mathematical language. A digital divide still exists – good schools are working hard to address this but many homes cannot access online support or activities, or parents do not have the necessary technical skills. Parents' own low levels of numeracy are often compounded by the 'new methods' taught in schools. Many have a lack of confidence stemming from their own educational experience. This can lead to low self-esteem and a feeling of being stigmatised if they attend a school support group. Many schools refer to 'hard to reach parents' but research has shown that these parents often themselves viewed the school as 'hard to reach'.⁴ Teachers cite lack of time and lack of clarity in understanding their role with regards to parental engagement. Sustainability of any engagement can also be a barrier but the majority of schools who have initiated intervention strategies have witnessed improvements – in some cases dramatic - in levels of mathematics attainment (for example, the Ocean Maths Project⁵).

General findings

It became evident very quickly that a clear distinction needs to be made between 'parental involvement' and 'parental engagement' – where parents are involved in school (activities such as attending shows, sports days, fayres, etc), these activities are not directly connected to learning and they have little impact on pupil achievement. Interestingly, as found by the DCSF research⁶, parents view parental engagement as offering support to students while teachers tend to view it as a means to improved behaviour. Students view parental engagement as being primarily about moral support and interest in their progress. This seems to be particularly true at secondary school. There is however a proven relationship between improved parent engagement and improved attendance, behaviour and achievement⁷. Many schools are now recognising that there must be a real partnership between them and parents. School staff, at all levels, traditionally work hard to raise the self-esteem of pupils but much less consideration is given to the self-esteem of parents⁸. Yet there are consistent cross-curricular messages that many types of parental involvement, that are associated with better student performance in PISA, require relatively little time and no specialised knowledge.⁹

The Reggio Emilio approach considers parents to be the 'first teachers', schools second. There needs to be a paradigm shift in our cultural thinking in which it is recognised by all that schools are only one of the many places where children learn. Add to this the negative views prevalent in this country regarding mathematics and it becomes clear why in countries such as China, parental

⁴ *Parental engagement: how to make a real difference* Oxford School Improvement 2012

⁵ *Building bridges between home and school mathematics: A review of the Ocean Mathematics Project*. Institute of Education, University of London. Bernie, J. Lall, M. 2008.

⁶ DCSF, 2007

⁷ *Achievement for all 3A's* Impact Report 2012/2013

⁸ *How to involve hard to reach parents – encouraging meaningful parental involvement with schools* NCSL 2011

⁹ *Let's read them a story! The Parent Factor in Education PISA OECD 2012*

engagement has a positive impact on children's learning – where parental engagement is high and importance is placed on doing well in mathematics, children achieve.

In a contrasting review paper, The Nuffield Foundation concluded that “there is no evidence that primary school interventions to enhance parental involvement are generally effective in increasing children's attainment”.¹⁰ On further reading, this was challenging the robustness of evidence used in some research. This was considered and debated in the first Parental Engagement Expert Group meeting and it was felt that our main reference point- alongside the Desforges International Literature review – should be the Education Endowment Foundation/Sutton Trust Learning and Teaching toolkit, which states “two recent meta-analyses from the USA suggest that increasing parental involvement in primary and secondary schools has on average 2-3 months positive impact”. This is worldwide research which is conclusive in its findings that “[t]he association between parental involvement and a child's academic success is well established, but rigorous evaluation of approaches to improve learning through parental involvement is more sparse”.¹¹

Many pieces of research agreed that the effect of parental engagement at home was stronger than that of either socio-economic status or parents' level of education. Even where children come from a poor background, children can achieve if their parents are involved and committed to their child's education. Children of involved parents are more motivated to learn for learning's sake – a crucial life skill. “If parents engage with their children's education, the attainment of the child will increase by 15% no matter what the social background of the child”.¹²

Parents

Most parents could give an example of how they supported children's learning in mathematics in everyday contexts but this tended to be limited to shopping, telling the time, pocket money. Research shows that parents need to engage in more mathematical conversations and do 'everyday tasks' together to enrich children's learning. There is a 'hidden nature'¹³ of just how much parents do help their children at home as, when discussed, many parents do not recognise the inherent maths in what they have been doing. This needs to be explored further and also recognised and valued by schools. In '[p]arents need to engage with maths', Rob Eastaway and Mike Askew explore the importance of talking to children about maths as this helps to develop their logical thinking. One to one interaction between parent and child is therefore vital. Further research also shows that fathers' involvement is particularly important for boys and for disadvantaged children.

Maths is the biggest worry for parents regarding their children's education – this is borne out by the rapid increase in sales of 'home help' books which have now hit the best-sellers lists! Parents are particularly concerned about the 'new methods' used in schools and their lack of understanding. This seems to be exacerbated by poor school-home communication regarding how maths is taught in the classroom. Yet a lot of research confirms that communicating with parents about their child's

¹⁰ 'Do parental involvement interventions increase attainment?' Nuffield Foundation 2013

¹¹ The Sutton Trust – Education Endowment Foundation Toolkit – Parental Engagement 2014

¹² The impact of parental involvement, parental support and family education on pupil achievement and adjustment' Desforges C and Abouchaar A 2003

¹³ Why do parents help their children with maths?' Rosemary Russell 2009

learning can improve attainment.¹⁴ Children of parents who take an active interest in their education make greater progress than other children.

Pupils

Pupils have positive and negative effects on parental engagement¹⁵ but girls are more likely to engage than boys. This was explored when we conducted the focus groups with pupils – see later.

Some pupils – often those with special educational needs and disabilities (SEND) – are unhappy at schools and this can be a barrier to parental engagement with them.

Schools

There is evidence of very effective practice and interventions in many schools to engage parents in their children's learning – such as Ocean Maths and Achievement for All. Features of successful strategies were shared at the expert group meeting. In order to achieve meaningful parental engagement, research is clear that;

Parents are an important component within the school system, to which head teachers and teachers must be responsive. Policy-makers expect parents to be active partners who have influence over school decision-making and participate in school activities and governance.¹⁶

It is clear from the research that parental engagement cannot be regarded as a 'bolt on' activity within school but that any strategy requires effective leadership and training of all staff. Schools should value the ways parents are already engaged with learning at home and build on this. It has also been found that teachers may pay more attention to pupils if they know their parents are involved.

Attitudes

Most parents felt that maths is important – to get a good job and for everyday lives. The Everyday Maths Project run by Bristol University (ongoing) also found that mothers are worried about passing on stereotype of 'girls not as good as boys at maths'. Many state that 'they are no good at maths' and that 'it runs in the family'. This is typical of the attitudes towards maths prevalent in the UK and representative of a 'fixed mindset' – the belief that abilities are fixed, as opposed to a 'growth mindset' – the belief that with effort and hard work, abilities can grow. Psychologist Carol Dweck found that students in her US study tended to have more of a fixed view of maths skills than of other intellectual skills¹⁷ – something that we are possibly seeing repeated here in the UK.

¹⁴ Oxford School Improvement 2012

¹⁵ Desforges C and Abouchar A 2003

¹⁶ NCSL 2011

¹⁷ Mindsets and Math/Science Achievement. Teaching & Leadership: Managing for Effective Teachers and Leaders. Dweck, C., 2008.

Analysis of field research

Parents

Six parents' focus groups have been conducted in a variety of geographical and socio-economic settings – four primary schools and two secondary schools. Responses from parents reflect many of the findings of the desk research. Questions explored their own experience of learning maths, the terminology, the importance of maths, their attitude towards the subject, their engagement with their children's learning and what support they would find useful.

We can expect a certain amount of bias in the field research findings; comments reported here are made by parents who have the confidence to come into school and discuss maths with strangers.

Although responses inevitably varied from group to group, there were many commonalities. Generally, there were high levels of anxiety around maths with many feeling negative due to their own experience of learning at school. Several remembered maths being used as a punishment and, sadly, this is still happening today. A few associate maths with panic. The vast majority value maths and try to be positive around their children. There were strong feelings expressed as “I don't want my kids to be like me!” A few expressed the idea that “I was never any good at maths so s/he won't be either”.

During discussions, it became clear that many parents are very hard on themselves and do not recognise the valuable everyday activities they do with their children as maths. In some schools, the focus groups consisted of interested and motivated parents who were keen to learn more and therefore support their children's learning appropriately. When the discussion moved to strategies to engage more/ all parents, it was interesting to note that many parents are actually put off by other parents whom they perceive to be “more articulate, confident and clever”. Therefore, despite some good efforts by the schools to engage parents, there remains a group who see the school as a barrier. One parent compared being disengaged to being unemployed – the longer you stay away, the harder it becomes, but after taking the initial step fear can be overcome - “they [other parents] don't come [to school] because they're scared – as soon as they come they're not scared any more”.

A further factor in parental engagement is the change in hierarchical relationships, within the home, whereby children have more say and control – this can be reflected in, for example, children refusing to engage their parents in their maths or through considering their parents to be “stupid because they don't know how to do it”. Parents also tend to do more for their children, in their everyday lives, and therefore crucial skills such as perseverance and resilience are not developed. Thus when children encounter difficulties (in maths) they give up. This feeds the negative feelings about maths rather than an enjoyable challenge which will provide satisfaction and pleasure.

Most were very happy to support their child's reading but viewed teaching maths as the school's job. One predominantly Asian group had high expectations regarding their children's progress in maths and advocated a return to more formal methods and textbooks. The majority were intimidated, or put off by, the 'new methods' or terminology. There was a range of views regarding the use of 'mathematics' or 'numeracy'. 'Numeracy' was thought of as an American term by some

whilst others thought “numeracy is just about numbers”. 'Mathematics' was considered to be “quadratic equations and the like” whereas 'arithmetic' was 'sums'.

In the secondary school groups, most parents were unaware of which set their child was in for maths or at what level they were working. Some were wary of school contact as they expected home/school communication to be regarding problematic behaviour. In the schools visited, there were very few signs of any learning partnership between school and home. However, all parents in the groups wanted to be able to help their child more with maths and universally, maths was considered important for employability, and for everyday life. They were clear you need maths (i.e. a qualification) to get a good job, less sure how often they would actually use maths in some jobs.

Parents volunteered many ideas of what they would view as useful support. Many of these involved the school and were fed back to school staff to (hopefully) implement. These included help with homework tasks – some guidance on how the task is taught in school and the methods used so as to avoid confusion between different approaches. Parents would like some comparisons of methods used (to how 'they were taught') and some rationale as to why they are taught that way. They would like – and, in some schools, appreciate existing provision – workshops on what their children are learning at each stage. Ideas included - parents teaching other parents in a workshop, and a breakdown or glossary of the mathematical language. Many parents – particularly those in the secondary sector – would appreciate improved home-school communication regarding learning. Parents of children in both phases wanted better information regarding school levels and what they mean.

One school is trying to encourage 'maths volunteers' in the same way that volunteers hear children read in school – this would be an excellent idea to develop, providing that the volunteers have received appropriate training to avoid further confusing the child.

Low self-esteem and lack of confidence prompted many to suggest a 'guide to talking to teachers' when discussing their child's mathematical learning and progress. To encourage more parents, it was strongly felt that any supporting resources should be presented with the carrot – for example 'your engagement (and improved maths skills) WILL improve your child's life chances'. Parents were adamant it is not engaging to state “this is what you should do to help your child in maths”. Many feel “bored of always being wrong”. It is therefore important to advertise any support positively and recognise the valuable activities which are already taking place at home.

Parents would like any activity – online or book – which encourages and enables them to learn with, or support, their child. For those lacking confidence, suggestions of questions which could be asked or mathematical talk which could be developed would be helpful. It was emphasized that using simple language would encourage participation. There were differing views regarding the type of support which could be produced – some already making good use of online resources and others preferring books or practical activities. Clearly one size will not fit all. However, all agreed the maths needs to be purposeful, relevant to everyday life and not cost prohibitive. For some, there was little awareness of any of the existing very good websites supporting parents and children's learning; other parents were overwhelmed by the sheer volume of resources; they were unable to ascertain which were valuable and which best matched their need.

Pupils

At one of the early parent focus groups, we also engaged with a group of Year 5 and 6 pupils – this proved to provide some important insights so became a regular part of our school visits.

Pupils' responses can generally be split easily into primary and secondary as there emerged a clear divide between their views.

Primary children were either already involving their parents in their learning or would very much like to. The majority were very happy to work with a parent and most expressed a liking for maths and especially for 'a challenge'. Only a few were not comfortable with the idea of their parent's involvement – usually when from split families but also for personal reasons “doing maths alone is more peaceful – parents just take over”. Others consider their maths, or their methods of working, to be better than their parents knowledge – one boy stated “I do not talk to my dad about maths; he's not the sharpest stick in the shed”! Another showed some maturity in observing that he preferred “to do maths independently so I get it when the exam happens”.

They all recognised the importance of maths and felt they would need it “to get a good job” and many could list jobs where they thought they would use maths in their everyday work.

There was a shared concern with parents about the methods used, particularly for set homework – usually a worksheet – and one boy stated that “parents don't realise they need help”. Children inevitably considered their methods to be the only ones. Some wanted more homework “to bring parents and children closer together”.

There was enthusiasm for maths but this may be because the schools selected articulate and confident pupils for the focus group – this meant they were the top groups/sets. One group stated “they loved maths right down to the last decimal”. Most preferred to work in groups for maths, “talking about it makes it more fun”. All children thought that anyone can learn maths but reported that some parents say they are not good at maths - “maybe they didn't pay attention at school”.

Interesting debates followed questions regarding gender aptitude in maths. Most thought that boys are no better than girls at maths but did feel boys like the subject more. There is a lack of role models for maths, particularly women. In one multi-cultural group, the boys felt that men are better at maths “because they earn the money but women have to be quite good because they do the shopping”.

Secondary pupils gave a more mixed set of responses. Only a few more able girls were prepared to say that they engaged with their parents with maths. The majority of participants in these groups did not want to share maths with their parents. It was seen as a source of confrontation - “when parents help, it just ends up in a massive fight”. When analysed with the pupils, it was linked to the difference in methods but also in a general change in relationships with parents at that age. They stated that it was easier to talk to parents when at primary school. Older pupils were sometimes dismissive about maths homework, asking “what's the point in doing it – no-one checks?” Others lacked confidence that their parents could help them with their maths. Only one boy was able to say his “parent learns when he learns”.

There was no indication that pupils felt boys were better at maths than girls but they did cite the fact that most maths and science teachers are males (at secondary). Also they noted that they could only think of famous male mathematicians i.e. Einstein and Galileo.

Most secondary pupils felt that everyone could learn maths but spoke about disruptive classrooms and frequent supply teachers as being real barriers to learning.

When asked about everyday maths, all could share examples such as telling the time, using timetables, calculating money and change. Games were discussed as an excellent way of practising mathematical skills but, in one particular group, they had not heard of Scrabble or Chess and, although had heard of Monopoly and card games, did not play family games.

Teachers

Sadly, we were only able to talk to a handful of teachers as workloads and timetables meant that teachers were largely unavailable during our school visits. We were able however to gather more data using surveys which is analysed in detail in the next section.

Analysis of online surveys

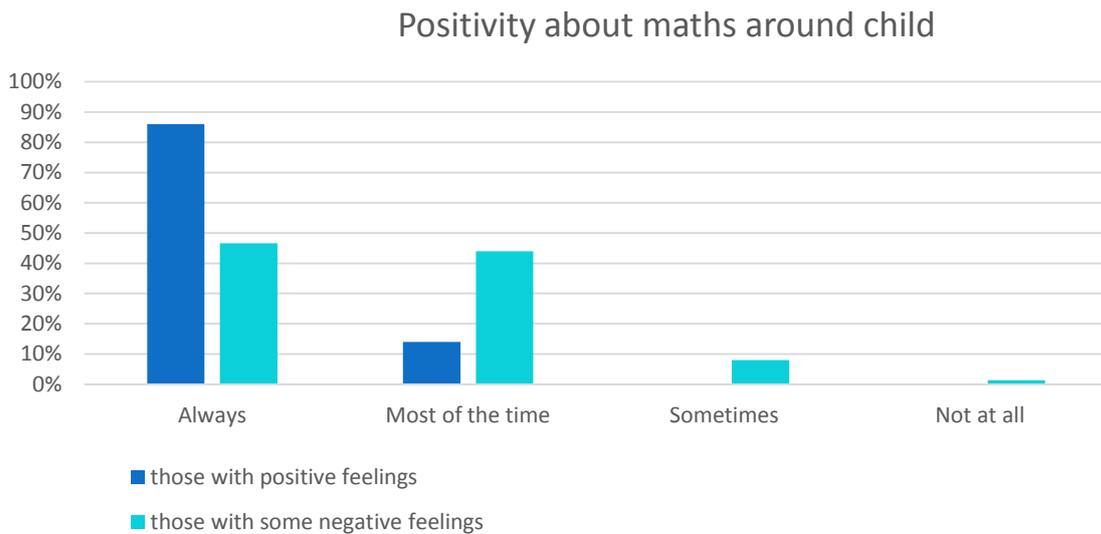
In the parents' survey, we asked parents to answer a number of questions about their engagement with children's acquisition of numeric skills, as well as of their own confidence with this set of basic skills (see survey questions in Appendix 13h). Here we present the findings of 168 responses by parents. This is not a random sample; we used the following channels to gather responses: Mumsnet, Twitter, Facebook, the networks of our Expert Group members, and the networks of schools with which we have previous interaction. Mumsnet accounted for 75 responses, social media for about 30.

When we asked parents about the degree to which they felt positive about maths, over half (55.4%) picked the most positive answer – '4'. Only 17.3%, a small proportion of our sample, graded their feelings towards maths as '1' or '2'. Similarly, when we asked how often parents involved children in maths at home, an overwhelming 62.5% said they do so "very often" and 28.6% say they did so sometimes. Few, around 9%, said they engage their children 'occasionally' or 'never'. This is unlikely to be representative of the population at large. Furthermore, it is likely that parents will invariably over-report their engagement with children and feeling towards maths in a survey such as this.

We asked parents both how often they involve children in maths activities at home as well as how often they talk to them about uses of maths in everyday life and work. The answers were quite similar, only 4% more said they talk to their children about everyday maths. The comparison should be interesting to observe, in the long term, as the sample grows and it can be tested for significance. It is interesting to know, for example, that with this currently small sample, about 21% of those who sometimes involve children with maths activities at home, talk to them very often about everyday maths.

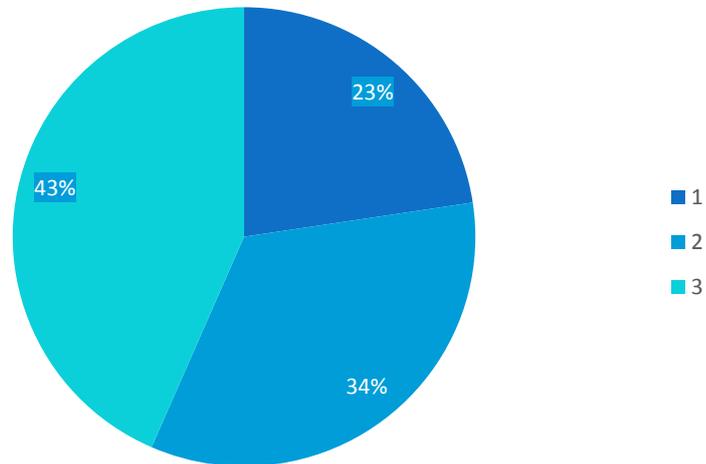
When we asked parents whether they felt they were able to be positive about maths around their child, a large proportion (69%) reported they always managed to exhibit a positive attitude around their child. However, on segmenting this by the parent's own positive feeling about maths, we

discovered a radical difference. We separated out those who said they had completely positive feelings towards maths (answered “4”) and those who reported some negative feelings (answered 1 – 3). In the future we would like to segment this still further; however, the current sample is too small to do so.



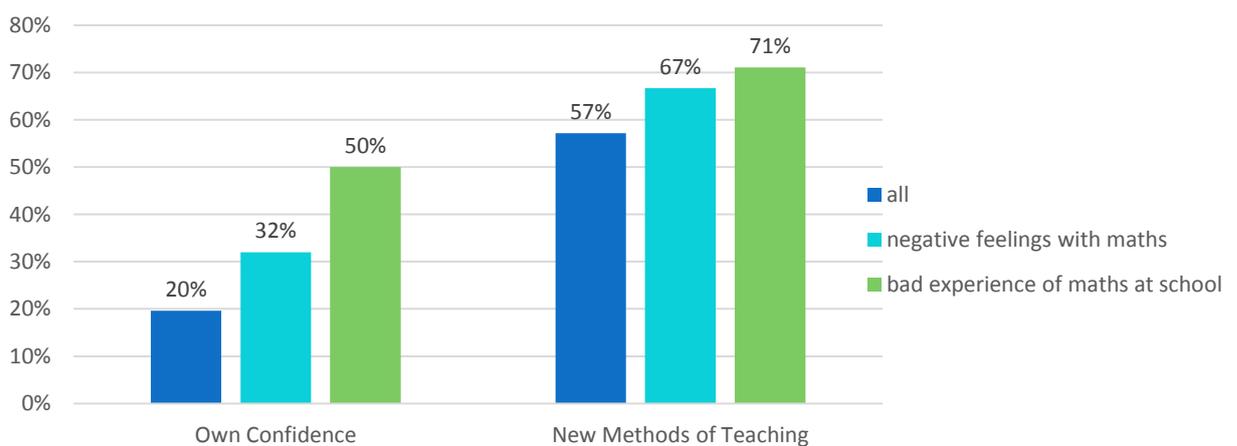
We attempted to understand the roots of parents' negative attitude to maths; we asked them about their own experiences of maths. Almost a quarter of those who responded said they had negative experiences of maths at school. We expected that, if we asked them whether those experiences still affect them, those with negative experiences would be likely to report ongoing issues. This was certainly the case - 66% of those with bad experiences at school said they were still affected by them. What was more surprising was that those who reported mild or good experiences were still affected by negative aspects of their maths education (46% and 11% respectively).

**What was Your Experience of Maths At School?
(1 is bad, 3 good)**



Parents gave us feedback on what inhibits them from helping their child with maths – we gave them the option to choose from: Own Confidence; New Methods of Teaching; Lack of Support; and Afraid of Looking stupid in front of my child. The last two seemed to be of little consequence for most parents. Irrespective of ability and past experiences, on average more than half of parents struggled with new methods of teaching. Those who had bad experiences at school or had generally negative feelings towards the subject, reported their own confidence with the subject as a stronger inhibiting factor in their ability to contribute to their child’s education in maths.

What inhibits helping child with maths



We asked parents in what way they would prefer to be supported in helping their child with maths. The answer was overwhelmingly that they would primarily prefer provision to be either online or in

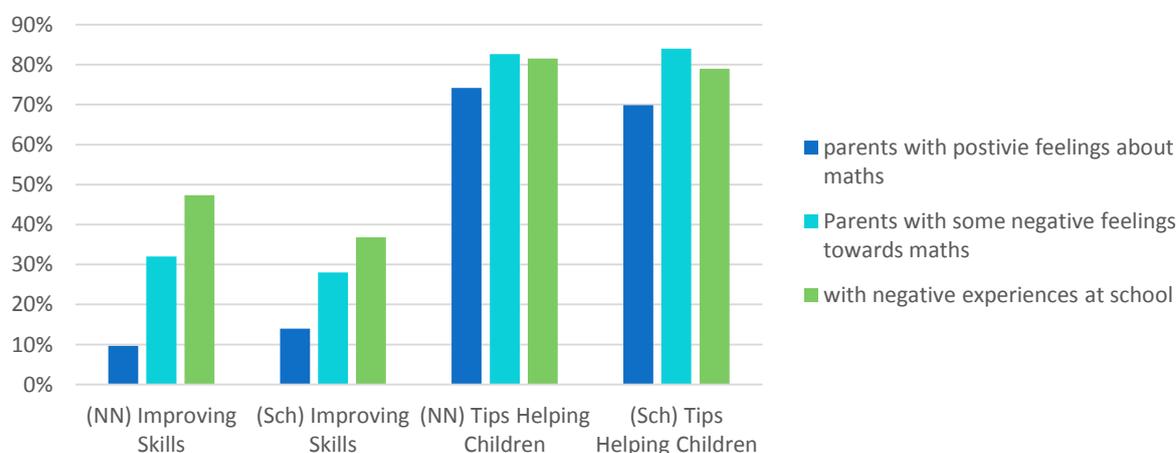
the form of workshops. We compared the responses of those who reported some negative attitudes to maths with those of the whole sample. We discovered that a larger proportion of those who have negative feelings towards maths would prefer workshops – although that number is still lower than the main method through which people would like to see provision - online. Parents also shared with us some of their suggestions for activities to engage with children. Two responses asked for more insight into teaching of maths at their child’s school – invitation to watch a class or getting an update at the start of the term with information of upcoming lessons and how to support one’s child with their learning for the term.

Preferred Method of Learning	all	those with some negative feelings about maths
Online	60%	62%
Leaflets	26%	28%
Workshop	45%	55%

To help us determine what kind of intervention would be most welcome amongst parents, we asked them whether they would like help from us or schools with: Improving their own maths skills; Tips on Helping their Children. A large proportion of all parents would like to have more help with tips to help their children learn (78 % across the whole sample). A smaller proportion of parents wanted to have help with their own maths

skills (about 20% across the whole sample). This rose to roughly 30% for those with negative feelings towards maths. Almost half of parents who had negative experiences of maths at school now wanted to improve their skills.

Within this limited sample, we were also able to get an initial sense of whether parents would prefer support to come through National Numeracy directly or through their child’s school. Parents with negative experiences of maths at school were more likely to want help from National Numeracy rather than their child’s school. Although there are other differences when it came to parents’ preferences across different levels of school experience and positive attitudes about maths, further testing will have to be done to conclude whether those are significant given the current sample size.



Teachers’ online surveys

In this survey, we asked teachers to answer a number of questions about their opinions on parental engagement and its' efficacy, as well as their insights into barriers and support wanted (see survey questions in Appendix 13h). Here we present the findings of 53 responses by teachers. We have not cross-analysed this data in the same way as the sample size is too small. This is not a random sample; the majority of the respondents of this survey are from two schools who are part of the project – either we ran a focus group there or they have a representative on the expert group.

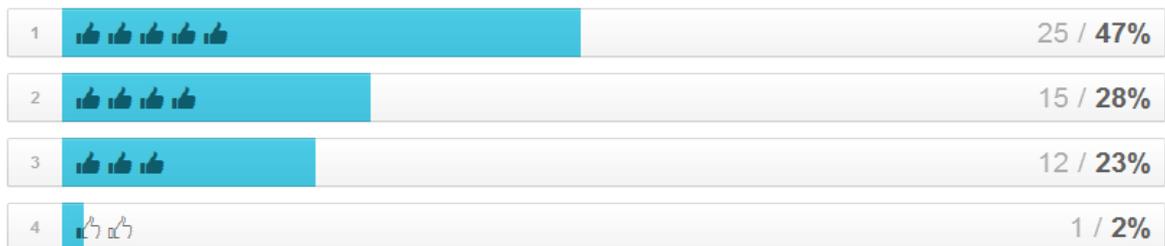
With a maximum possible of 5, teachers scored 'parents helping children with their homework' at an average of 4.21 in terms of this leading to good outcomes. Just under half (25) scored this at 5/5. No teachers scored this at 1/5.

Do you believe that parents helping pupils with their homework leads to good outcomes?

53 out of 53 people answered this question



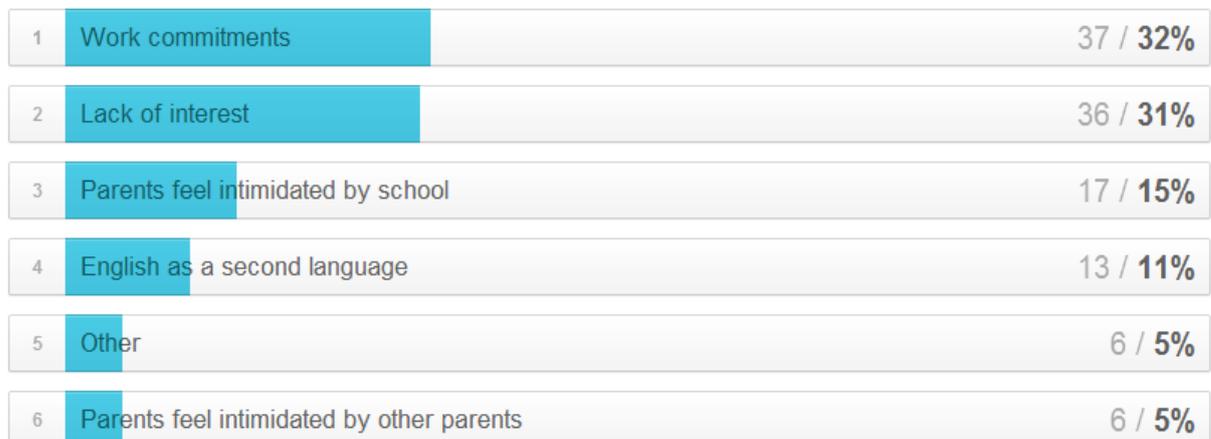
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In terms of barriers to parental engagement, teachers cited work commitments and a lack of interest as the largest barriers, those who answered 'other' generally added the barrier of 'parents own confidence and skills'. Parents cited 'own confidence' and 'new methods' as the largest barriers; in the future we will match these questions up in order to be able to compare effectively.

What are the issues that you have experienced when it comes to parental engagement?

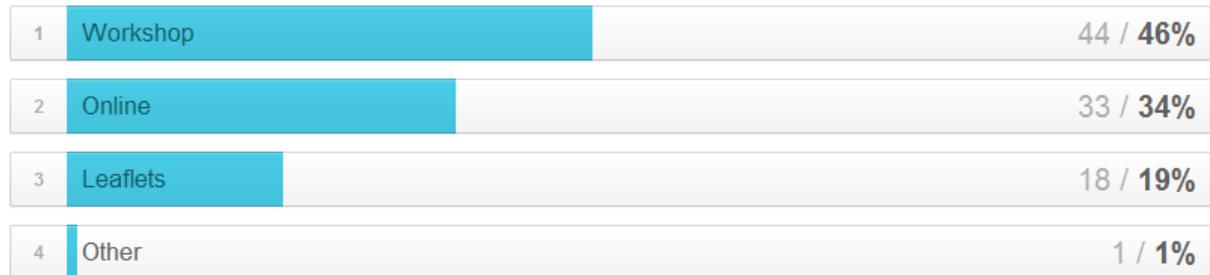
53 out of 53 people answered this question



When asked what form of support would best work for engaging parents (teachers were allowed to pick more than one), the most popular form was 'workshops', followed by 'online'. This is in contrast to the parents' findings who overall preferred 'online' to 'workshops'.

What form of support do you think would work best for engaging parents?

53 out of 53 people answered this question



The one teacher who answered 'other' added 'addressing parents individually'.

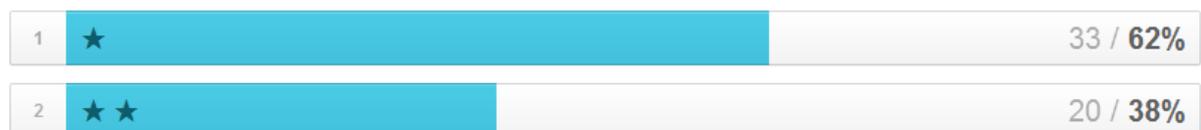
We also asked teachers if they thought that parents view maths as fun. With a maximum possible of 4, teachers scored at an average of 1.38 in terms of how much they think parents view maths as fun. Nearly two thirds (62%) scored the most negative option (1 star).

Parents view maths as fun

53 out of 53 people answered this question



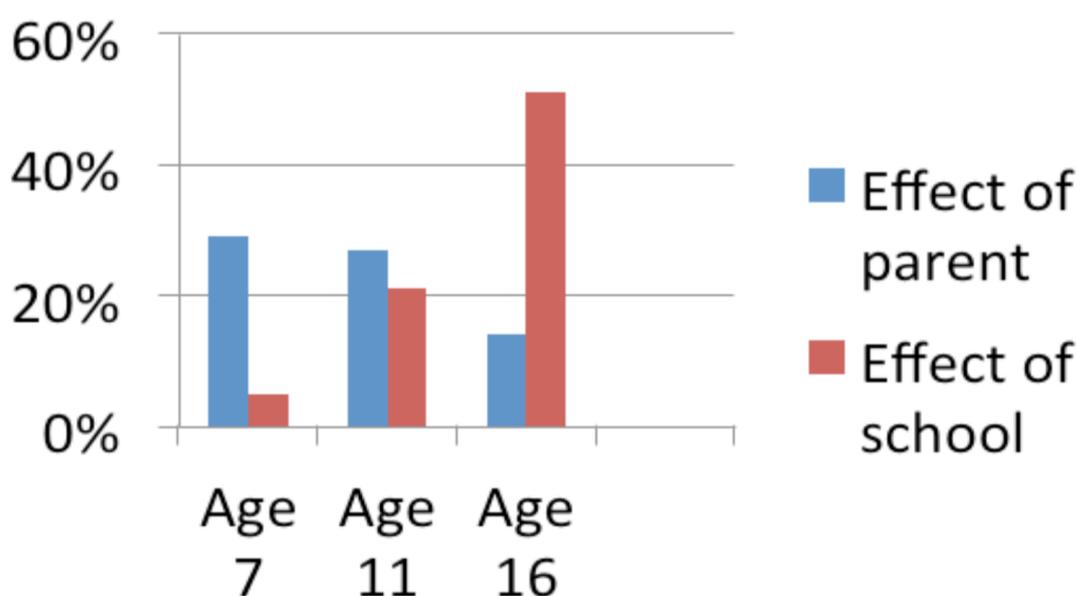
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Field research and expert groups – a comparison with the desk research

The parent focus group findings were very much in line with research findings. Some clear and consistent themes emerged. Parents steered discussions around maths to formal school calculations and methods – this was, in their perception, the biggest barrier to helping their child learn. In their view, this was invariably compounded by a lack of communication from school regarding learning. Most parents receive a great deal of literature about events, shows, fund raising etc. but very little regular information directly concerned with learning maths. They neither understood the methods nor the language of assessment, for example levels. If unable to help with work sent home, invariably a worksheet, they felt incompetent to do any maths with their child. Although there were many who, when prompted, could share valuable mathematical activities completed at home, these were not recognised as maths and nor could their place in learning progression be identified.

The pupil focus group discussions supported many of the findings of the desk research but further illustrated these with personal viewpoints and sometimes very perceptive comments. There is very little published research which has listened to the voice of the pupil – particularly younger children. There was a wide spread recognition, amongst pupils, of the differences in mathematical working and therefore the difficulties their parents may face. Most would like to engage their parents more and would welcome inclusive activities rather than possibly exclusive worksheets. They also had a clear understanding of the need to do maths and were able to list ways in which they use it in their everyday life – although there were still some surprises such as playing board games. Despite most research claiming that parental engagement would increase achievement at any age, there is a clear divide between primary and secondary pupils. Parents' relationship with the school changes and many older pupils no longer want their parents' direct involvement – most seem to appreciate parental support but not engagement with their maths learning. Also, as the mathematics becomes harder, the gap in methods increases. This is supported by the Social Science and Medicine Report which states that “the strongest positive proximal influence on children's resources at age 7 was parental involvement, which was equally strongly related to both educational achievement and psychosocial adjustment”.¹⁸ This is well illustrated in the table below:



The vast majority of parents are very engaged with their children's development at pre-school age and this continues into primary school but then decreases measurably. There is a cultural expectation that parents are less engaged by secondary school and this needs to be challenged by systematically addressing the barriers explored earlier.

During discussions with pupils, it was clear that girls are more likely to engage with their parents, supporting the desk research findings. However, all agreed there is a lack of role models for numeracy – as opposed to literacy. Dyslexia is well researched and given media attention with many famous people willing to talk about their difficulties and strategies for overcoming these. Dyscalculia very much remains a mystery and something no-one talks about. Older pupils would

¹⁸ *Social inequality in educational achievement and psychosocial adjustment throughout childhood; magnitude and mechanisms' Social Science and Medicine Sacker 2012*

like role models to relate to – either enthusiastic mathematicians or conversely those who struggle but present positive attitudes.

Overall, there was consistency between the expert group, research, parent and pupil focus groups. The expert group members (see Appendix 13c) added their contributions and analysis of successful and less successful features of parental engagement strategies they have implemented. All members were keen to share their own projects or work in schools – the meeting's length meant this was not possible in any depth but key questions focused their responses. However, valuable net-working enabled all to read independently and share good practice.

Key issues to be addressed in securing effective parental engagement in their children's learning were explored. All the group were in agreement of the need to promote a 'growth mind-set' and learning to learn, being willing to make mistakes, a development of resilience and that learning is 'learnable'. There was a strong feeling that there is a need to 'shift the context' – there is not widespread acknowledgement of how the lack of basic skills affects everyday family life here and now i.e. its relevance – prices, baby formula, day to day skills. It was recognised, within the expert group, that engagement should start early and be embedded as an expectation, even before pupils start school. The group saw a need to engage policy makers and raise awareness that basic skills are as important as behaviour management, childcare, etc. Alongside this, national awareness also needs to be developed of the problems faced by many and simplify the way numbers are often presented.

Experts were asked to share what had been particularly successful and what had been less successful. In line with some research, the group felt that any strategy should remove the embarrassment of being bad at maths (and of being good at it!) and change the notion that 'if I have to go to a support group, I must be rubbish'. Some members talked about their experiences working with parents who are not emotionally ready to get involved – we (the 'experts') do not know their home situations. In order to personalise engagement and reach these parents, schools may need to consider some form of outreach. Sometimes parents do not recognise engagement in education as part of their role. Catching parents during the 'critical response time' (between the child's ages 2 to 3 to mid-primary) is crucial. Then there is the need to keep activities and approaches simple and straightforward, with less 'bombarding' of parents and schools with information and choice – this scares some parents away. It may be necessary to target parents who have not yet come into school and give them extra support to take the initial step.

There was some debate over the question of whether workshops for parents is the most effective way to engage them. Some felt that maths workshops for curriculum information only attracts confident parents – there can be an implication that they are required to teach. Telling parents how to do maths has not worked for many. Offering a meeting in a community centre, to remove the fear of going to school, has not been successful either.

Planning support without consulting the parents was not successful. Additionally, it was clear that schools feel overwhelmed by the amount of choice, of support resources, and do not know how to access them or which would have the greatest impact.

The expert group were invited to share their thinking on innovative approaches. There was a suggestion to promote more tolerance for taking time out of work to attend school events (especially when child is at secondary school). Also to show parents what they can do when they are out and about, at their place of work, or projects or activities they can do at home. Teachers should be encouraged to develop a richer understanding of what parents can do.

Inevitably, with a diverse group of experts, there were some areas which not everyone could reach agreement on. For example, there were conflicting opinions on the value of holding workshops to teach parents the new methods of calculation – there is no ‘one size fits all’ solution. It is important to run a needs analysis and develop bespoke approaches for each school/community – some communities may welcome the opportunity to learn new methods, some may not. There were some suggestions which were cost prohibitive and others where sustainability might be an issue. It was agreed that choosing resources to trial which are innovative and have maximum impact – at feasible cost – is crucial. It is also clear there are excellent schemes, resources and websites but schools and parents do not know how to access them.

Summary

Parents have suggested a range of support they would find helpful:

- clear guidance on methods used in schools and how to talk to teachers
- everyday activities to develop mathematical understanding
- tips on having mathematical conversations which develop problem solving skills
- how to access the overwhelming range of current resources available online
- how to share good practice, particularly activities completed at home
- school workshops or homework clubs
- glossary of mathematical language
- maths volunteers in schools like the reading volunteers

Conclusions and recommendations

Throughout all the research, it is evident that parental involvement in school and parental engagement in learning are different. Any recommendations must be focussed on developing an enthusiasm for maths and dispel the myth that maths is just for the classroom. They must widen the learning environment beyond school and enhance the parent's role as first educators for their child. Parents should be helped to see mathematical opportunities in their everyday life and be supported in developing the vocabulary, language and questioning skills to maximise their child's learning. Any activities which could engage all family members and friends would help eradicate negative attitudes towards maths. There is therefore the potential to transform homework to focus on mathematical talk, thinking and reasoning. A carefully planned resource could challenge the perception that maths is just formal recording and encourage mathematical representation which demonstrates understanding. In the 1960s the American psychologist Jerome Bruner put forward a theory that people learn in three basic stages – by handling objects, through pictures and through symbols (with symbols clearly being the most mysterious of the three). This supports the approach advocated by the very successful Singapore Maths.

Ideally activities would prompt ideas for parents and schools to develop their own bespoke approaches. Any developed resources must be sustainable and able to be developed further. There is an imperative to recognise and build on, and complement, the wide range of existing resources which parents and/or schools may not be aware of. We should involve reciprocal

organisations and, ideally, all communities in displaying and encouraging maths everywhere – for example – supermarkets, waiting rooms, libraries. To meet all needs, a range of resources and media must be considered – online, books, leaflets.

The decision was taken to focus on three resources to develop for trialling:

A microsite

- This will include resources, information and a directory sign-posting parents and schools/community centres/parent organisations to existing good practice and resources.
- The focus will be effective approaches that break down barriers to parental engagement with maths.
- A set of criteria will be put together which we use to decide which resources to recommend. We will also match resources up against National Numeracy's Essentials of Numeracy for All (see Appendix 13o) to ensure we are helping parent to develop a wide range of numeracy skills.
- We envisage a 'Parents' section' for advice on helping their children feel positive about maths, sign-posting to explanations of the methods, and ideas for activities at home.
- Support will be offered in three age groups initially – under 6s; 6 -9s; 10-13s.
- Supportive resources for parents are split into – conversational, real life activity, online activities.
- For those who wish to improve their own numeracy, we will signpost to the National Numeracy Challenge.
- Schools/community centres/other parental organisations could use the 'Schools/other section (name TBC)' to develop a programme of parental engagement within their setting. Hopefully the site will also contribute to CPD in schools.
- The website will include advice for these settings to implement universal, targeted and bespoke support. We will also develop an auditing tool to assist schools with this process.

A leaflet prototype

- Available to download from the website
- This will have some locked (uneditable) and some unlocked text/picture areas.
- Unlocked/editable areas provide opportunities for schools to develop a bespoke approach whilst delivering the same key messages and attitudes about everyday maths.
- Schools/communities are encouraged to add their logo and also activities that can be done in their town/area.

A weekly maths challenge

- A maths based activity to be completed outside of school with parents.
- Activities will encourage (and give examples and prompts for) mathematical conversations, reasoning and justification.
- A scrapbook will be used to encourage any recording of the activity and findings – these could take the form of pictures, photos, diagrams, charts, graphs, any form of mathematical recording but will not be specified.
- The scrapbooks could then be displayed to encourage all to participate.
- Activities will be planned to support national expectations for the age group and will involve significant events on the calendar to give a purpose and link to real life.
- Initially these will be developed for school Years 3 and 4 (ages 7-8) as parental engagement is highest for younger children and we would wish to capture this critical point when it often begins to wane. These year groups are traditionally neglected in terms of support and there are often attainment dips.
- It is hoped the examples will prompt schools to review their homework and consider developing similar bespoke activities.

These will be developed over the summer with a view to start trialling in the school autumn term. A further recommendation is to encourage a parent to take on the role of championing mathematics within the school, encourage use of the resources and be a support for parents if needed. However we also wish to develop the idea that 'every parent is a parent champion for maths' and will therefore seek to avoid duplication of titles.

In summary, our aims and outcomes:

- More parents are actively engaged with their children's learning of maths
- Parents recognise and implement a number of strategies to improve their engagement
- Break down the barriers to parental engagement
- Pilot schools have developed a plan that includes universal, targeted and bespoke approaches and have evaluated the impact of their approach
- Parents who continue to experience barriers related to school still have access to resources
- Pilot schools have established the routine of the Maths Challenge
- Impact has been measured – through school evaluations, qualitative evidence of increased parental engagement and change in attitudes, quantitative measurement of use of microsite

Sue Skyrme

NN Pedagogy Expert

Parental Engagement – Bibliography

This bibliography includes all resources, projects and schemes researched.

- Achievement for All. 2013. Impact Report 2012-3
Achievement for All. Retrieved from <http://www.afa3as.org.uk/>
- Askew, M. Eastaway, R. 2010. Maths for Mums and Dads. Random House.
- BBC Learning. Early Years Foundation Stage. Retrieved from <http://www.bbc.co.uk/schools/websites/eyfs/>
- Bernie, J. Lall, M. 2008. Building bridges between home and school mathematics: A review of the Ocean Mathematics Project. Institute of Education, University of London.
- Boaler, J. 2010. The Elephant in the Classroom. Souvenir Press Limited.
- Burns, J. 2013. Boost family learning to close skills gap argues report. BBC. Retrieved from <http://www.bbc.co.uk/news/education-24570725>
- Campaign for Learning. 2013. Animate Learning! Retrieved from <http://www.campaign-for-learning.org.uk/cfl/new-media-centre/press-releases/index.asp?PressReleaseID=287>
- Campaign for Learning. 2013. Family Learning Festival. Retrieved from <http://www.campaign-for-learning.org.uk/map/fff/>
- Campbell, C. 2011. How to involve hard-to reach parents: encouraging meaningful parental involvement with schools. National College for School Leadership.
- Campbell, J. 2013. Helping your children with homework: New Hull City Council 'Proud Parents' course offers English and maths tips. Hull Daily Mail. Retrieved from <http://www.hulldailymail.co.uk/Helping-children-homework-New-Hull-City-Council/story-20006482-detail/story.html>
- Cbeebies and NIACE. 2013. Cbeebies Families and Children. Retrieved from <http://shop.niace.org.uk/cbeebies-modules-overview.html>
- Cbeebies Maths Month. 2014. How to help your child be epic at maths – even if you're not... Retrieved from <http://www.bbc.co.uk/cbeebies/grownups/article/help-your-child-with-maths>
- Chinn, S., 2012. Beliefs, Anxiety, and Avoiding Failure in Mathematics. Child Development Research 2012.
- Codrea-Rado. 2014. Translating maths in a multicultural school community. The Guardian. Retrieved from <http://www.theguardian.com/education/2014/mar/05/language-teach-math-english-second-language>
- Cracknell, S. Mathemagical. Retrieved from <http://www.mathemagical.co.uk/>
- Crowder, B. How to quit saying 'I hate math'. Retrieved from <http://mathfour.com/math-around-us/how-to-quit-saying-i-hate-math>
- Curriculum for Excellence Scotland. (n.d) Curriculum for Excellence: Numeracy and Mathematics, Experiences and Outcomes. Retrieved from http://www.educationscotland.gov.uk/Images/numeracy_mathematics_experiences_outcomes_tcm4-539878.pdf
- Dance Equation. Retrieved from <http://www.dance-equation.co.uk/maths-dance.php>
- de Coulon, A. Meschib, E. Vignoles, A. 2009. Parents' skills and children's cognitive and non-cognitive outcomes, Education Economics, DOI:10.1080/09645292.2010.511829
- Department for Children, Schools and Families. 2008. The Impact of Parental Involvement on Children's Education. Retrieved from <http://www.nationalcollege.org.uk/impact-of-parental-involvement-2.pdf>
- Department for Children, Schools and Families. 2010. Understanding progress in maths: a guide for parents. Retrieved from http://www.stdunstans.surrey.sch.uk/Prog_in_Ma_Parents_Guide.pdf
- Department for Education and Child Development Australia. (n.d). Great Start. Retrieved from <http://www.greatstart.sa.edu.au/>
- Department for Education and Skills. 2007. Every Parent Matters. Retrieved from <http://webarchive.nationalarchives.gov.uk/20130401151715/https://www.education.gov.uk/publications/eOrderingDownload/Every%20Parent%20Matters.pdf>
- Department for Education and Training. (n.d.) Queensland Government. Literacy and Numeracy Fact Sheet – Supporting Your Child. Retrieved from <http://education.qld.gov.au/literacyandnumeracy/pdf/factsheet-l-n.pdf>
- Department for Education. 2010. Review of best practice in parental engagement. Research Report DFE-RR156
- Department for Education. 2011. Support and Aspiration: A new approach to special educational needs and disability. A Consultation. Retrieved from <http://webarchive.nationalarchives.gov.uk/20130401151715/https://www.education.gov.uk/publications/eOrderingDownload/Green-Paper-SEN.pdf>
- Desforges, D. Abouchaar, A. 2003. The Impact of Parental Involvement, Parental Support and Family Education on Pupil Achievements and Adjustment: A Literature Review . Department for Education and Skills. Research Report RR433.

- Dowker, A et al. 2000 Numeracy Recovery: A Pilot Scheme: Early Intervention for Children with Numeracy Difficulties, Paper presented at the ESRC Teaching and Learning Research Programme, First Annual Conference - University of Leicester, November 2000. Retrieved from <http://www.leeds.ac.uk/educol/documents/00003208.htm>
- Dweck, C., 2008. Mindsets and Math/Science Achievement. Teaching & Leadership: Managing for Effective Teachers and Leaders.
- Dweck, C. 2007. The Perils and Promises of Praise. Early Intervention at Every Age. Vol 65, No 2, pg 34-39. Education Endowment Fund. 2013. Teaching and Learnign Toolkit. Retrieved from <http://educationendowmentfoundation.org.uk/toolkit/>
- Education Scotland. Lighthouse Keeper Joint Transition Project. Retrieved from http://www.educationscotland.gov.uk/earlyyearsmatters/t/genericcontent_tcm4754207.asp
- Family Learning. Retrieved from <http://www.familylearning.org.uk/numeracy.html>
- Gorard. See. 2013. Do parental involvement interventions increase attainment? The Nuffield Foundation. Retrieved from http://www.nuffieldfoundation.org/sites/default/files/files/Do_parental_involvement_interventions_increase_attainment1.pdf
- Gorard. See. 2013. What do rigorous evaluations tell us about the most promising parental involvement interventions? The Nuffield Foundation. Retrieved from http://www.nuffieldfoundation.org/sites/default/files/files/What_do_rigorous_evaluations_tell_us_about_the_most_promising_parental_involvement_interventions.pdf
- Gunderson, E.A., Ramirez, G., Levine, S.C., Beilock, S.L., 2012. The role of parents and teachers in the development of gender-related math attitudes. Sex Roles 66, 153–166.
- Harding, J. 2013. 1, 2, 3... and away we go with numbers. BBC Grownups. Retrieved from <http://www.bbc.co.uk/cbeebies/grownups/article/one-two-three-and-away-we-go-with-numbers>
- Harris, A. Goodall, J. 2007. Engaging Parents in Raising Achievement - Do parents know they matter? Brief No: DCSF-RBW004. Retrieved from <http://webarchive.nationalarchives.gov.uk/20130401151715/https://www.education.gov.uk/publications/eOrderingDownload/DCSF-RBW004.pdf>
- Harvard Family Research Project. Family Involvement Research Digests. Retrieved from <http://www.hfrp.org/publications-resources/publications-series/family-involvement-research-digests>
- Ipswich Star. 2013. Maths Challenge adds up to award winning idea. Retrieved from http://www.ipswichstar.co.uk/news/ipswich_star_s_maths_challenge_adds_up_to_an_award_winning_idea_1_217723 SS
- Loughran, E. 2013. Helping children with numbers and maths. Cbeebies Grown-Ups. Retrieved from <http://www.bbc.co.uk/cbeebies/grownups/article/supporting-learning-at-home>
- Mad4Maths. Retrieved from http://www.mad4maths.com/math_help/
- Maths Busking. Retrieved from <http://mathsbusking.com/>
- Maths on Toast. Retrieved from <http://www.mathsonttoast.org.uk/>
- Maths4US. 2013. Helping Children with Maths. Retrieved from <http://learningmathsonline.ac.uk/wp/m/helping-children-with-maths/>
- McCallum, A. Hernandez, L. 2011. Eat Your Maths Homework. Charlesbridge.
- Middlesex University. FAST - Family and Schools Together. Retrieved from [http://www.education.gov.uk/commissioning-toolkit/Content/PDF/Families%20and%20Schools%20Together%20\(FAST\).pdf](http://www.education.gov.uk/commissioning-toolkit/Content/PDF/Families%20and%20Schools%20Together%20(FAST).pdf)
- Morales. Guerra. 2006. Effects of Multiple Context and Cumulative Stress on Urban Children's Adjustment in Elementary School. Child Development. Volume 77, Number 4, Pages 907 – 923
- Muir, T. 2012. Numeracy at Home: Involving Parents in Maths Education. Retrieved from <http://www.cimt.plymouth.ac.uk/journal/muir.pdf>
- Neal, D. Thinking numerately: all children are mathematicians. Every Child. Vol 13, No 3. Newton, R. and Abreu, G de. 2011. Parent-child interactions on primary school-related mathematics. Proceedings of the Seventh Congress of the European Society for Research in Mathematics Education, University of Rzeszów, Poland, 9-13
- NIACE. 2013. Family Learning Works: The Inquiry into Family Learning in England and Wales. Retrieved from <http://shop.niace.org.uk/family-learning-inquiry-report.html>
- Number Fit. Retrieved from <http://numberfit.com/>
- OECD. 2013. PISA - Let's Read Them a Story - the parent factor in education. Retrieved from <http://www.oecd.org/edu/school/programme-for-international-student-assessment-pisa/pisa-lets-read-them-a-story-the-parent-factor-in-education.htm>
- Ofsted. 2008. Learning outside the classroom. Reference no: 070219. Retrieved from <http://www.ofsted.gov.uk/resources/learning-outside-classroom>
- Ofsted. 2011. Schools and parents. Reference no: 100044. Retrieved from <http://www.ofsted.gov.uk/resources/schools-and-parents>

- One Scotland. 2006. Parents as partners in their children's learning – Toolkit. Scottish Executive, Edinburgh. Retrieved from <http://www.scotland.gov.uk/Resource/Doc/147410/0038822.pdf>
- Ontario Early Math Strategy. 2012. Doing Mathematics with Your Child – A Parent Guide. Retrieved from <http://www.edu.gov.on.ca/eng/literacynumeracy/parentguidenum2012.pdf>
- Oxford School Improvement. 2012. Parental Engagement - How to make a real difference. Retrieved from http://fdslive.oup.com/www.oup.com/oxed/primary/reports/parental_engagement_report.pdf?region=uk
- Parent Edge. (n.d.) Ten Effective Ways to Equip Your Child With Numeracy Skills. Retrieved from <http://parentedge.in/ten-effective-ways-to-equip-your-child-with-numeracy-skills/>
- Parent Toolkit. Retrieved from <http://www.parenttoolkit.com/>
- Parents Early Education Partnership. Retrieved from <http://www.peep.org.uk/index.asp?id=1>
- Rose, J. Jay, T. Simmonds, B. 2013. Everyday Maths Project – Bristol. Retrieved from <http://nrch.maths.org/9839>
- Russell, R. 2013. Managing parental involvement and expectations with maths <http://blog.voicetheunion.org.uk/wp-content/uploads/2013/10/RRRussellNovember2013.pdf>
- Russell, R. Maths for Mums and Dads. Retrieved from <http://www.maths4mumsanddads.co.uk/index.php>
- Russell, R. Why do parents help their children with maths? Proceedings of the British Society for Research into Learning Mathematics 29(2) June 2009
- Sacker, A. Schoon, I. Bartley, M. 2002. Social inequality in educational achievement and psychosocial adjustment throughout childhood: magnitude and mechanisms. Soc Sci Med. Sep; 55 (5):863-80.
- Sani, N. 2010. How to do maths so your children can too. Vermillion
- School Home Support. Retrieved from <http://www.schoolhomesupport.org.uk/index.php>
- Sonnenschein, S. Galindo, C. Metzger, S. Thompson, J. Huang, H. Lewis, H. 2012. Parents' Beliefs about Children's Math Development and Children's Participation in Math Activities. Child Development Research Volume 2012 (2012), Article ID 851657, 13 pages
- Stewart-Brown, S. and Schrader McMillan, A. 2010. Home and community based parenting support programmes. Warwick: Warwick Medical School. Retrieved from <http://wrap.warwick.ac.uk/3239/>
- Talking Math with Your Kids . Retrieved from <http://talkingmathwithkids.com/>
- The Reading Agency. Summer Reading Challenge. Retrieved from <http://readingagency.org.uk/children/004-impact/record-participation-in-2013-summer-reading-challenge.html>
- Tough, P. 2012. How Children Succeed: Grit, Curiosity and the Hidden Power of Character. Mariner Books.
- Wales Department for Education and Skills. 2014. What you say counts. Retrieved from <http://learning.wales.gov.uk/news/sitenews/what-you-say-counts/?lang=en>
- Watson, C. 2013. Parents can make children afraid of learning maths. Adelaide Now. Retrieved from <http://www.adelaidenow.com.au/news/parents-can-make-children-afraid-of-learning-maths/story-e6frea6u-1226641540573>
- Williams, B. Williams, J. Ullman, A. 2002. Parental Involvement in Education. BMRB Social Research, Department for Education and Skills. Retrieved from <http://dera.ioe.ac.uk/4669/1/RR332.pdf>
- Williams. 2008. Review of Mathematics Teaching in Early Years Settings and Primary Schools. Department for Children, Schools and Families. Retrieved from <http://webarchive.nationalarchives.gov.uk/20130401151715/https://www.education.gov.uk/publications/eOrderingDownload/Williams%20Mathematics.pdf>

13h: Parental Engagement: Survey Questions

Parents:

*Where we say 'parents' we mean anyone in a significant caring role of a child.

*Where we say 'child' we also mean grandchild, sibling, cousin etc

How did you access this survey?

Do you think any person can learn and do maths?

(if 'no') Tell us why:

How important is maths?

How often do you use maths?

How often do you talk to your child about uses of maths in everyday life and work?

(if 'not at all') Please tell us why:

How often do you involve your child in maths at home? E.g. cooking, measuring, using money, using time

(if 'not at all') Please tell us why:

How positive are you feelings about maths?

How was your experience of maths at school?

How much do negative experiences affect the way you feel about maths now?

Do you feel that you are positive about maths around your child?

How much do you think the way you talk about maths affects your child's opinions of maths?

What do you think most affects how a child feels about maths?

At the moment, how much do you encourage your child's interest in maths?

Do you want to do more to support your child's learning of maths?

What, if anything, stops you from feeling able to help your child with maths?

Would you welcome support from National Numeracy on: Improving your maths skills/Tips on how to help your child learn/Neither

Would you welcome support from your child's school on: Improving your maths skills, Tips on how to help your child learn/Neither

What form of support would be best? Leaflets/Online/Workshop/Other

What would encourage parents to attend maths workshops in schools?

Is there anything else you would like to tell us?

Teachers:

How did you access this survey?

What is your current role in the school?

Do you believe that parents helping pupils with their homework leads to good outcomes?

Does the school have an overall policy for engaging parents in their child's learning?

(if 'no') Why do you think this is the case?

(if 'yes') How successful do you think the school has been in engaging parents?

Do you, in your current role, try to engage parents in their child's learning?

(if 'yes') How successful do you feel you have been in engaging parents?

What are the issues that you have experienced when it comes to parental engagement? Lack of interest/ Work commitments/ English as a second language/ Parents feel intimidated by school/ Parents feel intimidated by other parents

Is there anything else you'd like to tell us about why parental engagement may be difficult?

What form of support do you think would work best for engaging parents? Leaflet/ Online/ Workshop

Any other ideas?

To what degree do you agree:

Parents know that maths is an important subject

Parents understand that maths is used a lot in everyday life and work

Parents encourage boys more than girls when it comes to maths

Parents view maths as fun

Is there anything else you would like to add?

13i: Firm Foundations for All: Expert Group members and Terms of Reference

Purpose of the group:

- To share expertise and experience relevant to providing adults with low numeracy levels (EL2 or below) with the foundations of number understanding.
- To provide advice to National Numeracy on the scope and direction of the 'Firm Foundations for All' project.
- To receive and provide feedback on project proposals and reports.

Membership:

The current period of membership is from December 2013 to Feb 2015 (date of final report). However, we hope that this is just the beginning of the Firm Foundations for All project and that there will be further opportunities for involvement in the future.

We have sought to bring together experts with varying experience and specialisms. As of 17.02.14, the members are:

Name	Role, Organisation
Michael Allcock	Functional Skills Tutor, HMP Everthorpe
Judith Aveyard	SEN Support, Leeds Education Authority
Diane Dalby	Research Student, experiences of vocational students in FE with functional maths (16-18).
Chris Delahunt	Numeracy and Literacy Tutor, Brighton Friends' Centre
Ann Dowker	University Research Lecturer at the Department of Experimental Psychology, University of Oxford.
Beverley Frey	Financial Capability Tutor, CAB
Karen Knepper	School Improvement Consultant, Leeds Local Authority
William O'Connor	Functional Skill Tutor, Prince's Trust
Romey Sawtell	Former Head teacher and Original founder, Numicon
Tony Wing	Former teacher, lecturer and Professional Development Leader and Original founder, Numicon
Scott Morten	Lead Teacher of Mathematics at Cockburn School

Accountability: National Numeracy:

Project Manager, Sarah-Jane Gay

Sarah-Jane is responsible for reporting meeting minutes, next steps and any other relevant documents to group members, and organising subsequent meetings and project based events.

Pedagogy Expert, Margaret Haseler

Margaret is responsible for conducting desk and field research, as well as reporting the progress of the Firm Foundations for all project to group members.

Consultant and Chair of Expert Group, Di Hatchett

Di is responsible for chairing Expert Group meetings.

Meetings:

- Two and a half hourly meetings to be held four times over the course of the project, at a Central London venue.
- Agendas and papers to be generated by National Numeracy, agreed by the Chair and circulated by e-mail at least one week in advance of each meeting.
- In order to ensure optimum efficiency of the meetings, members are expected to read through any relevant papers in advance of each meeting.
- We intend the meetings to be interactive and discursive.
- Members will be asked to observe confidentiality of papers/discussion as appropriate.

13j: Firm Foundations for All: Findings & Recommendations Overview

Findings

In comparison with literacy, there has been little research carried out on adult numeracy and much of the information available has been obtained through national and international surveys. Despite an increase in funding, initiatives and training over the last decade, the success rates of learners attending courses are not high and participation in numeracy classes is continuing to decrease. Although there have been no studies on effective approaches in teaching adults, several national organisations have produced 'good practice' lists based on anecdotal evidence of numeracy tutors. Much of this has been drawn from successful practice developed in primary and secondary schools. Recommendations for good practice when working with adults include:

- carrying out a diagnostic assessment to identify not only gaps and misconceptions but also strengths in order to build on what learners already know
- involve learners in compiling a learning plan which identifies learning contexts specifically relevant to the individual
- develop mathematical reasoning and problem solving skills alongside basic mathematical skills
- include a variety of approaches such as use of resources, ICT, games, collaborative learning in pairs or small groups

However despite these recommendations, much of the provision for adults observed does not follow these guidelines. For example, sessions are often skills driven rather than developing mathematical thinking and problem solving in learners, few effective resources are used to help develop conceptual understanding and course content is not always tailored to meet individual needs. A particular challenge for practitioners working with adults with the lowest levels of numeracy is finding suitable materials. Structured resources are known to help develop conceptual understanding in children and there is some anecdotal evidence showing that these resources

have also been successful with young adults. However, as adult learners have many differing needs, it is unlikely that one type of resource will suffice. The project therefore seeks to develop a toolkit of appropriate resources with accompanying teaching materials.

The increased use of ICT is recommended as it is thought to both attract learners and maintain interest. Programmes can be tailor made for the individual as well as providing opportunities for more flexible learning which may be more suitable for adults with family or work commitments. However, there has been no robust research carried out on identifying successful programs for adult learners or whether the use of ICT suits all levels of learners. The latter question is quite crucial in relation to this project as adults with low levels of numeracy are also thought to have low levels of ICT skills. Additionally, adults with low levels of numeracy are also less likely to be either employed, in training or in education so will have very limited access to computers or hand held devices. However, given the advances in opportunities for digital learning e.g. programs for handheld devices, mobile phone apps , the project seeks to explore this area further with a view to developing a digital equivalent of the hands on resources described above.

Recommendations for the next phase of the project are:

- Carry out a small scale pilot study on the use of structured resources with groups of adult learners. This will include accompanying teaching materials and will consider whether the resources need any adaptations to suit adult learners.
- Explore the use of digital learning further, especially for those with the lowest levels of numeracy. If appropriate, this may lead to developing complementary digital resources to match the hands on resources.

13k: Firm Foundations for All: Focus Groups Questions

	Competence	Confidence	Attitudes/views	Relevance
Statements	I have friends who are good at maths/enjoy maths.	When I get stuck with a maths problem, I keep trying until I can do it.	With effort and support, anyone can learn maths.	Maths is useful in my life.
	If I wanted to improve my maths, I would know how to go about it.	I'm confident that I can learn maths.	Maths is important.	You don't need maths unless you are going to do a job that needs maths like working in a bank.
	I prefer to learn using a computer.	Thinking about maths makes me nervous.	Maths is interesting.	You need maths to get a good job.
	I prefer to learn using paper/books.	I'm not embarrassed to ask for help.	Everyone finds maths difficult sometimes.	I will use maths in the job I want to do.

	I prefer to learn using equipment.		Maths is harder to learn than English/literacy.	I have used maths today.
			School maths prepares you well for maths in real life.	There are the same opportunities to improve maths as there are to improve literacy
			Some people are born not being able to do maths.	
			If you are good at maths you will enjoy it.	
			I care about doing well in maths.	
			People who are good at maths are people who can do it quickly.	

13I: Firm Foundations for All: Focus Groups Summary

To help us to understand the current adult numeracy landscape and gain an insight into the kind of support that learners want, we have run three learner focus groups and one tutor focus group. The learner focus groups took place at: an East Sussex High School, Prince's Trust Chatham, and HMP Oakwood. The tutor group ran with Citizen's Advice Bureau Financial Capability tutors from varying locations. We have one more group planned at an independent adult education centre in Brighton, and may run one more session if necessary. National Numeracy wanted to find out about adults' confidence and competence with maths and numeracy, as well as attitudes to and perceptions of the relevance of numeracy.

Confidence

- Confidence and perseverance was low across participants.
- Bad experiences at school had left a few feeling as though they would never be able to learn – *'I didn't get much attention [at school] because I was too slow. My damn brain is too slow, I'm too slow at doing things, that's me.'*
- Many felt they would be embarrassed to ask for help - *'I'm quite thick at maths. I wouldn't put my hand up cos I don't want to look like a twat.'*
- Some mentioned that people hide from/ignore their numeracy problems and have avoidance strategies.

- Generally participants felt that they could learn maths. Many blamed teachers/poor teaching for low skills.
- Experience of some negative emotion, e.g nerves/anger/anxiety/frustration, when thinking about maths was common.

Competence

- Across groups, participants preferred learning with equipment rather than computers or books.
- Participants liked being able to move and manipulate physical objects, and many stated that they disliked using computers to learn.
- Some liked using games to learn, Monopoly and Scrabble were mentioned.
- Some participants mentioned the literacy and language barriers that arise when working with books and computers.
- Particularly in the prison, participants had found that lack of computer knowledge had created difficulties for prisoners trying to learn using computers.
- On calculators, it was mentioned that some people do not know what the operation symbols (- + x ÷) mean.
- Participants gave mixed responses about knowing where to go for maths support. All groups liked the idea of a variety of group work and one on one support.

Attitudes

- Participants largely agreed that apart from people with particular learning disabilities, everyone can learn maths – people are not born not being able to do maths.
- The prison group pointed out that you need to believe that you can learn maths. This group knew of someone who had been labelled as ‘unteachable’. They felt that this was unreasonable and unhelpful.
- Most participants, across groups, agreed that school maths does not adequately prepare people for maths in real life.

Relevance

- Maths was seen as important, but not interesting – it is generally seen as harder than English/literacy.
- Across groups (including the tutors’ group), participants felt that learning maths through everyday contexts and practical, real world examples was helpful – *‘people think ‘maths, that’s complicated like school’, but they enjoy practical applications’*.
- Participants felt that maths is very important – particularly for getting a job.

13m: Findings, recommendations and bibliography – Firm Foundations for All

The aim of the Firm Foundations for All (FFfA) project is to explore a different approach to raising numeracy skills in adults, by focusing on the development of ‘number sense’ in those adults with the lowest levels of numeracy through the use of structured resources.

1. Introduction

The first stage of the project has concentrated on conducting desk and field research on the issues surrounding adult numeracy – the prevalence, causes and types of numeracy difficulties, the efficacy of existing provision, including the identification of any barriers of access and recommendations for good practice. Desk research explored these issues through the existing research base on adult numeracy. The field research gathered submissions from 3 focus groups of learners of all ages and one expert group, comprising of individuals who have experience of working with adult learners of numeracy and individuals who have extensive experience of mathematics teaching within statutory education.

2. Desk research

2.1 Background context

Following the findings of the International Adult Literacy Survey in 1996 which revealed that England had low levels of literacy and numeracy in comparison with other OECD countries, there has been much investment in addressing this deficit over the past decade or so. The latest International Survey of Adult Skills (ISAS) carried out in 2012 found that while England's performance in literacy was now more or less in line with the OECD average, numeracy has remained significantly below the OECD average. Participants were graded on one of 6 levels, ranging from below level 1 through to level 5. There were marked differences between the proportions of participants at the lowest 2 levels in comparison with those at the highest in England than in most other participating countries. The highest performing countries had a lower proportion of participants at the lowest 2 levels (Level 1 and below) and a higher proportion at the highest level. In contrast, the percentage of those in England achieving level 4 or above was 12% which is slightly higher than the OECD average of 11% but is significantly lower than the 19% of participants in the highest performing countries. The OECD average for those working at the lowest 2 levels (Level 1 and below) was 19% whereas in comparison England had almost a quarter (24%) at the lowest 2 levels. In relation to those working at the lowest level (below level 1) the survey also showed that twice as many people in England are below level 1 in numeracy than in literacy.

2.2 Research into adult numeracy

The ISAS survey showed that while there has been some improvement in literacy levels, England still has a significant problem with numeracy skills across all ability ranges but particularly at the lower levels. Considering the increased attention in terms of funding, initiatives and training over the past 10 or so years, it is perhaps surprising that there has not been more success in raising attainment for adults in these groups. However, this may be due to the lack of research carried out on adult numeracy which, in comparison with research into adult literacy, is quite sparse (NRDC 2010, Forrest 2011). This mirrors the balance between educational research on literacy and numeracy difficulties generally. Additionally, within the (already small) research base on mathematical difficulties, the vast majority of research has focused on exploring the numeracy difficulties in primary school age children. Thus much of what we know about adults who struggle with mathematics comes from national and international surveys such as the ISAS.

2.3 Characteristics of adults with low levels of numeracy:

The ISAS found that in comparison with literacy, numeracy had more significant associations between characteristics and low proficiency, such as gender, levels of education, employment status and ethnicity. Those with low levels of numeracy were likely to:

- be female – this is in contrast to the findings for literacy where gender did not appear to be

significant.

- have a level of education below that of secondary school level, be unemployed or looking for work. Lower levels of parental education was also found to be significant.
- be born outside the UK or belong to particular ethnic groups (such as Asian or Black), or have English as an additional language (EAL). It is interesting to note that EAL was not found to be a significant association with low levels of literacy.
- are also more likely to have low levels of general health.
- have limited or no computer experience.

2.4 Provision for adults with low levels of numeracy:

A number of organisations have expressed concern over adult numeracy provision in relation to availability, accessibility, content and faculty expertise. The NIACE Enquiry into Adult Numeracy Learning Numeracy Counts in 2011 reported that provision for adult numeracy should include more opportunities for flexible learning and this should be available not just through education providers but also through workplaces, community groups and areas such as libraries and museums. Adults with the poorest numeracy skills are found to be the least likely to attend classes. Within the group of adults with a numeracy level of below entry level 3, only 1 in 10 has taken part in a numeracy course (NAO 2008). Furthermore, even for those who do enrol on courses, success rates are not high, with approximately one half gaining a qualification. And according to the most recent survey conducted by Niace, the outlook is not positive as it shows that adult participation in numeracy classes is continuing to fall. Why is this? To answer this, it is necessary to explore the barriers that may exist, both in relation to learners themselves ('within learner' issues) and with the provision of courses ('without learner' issues).

2.4.1 'Within learner' issues:

As the ISAS results show, as a nation, we have a problem with numeracy levels. However, this problem goes much deeper than a nation with comparatively poor numeracy skills. Across the population, there is a predominance of negative attitudes and perceptions in relation to mathematics. Many adults have negative memories of mathematics teaching from their school days and our take up of young people continuing mathematics education beyond the statutory age is low (13%) in comparison with other well developed countries (65+%). For many adults and young people, being 'bad' at maths is seen as a badge of honour, despite the evidence that adults with poor numeracy skills are 'twice as likely to be unemployed, less likely to receive work-related training, get a promotion or a raise', and as a result are more likely to suffer from mental health issues, such as depression. In some cases, this negative attitude towards mathematics can manifest itself in a more entrenched difficulty, that of 'maths anxiety'. Stress or anxiety is known to have a negative effect on any task being undertaken, however simple (Pons 2011). Mathematics, unlike any other curricular subject, seems to be unique in that it can evoke strong negative feelings in a significant sector of the population of all ages (Dowker 2005) and this has been recognised as far back as 1982 (Cockcroft 1982). Maths anxiety has been shown to disrupt cognitive processes on a number of levels and, if left unchecked, will interfere significantly with mathematical attainment. (Passolunghi, 2011, Moore & Ashcraft 2012, Ashcraft et al 2007, Dowker 2005, Krinzinger et al 2009).

Even if learners do not suffer from maths anxiety, previous negative feelings in relation to learning mathematics are likely to lead to some reluctance in /resistance to improving skills at a later stage. Other issues which have been found to hinder adult take up and attendance at numeracy classes relate to the difficulty of juggling family and/or work commitments. (REF)

2.4.2 'Without learner' issues

Although the 'within learner' barriers are commonly acknowledged and can explain to some extent the low take up of adults attending numeracy classes, responsibility for poor attendance and low success rates among those who do attend must also lie with course providers. Ofsted found (2005, 2007) that an unacceptably high proportion of adult numeracy provision is unsatisfactory, due to a predominance of a test or skills driven curriculum. Focusing on the acquisition of a disparate set of memorized arbitrary rules and procedures does little to help learners relate what they are learning to real life. Additionally there has been much concern expressed about the standard of teaching within adult numeracy and the qualifications of numeracy tutors. Since 2002, all numeracy tutors working in further education colleges are required to have both a teaching qualification and a subject specialist qualification to a specified level. Despite this, Ofsted found that a quarter of the tutors delivering numeracy classes did not have a generic teaching qualification and of the three quarters that did, just over a quarter of these had met the national tutor requirements for teaching numeracy.

2.5 Developing secure conceptual understanding in mathematics

Over the past decade there has been much research and debate on the curriculum content and pedagogical approach to teaching mathematics. In relation to adult learning, the curriculum content has focused on developing numeracy skills. Numeracy - a particular subset of mathematics - consists of the *essential skills needed for solving problems, processing information, making decisions and interpreting data*. (NN website). Being numerate is being able to confidently and competently use number to solve problems, and to access and interpret information. Although it is essential for beginner learners to acquire fundamental mathematical skills (e.g. in arithmetic) in order to access later more complex mathematical topics, it is widely accepted among mathematics educators that an approach which concentrates just on learners acquiring a set of skills and procedures is not effective. Learners also need to develop mathematical reasoning, make connections between mathematical concepts, to develop flexible approaches to calculations and to be able to apply these skills in a variety of contexts. Research has shown that although having a 'toolbox' of mathematical skills and procedures is important, in terms of future success in mathematics, it is not as important as developing mathematical reasoning and problem solving skills. In fact, the experience of solving problems is essential in order to acquire deep understanding of mathematical concepts as well as increased fluency and sense of number. Some researchers describe the combination of a toolbox of skills and procedures coupled with an ability to reason mathematically as having 'number sense'. Number sense can be described as:

'.....a person's general understanding of numbers and operations and the ability to handle daily-life situations that include numbers. This ability is used to develop flexible and efficient strategies (including mental computation and estimation) to handle numerical problems' (Der-Ching Yang, Robert E. Reys and Barbara J. Reys 2007)

Although not a common term in the UK, there is overwhelming evidence on the importance of developing number sense in children to ensure future mathematical competence. Number sense is developed when learners have opportunities to explore number in a variety of contexts, visualise numbers using different representations and develop relational understanding of number. A key aspect of number sense is the ability to see patterns and relationships in number and there has been much success in developing this in school age children through the use of structured resources. The skills required to become numerate are closely related to those which develop number sense e.g. solving problems, estimation, developing flexible approaches to calculations.

Thus, developing number sense may be considered as important for adults in developing secure conceptual understanding of mathematics as it is for children.

As there is more than enough evidence to support an approach to mathematics teaching which focuses on the development of mathematical reasoning and number sense, including the use of structured resources, such an approach is also considered good practice in adult numeracy teaching. Niace recommends an approach that ‘prepares people to understand and use maths in daily life, giving learners a practical grounding in how to apply skills in everyday situations and focus on independent problem solving and transferring skills to different situations.’ Despite this, numerous studies show that this approach is not the norm and much provision still focuses just on the acquisition of skills and procedures. Furthermore, studies have also found little evidence of effective use in terms of practical resources to develop conceptual understanding. (BIS 2011)

2.6 Working with adults

Although the research on developing an effective pedagogy in mathematics teaching has been developed mainly in relation to school age children, it has influenced much of the good practice when working with adults in numeracy. In relation to curriculum content, the progression and development of mathematical skills is the same whatever the age of the learner. Thus what we have learned from effective teaching of mathematics in the school system can be applied to adults who for whatever reason are still working at low levels of numeracy. However, working with adults who present mathematical difficulties is inevitably a more complex undertaking than working with children, given the additional complications of entrenched historic experiences and attitudes (Dowker, 2005).

- Unlike children, adults, even those with very low levels of numeracy, come with some level of mathematical understanding, skills and ability gained over the years – after all they have lived in a world surrounded by number and numerical data.
- Children have approximately 13 years of statutory schooling (which includes a daily mathematics lesson) to progress through the mathematics curriculum. Courses for adults on the other hand rarely run beyond a year and consist of at most an hour a week. Yet some research suggests that for any significant progress to be made, learners need to engage in excess of 100 hours of learning.
- Previous negative experiences of learning mathematics can be a major barrier both in adults recognising that they have a problem and then in seeking help. Motivation and engagement is therefore seen as a particular challenge in the adult numeracy world.

The majority of adults who consider themselves unable to do maths do not realise just how much mathematics they are actually able to do and carry out on a day to day basis. It is not uncommon for learners to refer to examples of the ‘everyday’ maths they engage in as not maths at all but ‘just common sense’. It is thought that this relates to a lack of confidence in their mathematical abilities - the entrenched belief that if I am no good at maths, then anything with number that I can do, cannot be maths at all. (NRDC 2010, Coben 2003)

2.7 The use of ICT:

Good practice guidelines suggest that ICT should be used more as it is thought to act as an incentive both in terms of attracting potential learners and helping to maintain interest and engagement. ICT can also support the need for multiple ways of engaging learners, such as self-study, distance learning, virtual environments, thus addressing some of the ‘within learner’ issues identified above. However, in relation to the use and efficacy of technologies and digital resources

to assist in learning, to date, there is only a small body of evidence available (BIS 2011). Consequently there is a need to carry out robust trials in this area in order to identify effective practices in the use of technology, especially in relation to different groups of learners. For example, some studies have been carried out with learners at level 2 or above. No trials on adult learners with very low levels of numeracy (e.g. Entry levels and level 1) have been carried out. This is especially important for 2 reasons:

- Given the suggested correlation between poor numeracy skills and low levels of ICT skills, would a digital approach be suited to learners at the lowest levels?
- There is strong evidence that adult learners at the lowest levels are often the hardest to reach as they are often not in employment, training or education. As a result, these learners may not have access to computers or handheld digital devices.

2.8 Recommendations for good practice when working with adults in numeracy:

- Due to different experiences that adult learners bring, a thorough diagnostic assessment is recommended in order to identify not only gaps and misconceptions but also strengths. Literacy skills should also be assessed.
- Using the assessment findings, build on what learners already know and identify learning contexts that are specifically relevant to the individual.
- Involve learners in drawing up an individual learning plan that takes into account not only any gaps and misconceptions but also the aspirations of the learner.
- Ensure that all activities promote problem solving and reasoning skills as well as addressing basic mathematical skills
- Help learners to make connections between mathematical topics
- Use a variety of approaches e.g. games, collaborative learning in pairs or small groups, creative uses of ICT
- Regularly monitor progress and check knowledge and understanding

3. Field research

3.1 Focus groups:

3 focus groups were convened:

- a group of Y11 pupils from a secondary school
- a group of young people aged between 16-25 years currently attending an employment course at the Prince's Trust
- a group of male prisoners aged from 18-60+ to in a category C prison.

For each group, participants were asked to sort statements into Agree/Disagree/Not sure. A copy of the statements is attached in Appendix 13k.

Much of the evidence from the focus groups backed up the desk research such as:

- the difficulty of finding suitable courses and age appropriate materials
- the need to link numeracy learning to the individual needs and circumstances of the adult
- negative experiences at school which have left lasting negative memories and a fear of failure.

..... but there were also some differences:

- the majority of participants recognized that numeracy was an essential life skill and some expressed a desire to improve their current levels.
- no evidence was observed of a difference between men and women in relation to numeracy difficulties
- the majority of participants said they would prefer to learn using 'hands on' resources instead of using a computer.

3.2 Expert group:

Members of the Expert group endorsed the points highlighted in the desk research and also the comments made by the focus group participants. In addition, they highlighted the following:

- Effective practice includes:
 - Setting learning goals with the adult learner
 - Contextualising the learning specific to the learner – not just setting it in a real life context but identifying a context that matches the learner's experiences and situation.
 - Identifying gaps, misconceptions and strengths through a diagnostic assessment
 - Building on what the learner already knows and can do
- that lack of confidence, self-esteem and anxiety in relation to poor numeracy skills is a major barrier for many learners, particularly those at the lowest levels
- although many learners recognise the value of numeracy, they still find it boring and uninteresting – something to be endured rather than enjoyed.
- Many learners have developed strategies to hide their difficulties and to avoid addressing them
- Finding suitable materials for adult learners can be challenging, especially contextualizing for the individual as described above
- Mathematics evokes high anxiety levels and negative feelings in many adult learners. Because of this, adults need a very strong reason to tackle their difficulties, such as helping their children with homework or increasing their chances of employment.
- Some adults find the use of hands on resources too babyish. However this may be more to do with adults not recognizing the extent of their difficulties. Practitioners felt that once adults had taken the step to improve their numeracy skills, they were prepared to use anything that would help them to improve.
- One practitioner reported having achieved much success in using structured resources with secondary aged pupils who had low levels of numeracy.
- None of the expert group members had knowledge or experience of using ICT with adult learners.
- Adults with the lowest levels of numeracy skills are less likely to be in employment, training or education so this group are the hardest to reach.

4. Conclusions and recommendations

- The research base on adult numeracy is sparse, especially when compared with research into adult literacy. However, we were able to identify some of the issues surrounding adult numeracy in terms of provision and accessibility as well as identify characteristics of the group of learners which the project is focusing on. i.e. those with the lowest levels of numeracy. With some exceptions, the evidence gained from both the focus and expert groups complemented the evidence from the research base.

-
- Although good practice guidelines suggest the use of a variety of resources to complement learning, to date, there have been no studies exploring which type of resources have proved most effective. Given the differing needs of adult learners, it is unlikely that one resource will be suitable. We are therefore looking at developing a toolkit of appropriate resources.

Similarly, good practice guidelines suggest a more creative use of ICT and digital learning but again, there are no studies available identifying what is most effective and whether this suits all levels of adult learners. The focus group members favoured hands on resources to computer learning. The research base suggests that adult with low levels of numeracy are often those who also have poor computer skills. Nevertheless given the advances in opportunities for digital learning e.g. handheld devices, mobile phone apps etc, this is an area that requires further exploration.

Our recommendations for the next phase of the project address both these areas:

- Carry out a small scale pilot study on using structured resources with groups of adult learners.
- Consider whether the resources used above need to be adapted to suit adult learners
- Develop a set of teaching materials to use alongside the resources
- Explore the use of digital learning further, including the possibility of developing a complementary digital resource to match the structured resources used above.
- To recruit a least one additional member to the expert group who has experience of digital learning, preferably in the adult sector.

Firm Foundations for All – Bibliography

- ANTHONY, G. & WALSHAW, M. 2009. Effective pedagogy in mathematics. Educational Practices Series.
- ASHCRAFT, M. H. & KRAUSE, J. A. 2007. Working memory, math performance, and math anxiety. *Psychonomic bulletin & review*, 14, 243-248.
- BEDDINGTON, J., COOPER, C. L., FIELD, J., GOSWAMI, U., HUPPERT, F. A., JENKINS, R., JONES, H. S., KIRKWOOD, T. B., SAHAKIAN, B. J. & THOMAS, S. M. 2008. The mental wealth of nations. *Nature*, 455, 1057-1060.
- CARPENTIER, J., LISTER, J. & FRUMKIN, L. 2010. Adult numeracy: a review of research.
- CASTRONOVO, J. & GÖBEL, S. M. 2012. Impact of high mathematics education on the number sense. *PloS one*, 7, e33832.
- CHINN, S. 2009. Mathematics anxiety in secondary students in England. *Dyslexia*, 15, 61-68.
- CHINN, S. 2012. Beliefs, Anxiety, and Avoiding Failure in Mathematics. *Child Development Research*, Volume 2012, Article ID 396071
- CHISMAN, F. P. 2011. Facing the challenge of numeracy in adult education.
- COBEN, D. 2005. Adult Numeracy: shifting the focus. A report and recommendations.
- COBEN, D. & GAL, I. 2006. AMERICAN INSTITUTES FOR RESEARCH®.
- DALBY, D. The connections and contradictions of contextualised tasks.
- DALBY, D. From failure to functionality: a study of the experience of vocational students with functional mathematics in Further Education.
- DEVINE, A., FAWCETT, K., SZÚCS, D. & DOWKER, A. 2012. Gender differences in mathematics anxiety and the relation to mathematics performance while controlling for test anxiety. *Behavioral and Brain Functions*, 8, 33.

- FITZSIMONS, G. & COBEN, D. 2009. Adult numeracy for work and life: Curriculum and teaching implications of recent research. *International Handbook of Education for the Changing World of Work*. Springer.
- GERBER, P. J. 2012. The Impact of Learning Disabilities on Adulthood A Review of the Evidenced-Based Literature for Research and Practice in Adult Education. *Journal of Learning Disabilities*, 45, 31-46.
- GROSS, J., HUDSON, C. & PRICE, D. 2009. *The long term costs of numeracy difficulties*. London (UK): Every Child a Chance Trust and KPMG.
- HALBERDA, J., LY, R., WILMER, J. B., NAIMAN, D. Q. & GERMINE, L. 2012. Number sense across the lifespan as revealed by a massive Internet-based sample. *Proceedings of the National Academy of Sciences*, 109, 11116-11120.
- HITCH, G. 1978. The numerical abilities of industrial trainee apprentices. *Journal of Occupational Psychology*, 51, 163-176.
- HODGEN, J. & MARKS, R. 2013. *The Employment Equation*.
- IOSSI, L. 2013. *Strategies for reducing math anxiety in post-secondary students*.
- JENKINS, A., ACKERMAN, R., FRUMKIN, L., SALTER, E. & VORHAUS, J. 2011. *Literacy, numeracy and disadvantage among older adults in England*. Nuffield Foundation, UK.
- KAUFMANN, L., PIXNER, S. & GÖBEL, S. M. 2011. Finger usage and arithmetic in adults with math difficulties: evidence from a case report. *Frontiers in Psychology*, 2.
- LAURILLARD, D. & BAAJOUR, H. 2009. *Digital interventions for dyscalculia and low numeracy: final report (D2): for the Becta Research Grant programme 2008-2009*.
- NIACE COMMITTEE OF ENQUIRY ON ADULT NUMERACY LEARNING 2011. *Numeracy Counts*, NIACE.
- NICOL, M. & ANDERSON, A. 2000. Computer - assisted vs. teacher - directed teaching of numeracy in adults. *Journal of Computer Assisted Learning*, 16, 184-192.
- NYS, J. & CONTENT, A. 2012. Judgement of discrete and continuous quantity in adults: Number counts! *The Quarterly Journal of Experimental Psychology*, 65, 675-690.
- OFSTED 2011. *Tackling the challenge of low numeracy skills in young people and adults*.
- PARSONS, S. & BYNNER, J. 2008. *New Light on Adult Literacy and Numeracy in Scotland: Evidence from the 2004 survey of the British Cohort Study (BCS70)*. London, NRDC.
- PARSONS, S., CROFT, T. & HARRISON, M. C. 2009. Does students' confidence in their ability in mathematics matter?
- PRICE, G. R., PALMER, D., BATTISTA, C. & ANSARI, D. 2012. Nonsymbolic numerical magnitude comparison: Reliability and validity of different task variants and outcome measures, and their relationship to arithmetic achievement in adults. *Acta psychologica*, 140, 50-57.
- SOUTHWOOD, S. 2011. *Innovative practice in numeracy learning*.
- SOUTHWOOD, S. & DIXON, L. 2012. *The Vital Ingredients: Adults learning maths*, NIACE.
- SOUTHWOOD, S., DIXON, L. & RUCK, T. 2012. *Developing functional skills: learning from adult pilots*, NIACE.
- STARR, A., LIBERTUS, M. E. & BRANNON, E. M. 2013. Number sense in infancy predicts mathematical abilities in childhood. *Proceedings of the National Academy of Sciences*, 110, 18116-18120.
- STEEN, L. A. 2001. Mathematics and numeracy: Two literacies, one language. *The Mathematics Educator*, 6, 10-16.
- SWAIN, J., BROWN, M., COBEN, D., RHODES, V., ANANIADOU, K. & BROWN, P. 2008. Issues involved in designing and administering an assessment instrument to measure adult learners' progress in numeracy classes. *Research in Post - Compulsory Education*, 13, 69-78.
- TOBIAS, S. & WEISSBROD, C. 1980. Anxiety and mathematics: An update. *Harvard Educational Review*, 50, 63-70.
- TORGERSON, C., PORTHOUSE, J. & BROOKS, G. 2005. A systematic review of controlled trials evaluating interventions in adult literacy and numeracy. *Journal of Research in Reading*, 28, 87-107.
- VORHAUS, J., LITSTER, J., FREARSON, M. & JOHNSON, S. 2011. *Review of research and evaluation on improving adult literacy and numeracy skills*.

WHEATER, R., BURGE, B., SEWELL, J., SIZMUR, J., WORTH, J. & WILLIAMS, J. 2013. The International Survey of Adult Skills 2012: adult literacy numeracy and problem solving in England. Department for Business innovation & Skills.

13n: Biographies

Mike Ellicock

Mike was previously the Managing Director of [Numicon](#) an innovative maths teaching approach now used in over 8,000 schools, until its sale to [Oxford University Press](#) in 2010. He is an ex-international sportsman and a former Parachute Regiment officer before moving into business. He gained an MBA from Cranfield School of Management and was a Global Relationship Manager for HSBC Corporate Bank before joining Numicon in 2008. Having chaired the National Numeracy Steering Group whilst supporting Oxford University Press post acquisition, he has become the inaugural Chief Executive now that the concept has become a reality.

Lynn Churchman

Lynn spent her teaching career in challenging and diverse environments, working with the full age spectrum (from early years to adult education) and attainment range (from early counting through to Further Mathematics at A and AS level). Following Senior Inspection and Advisory roles in local authorities, she moved on to senior national roles as Principal Manager of the Mathematics team at QCA, and then as Lead HMI for Mathematics with Ofsted.

Having spent more than 30 years working at every level in mathematics education, Lynn remains passionate both about the subject and the capacity of people to learn it successfully. Lynn set up [National Mathematics Partnership](#) in 2006, when she left her role with Ofsted, to share her cumulative knowledge and expertise about how to raise achievement in mathematics. Since then, NMP has grown into the largest dedicated mathematics improvement organisation working nationally and is now part of National Numeracy Solutions.

Di Hatchett

Di is an expert in early intervention in literacy and mathematics and in the leadership of inclusion and effective support for children most at risk of not achieving their potential. Her extensive career in primary education has spanned over 40 years, including twelve years as a head teacher, service as Senior Director for inclusion and achievement with the National Strategies, and, since 2008, as Director of the Every Child a Chance Trust, leading the development and national roll out of the highly successful Every Child a Reader and [Every Child Counts](#) programmes. Di's field of expertise is the development of high-quality approaches to intervention for children who struggle with the development of core skills in literacy and/or mathematics.

Margaret Haseler

Margaret has over 30 years' experience of working in education and has developed particular expertise in mathematics teaching and learning. Her passion for making maths more accessible to all began when she was manager of an education project for vulnerable young people in South London. Since then she has worked in a variety of education settings with children from Early Years through to KS3 and has extensive experience of devising and delivering intervention programmes for children who experience difficulties in learning mathematics. As an independent consultant, Margaret works with a number of primary and secondary schools on raising achievement in mathematics and is also currently acting as a numeracy consultant for the BBC. She is an active member of several professional teaching organisations and has contributed to a number of professional publications, including Ann Dowker's book *Mathematical Difficulties: Psychology and Intervention*.

Sue Skyrme

Sue was a mature student into teaching, having previously worked for the MOD. She has worked in a variety of roles in education including as a Numeracy Consultant for the LA and the National Numeracy Strategy (NNS), a Primary Headteacher and as an Initial Teacher Training (ITT) lecturer and link tutor. Sue has worked for the Department for International Development and completed several visits to Anguilla and Montserrat to develop the NNS. She has worked with National College for Teaching and Leadership to develop leadership succession and models of leadership, and also to develop a programme to support candidates for National Professional Qualification for Headship. Sue now works for the University of Winchester, developing ITT on the Isle of Wight. She continues to work in schools as an independent maths consultant and trains teachers in all aspects of numeracy and assessment.

13o: The Essentials of Numeracy for All

Developed by National Numeracy, the Essentials of Numeracy for All provide an overall picture of the numeracy landscape and attempt to summarise all the key skills, processes, concepts and attitudes that define 'being numerate'.

For more information, please visit <http://www.nationalnumeracy.org.uk/essentials-of-numeracy-for-all/index.html>.

13p: Submission to Select Committee on Business, Innovation and Skills: Adult Literacy and Numeracy

Executive Summary

- Adult numeracy is a long neglected area that now deserves urgent attention. As Andreas Schleicher from the OECD highlights, across all the variables that they measure, '**Good numeracy is the best protection against unemployment, low wages and poor health**'.
- Government initiatives over the past 15 years have had no significant impact on adult numeracy. Whereas there has been some improvement in adult literacy, numeracy levels have actually shown a slight decline and from a far lower base (see Fig.1 and Fig.2).

- Adult numeracy and literacy levels should be treated equivalently. It should no longer be assumed that a lower level of numeracy is acceptable; doing so to date has hidden the true extent of the numeracy issue in this country.
- The issues around adult numeracy, including the social acceptability of 'I can't do maths', the myth of a 'maths gene' and the ongoing impact of often negative experiences of maths within the school system, are fundamentally different from those around adult literacy – specific approaches to numeracy are needed for adult (and school) numeracy to improve.
- The definition of numeracy needs to include more than the 'tool set' currently outlined in the Adult Core Curriculum. Our 'Essentials of Numeracy for All' (see Fig.3) more closely reflects the curricula of high performing jurisdictions and includes at its core the vital elements of attitudes of mind, problem-solving, reasoning and decision-making.
- Given the specific issues around numeracy, National Numeracy believes that a Behavioural Science approach to building 'mathematical resilience' has merit. We are working with the Cabinet Office Behavioural Insights Team on this.
- The GCSE exam does not prepare students adequately for the workplace. The government and Ofqual should seriously consider the introduction of a dual GCSE, with one of the paired qualifications focusing on functional maths.
- National Numeracy welcomes the extension of compulsory maths to 18 but believes a different approach is needed for those who fail to pass GCSE maths at A*-C at 16. We believe that nearly everyone has the capacity to achieve L2; we need to identify and then systematically attack the barriers that are preventing them from doing so.
- We believe that improving the quality and supply of the adult numeracy workforce is a key role for government and urge it to give this greater attention.
- Adults need a variety of learning pathways: many will prefer an informal setting. Interactive technology has a significant part to play. The current formal qualifications-based funding regime is fundamentally flawed and should be replaced by one orientated towards 'distance travelled'.
- There is scope for considerable innovation in approaches to learning. Government is not best placed to lead on this, although it should offer active support.
- The National Numeracy Challenge offers an opportunity to improving adult numeracy skills and tracking progress or 'distance travelled'. This major drive – with an interactive tool at its heart – will be launched in March in partnership with employers and other organisations. Analysis of the 'big data' generated represents a much needed opportunity to identify, and look to replicate, effective numeracy teaching and learning.

Background on National Numeracy

National Numeracy www.nationalnumeracy.org.uk is a charity established in March 2012 with the aim of improving everyday maths skills in the UK and changing negative attitudes to maths.

Its role is unique in that it is the sole charity focusing specifically on numeracy skills for people of all ages. It came into existence after a report from New Philanthropy Capital, 'Count me in' (2010), proposed "a new National Numeracy Trust to campaign about the issues and coordinate the sector".

At its launch, National Numeracy drew attention to the government's Skills for Life survey results which showed that 17 million adults in England had numeracy skills roughly equivalent to those expected of children at primary school. The significance of this had not previously been highlighted. Since then National Numeracy has maintained an unrelenting spotlight on the issue and has developed a recognised expertise in the area. It has close contact with government, politicians and policy makers and works with other organisations in adult learning, school maths and business, recently setting up a Numeracy Forum, which brought together a variety of interested stakeholders.

National Numeracy has also been asked to provide advice and secretariat support to a proposed new APPG on maths and numeracy.

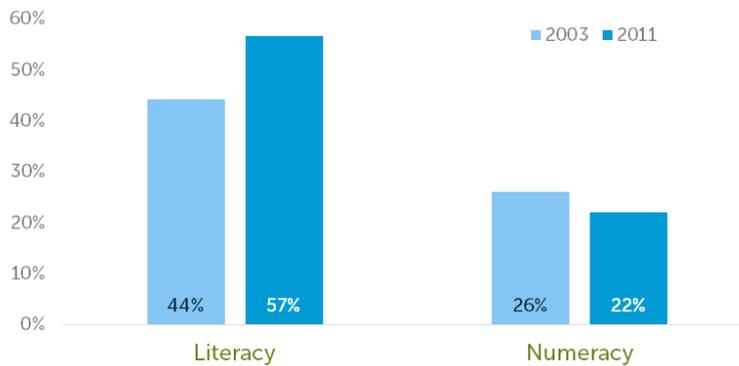
National Numeracy will shortly be launching a major project, the National Numeracy Challenge, designed to lift the numeracy skills of a million adults over the next five years and supported by a number of employers and other organisations. It is also involved in various school-based programmes and is developing a project to improve parents' engagement in maths.

National Numeracy's chief executive, Mike Ellicock, is very willing to appear before the Select Committee and/or provide the Committee with further information.

Response to the Committee's questions

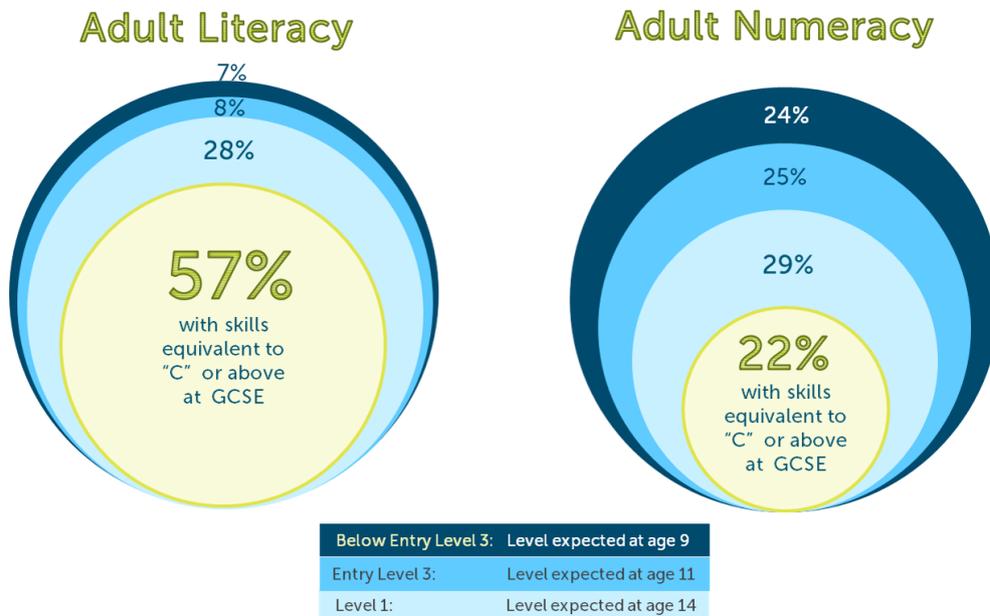
In this submission we are confining our responses to the issue of numeracy. We realise the committee is looking at both numeracy and literacy – and we do recognise the importance of literacy and the need to improve reading and writing skills – but we are conscious that **numeracy is an area that has long been neglected and side-lined and now deserves specific attention.**

1. ***What is the Government currently doing to help adults improve their reading, writing and maths skills?***
 - i. We recognise that both the current and previous governments have been and are aware of the urgent need to improve adults' skills and have brought funding and policy initiatives to bear on the problem. In its 2013 report, *Rigour and Responsiveness in Skills*, the government announced plans for putting 'employers and learners more directly in the driving seat' and improving skills training provision. We understand that the government is also looking at particular support in literacy and numeracy for young unemployed people. In addition, education and skills ministers have publicly stressed the importance of skills and in particular of maths, and adult literacy and numeracy were recently the subject of a Commons backbench debate, to which the minister for skills contributed.
 - ii. We welcome this attention and do not doubt ministers' and officials' good intentions. However, **the depth of the numeracy problem – and its impact on lives and the economy – is such that we are not confident that current policies will achieve any significant improvement.** This is not a new problem and there have been no signs of any improvement in adult numeracy since Lord Moser (now a National Numeracy trustee) first drew attention to it in his 1999 enquiry report. The very recent OECD surveys of adults' and teenagers' skills – the PIAAC and PISA programmes – have confirmed the suspicion that the UK is failing to keep pace with other countries, especially – but not only – those on the Pacific Rim. The finding that the UK was the only country where young adults did worse than the over-55s quite rightly attracted much comment.
 - iii. Furthermore, the full results from the government's Skills for Life survey (2011) showed that adult numeracy skills had declined slightly since the previous 2003 survey while literacy levels had risen.



Source: Department for Business Innovation and Skills. 2012. "The 2011 Skills for Life Survey: A Survey of Literacy, Numeracy and ICT Levels in England."

Figure 1: Percentage of those surveyed whose ability was assessed to be at Level 2 and above



Source: Department for Business Innovation and Skills. 2012. "The 2011 Skills for Life Survey: A Survey of Literacy, Numeracy and ICT Levels in England."

Figure 2: Range of ability in literacy & numeracy of those surveyed

- iv. **There has long been an assumption – in government and elsewhere – that numeracy and literacy abilities need not be equivalent**, that is, that a higher level of literacy than numeracy is required. Level 1 in literacy has been compared with the lower Entry Level 3 in numeracy. We do not feel this should ever have been the case and now, with changes in skills requirements for work, **we believe this assumption should be corrected and skills levels be given parity in both subjects.**
- v. Numeracy is often subsumed into literacy in measures to improve adult skills, and inadequate attention has been given to the particular, and often greater and more complex, needs of maths learning. We believe this tendency is partly responsible for the discrepancies noted in the figures above. We therefore welcome any new attention on numeracy and believe it deserves urgent and special focus. There is a good deal of catching up to do.

2. How can the Government make sure that adults have the right skills that can help them find a job, which in turn will help the country, and more widely?

- i. Although the committee's remit is adult skills beyond the compulsory education system, it is fairly obvious that preparing adults for work starts at school. Complaints from employers about the skills and employability of young people are longstanding and these employers have a point (although we also believe that employers must be willing to contribute to the training of their existing staff).
- ii. We have various concerns about the school maths curriculum in England and have discussed these with ministers and officials at DfE and BIS. We note also that different approaches are being taken in the devolved areas of the UK. In particular, we have concerns about the GCSE exam and the post-16 curriculum, which we believe are relevant to the Committee's current enquiry.
- iii. There is an alarming discrepancy between the results of the Skills for Life survey and the GCSE exams. In 2011 only 18% of the 16-19 age group were assessed as being at Level 2 in maths (roughly equivalent to GCSE A*-C) –although the pass rate at A*-C in the actual GCSE maths exam is now just under 60%. As our former chair, Chris Humphries, said: "This discrepancy between the results of the Skills for Life tests and GCSE exams is both puzzling and worrying for everyone involved in education and merits further investigation."
- iv. We are therefore not convinced that the GCSE exam is fully fit for purpose nor that the government's reforms as they currently stand will deliver the desired results. **There is still a strong case for a dual maths GCSE (as exists for GCSE English), with one of the pair focusing on functional maths skills – the direction being taken in other parts of UK.** We do not believe that simply giving the new GCSE double weighting in the exam league tables will send students the right signals about its value and importance and urge the government and Ofqual to reconsider this.
- v. With the raising of the education and participation age, we welcome the government's plans for making maths compulsory to 18 and in particular the new core post-GCSE maths curriculum for those who achieved GCSE A*-C. However, for the more than 40% who do not get GCSE A*-C, a different approach is needed. **We believe that nearly everyone has the capacity to achieve L2; we need to identify and then systematically attack the barriers that are preventing them from doing so.** There is growing evidence from the work of Carol Dweck, Angela Duckworth, Jo Boaler, Matthew Syed, Sue Johnston-Wilder and Clare Lee and others that a focus on 'mindset', grit and building 'mathematical resilience' are key areas. There is also evidence that simply obliging young people to re-take an exam they have already failed and which most of them will see as not relevant to workplace needs will serve any purpose and mostly results in repeated failure. **We urge the government to reconsider the needs of this group and work towards devising better alternatives for them.**
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- vi. **We understand and agree with the government's focus on the skills needs of young unemployed adults** and see it as essential that BIS and DWP work together on this. **However we are concerned that there should be at least as much carrot as stick in any government initiative.** Compulsion not mitigated by positive support for learning is unlikely to succeed and is likely to have an adverse effect on people's attitude to maths – and affect the views that they may in future pass on to their children. We know that some adults who already take numeracy classes do so to get a qualification on their CV and satisfy employers, not because they really see the value in learning new skills or believe they will use maths at work.
- vii. Finally, we believe that **improving the supply and quality of the adult numeracy workforce is essential and absolutely a role for government.** For too long, maths has been taught to many

adults in the FE sector by non-maths specialists. We recognise some moves in the right direction in relation to training and qualifications – and incentives for maths graduates to go into FE teaching – but we do not see any proposals that are yet substantial enough to alter decades of neglect.

3. What are the best ways to help adults learn how to read, write and do maths—through formal education providers or in a different way?

- i. There is a variety of pathways to learning – some formal and college-based, others more informal, in the workplace or community. Many adults are reluctant to go back to college to learn because of bad memories of school maths and alternative approaches should be available for them. Online and mobile technology have an increasing part to play in adult learning, and we welcome the establishment of the Further Education Learning Technology Action Group / ETAG. **There is clearly scope for much innovation in adult numeracy provision, mainly because it has received so little attention in the past. The government is probably not best placed to lead much of that innovation, although it should look to support initiatives; ‘failing conventionally’ has gone on for far too long. It is now time to see whether we can overcome vested interests and ‘succeed unconventionally’.**
- ii. Overall, we believe that searching for ‘best ways’ (cf. the ongoing RCT for English and mathematics) is flawed and can only generate very superficial results. Different pathways will be appropriate for different individuals and different circumstances – **the key is to look at how effective the actual teaching and learning is - and for that we need to use a ‘distance travelled’ measure that focuses on the knowledge, skills and attitudes that are needed to be numerate.**
- iii. **We believe that the common problem of negative attitudes to maths has not been adequately taken into account up to now and that this should be factored in much more in developing new modes of learning.** We are now working with the Cabinet Office Behavioural Insights Team on this issue. Provision needs to consider how to attract people back into learning and how to build the ‘mathematical resilience’ needed to make them stick with learning and make progress.
- iv. **We also believe that not enough attention has been given to the actual knowledge, skills and attitudes that adults need to be numerate, which at its heart is the ability to use quantitative information to make good decisions.** The definition of numeracy needs to include more than the ‘tool set’ currently outlined in the Adult Core Curriculum. Our ‘Essentials of Numeracy for All’ more closely reflects the curricula of high performing jurisdictions and includes at its core the vital elements of attitudes of mind, problem-solving, reasoning and decision-making. Full details are available at www.nationalnumeracy.org.uk/essentialsofnumeracy and the main building blocks are outlined below.



Figure 3.: The Essentials of Numeracy for All - overview

- v. **National Numeracy has spent the last year developing a major drive to help adults learn maths – the National Numeracy Challenge – www.nationalnumeracy.org.uk/nnchallenge. This will be launched in March with the aim of lifting a million people out of low numeracy over the next five years.** It has been developed with employers, unions, education providers and community organisations and aims to tackle negative attitudes to maths and measure actual improvement in numeracy.
- vi. At the heart of the Challenge is an online diagnostic or ‘check-up’ which is based on the ‘Essentials of Numeracy’ and which leads to personalised learning suggestions for those who want to take their numeracy up to Level 1 or preferably Level 2. Returning to the check-up will allow learners to measure their progress or ‘distance travelled’ and National Numeracy and its partners to assess overall improvement and the effectiveness of different learning provision. **This analysis of the ‘big data’ generated represents a much needed opportunity to identify, and look to replicate, effective numeracy teaching and learning.**
- vii. We are also researching how to best support those with the lowest numeracy skills (Pre-Entry and Entry Level 1) via our Firm Foundations for All project. After an initial research phase, we will develop and trial materials and approaches. We aim to create both a physical resource with appropriate supporting materials which could be used in any adult education setting, together with an App version. We also plan to make recommendations for scaling up effective practice in this area: we are aware that spreading success in adult numeracy teaching and learning is vital.