Number confidence and social mobility

A National Numeracy research report

April 2023

National Numeracy

Getting on with numbers

About National Numeracy

National Numeracy is a charity dedicated to helping people feel confident with numbers and using everyday maths. Our mission is to empower children and adults in the UK to get on with numbers so they can fulfil their potential at work, home and school. Our work improves how people understand and work with numbers in everyday life, sparking better opportunities and brighter futures.

www.nationalnumeracy.org.uk

About Capital One

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About Research Partners

Research Partners Ltd are an agile team of highly experienced social and policy-making research and evaluation specialists. Established in 2011, their emphasis is on affordable, practical, and creative research and evaluation solutions. The team work flexibly in partnership with a wide range of clients, producing and interpreting research results, and then applying these to real-world issues. Research Partners work across different policy areas including health, education and employment. In addition to National Numeracy, recent clients include the Chartered Institute for Personnel and Development, the Police Uplift Programme, Skills for Care, the Local Government Association, and East Sussex Healthcare NHS Trust.

About this report

Research conducted and written by Claire Tyers and Jane Aston of Research Partners.

Foreword

Numeracy is relevant and valuable to all our lives. It helps us to navigate the world around us, make informed decisions and access opportunities. It is a powerful driver of social mobility. But when it comes to numeracy, too many people are too often left behind. It's an affront to our society that thousands of young people leave school every year feeling negative and fearful about numbers. These experiences can hold people back for a lifetime. But crucially this is changeable.

National Numeracy's experience has revealed that building confidence and the belief that every one of us can improve our skills, is key to addressing the issue of low numeracy. This experience has informed the development of the National Numeracy Challenge, which has supported over half a million people to take their first steps towards improving their confidence and skills.

But what opportunities does this open up? And where do these opportunities take the people we support? Answering these questions is central to National Numeracy's mission.

This report reveals fresh insight into the power of improving number confidence, as well as the rich and varied ways it can positively impact upon people's lives, particularly when it comes to work opportunities and broader learning outcomes. And it brings into sharp relief, a yawning gap in number confidence between women and men. We cannot improve the numeracy of the nation without addressing that gap.

We are deeply grateful to Research Partners for carrying out the research and to Capital One, who as a valued partner of National Numeracy, had the vision to support this genuinely novel investigation into the role that improving numeracy can play in boosting social mobility.

Sam Sims,
CEO of National Numeracy

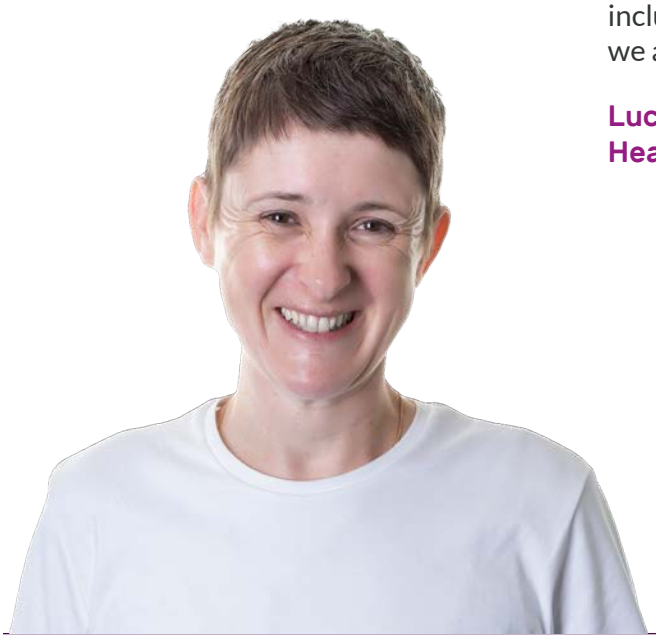
Foreword

"I hated maths at school".
"I'm terrible at maths".

We've all heard this type of remark so many times. Our society can tend to view maths skills as a blessing bestowed on a small proportion of people. It's more usual to hear friends and family talk about maths as something to be feared than to be enjoyed.

This experience of the world starts early in life, and disproportionately affects two groups of people: those who are disadvantaged early in life in their education (often those from lower socio-economic groups); and girls.

This report shows us that there are very real consequences of our collective failure to address the gap in numeracy skills. Talented people aren't applying for jobs for which they're otherwise qualified. Women aren't achieving the financial and career outcomes they deserve. The best opportunities in life are restricted to the fortunate few.



Lack of number confidence is an obstacle that stops people from achieving their full potential and from making their greatest possible contribution to our communities.

This report is a call to action. National Numeracy has helped half a million people to build their number confidence and skills. They have proved that confidence with numbers isn't a gift that's chosen for us early in our lives, it's something that can be changed with the right help. They've shown that it's possible to open a path for people who have struggled with maths before, to revisit their broader maths education, and to write a different future for themselves and their families.

Their work is driving real change and I'm so proud that we're partnering with them to do everything we can to help. But there's more for all of us to do. We have to change the way we think and talk about numeracy. We have to address our own insecurities about working with numbers, talk to our children differently, remove the shame and the sense of exclusion and transform our number culture. I believe that if we can achieve that shift we can create the diverse, inclusive, socially mobile society that we all aspire to.

Lucy-Marie Hagues,
Head of UK at Capital One

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Executive Summary

National Numeracy is an independent charity with a mission is to empower children and adults in the UK to get on with numbers so they can fulfil their potential at work, home and school. Our work improves how people understand and work with numbers in everyday life, sparking better opportunities and brighter futures.

Low levels of numeracy skills and number confidence are holding individuals, families, communities, and society back. Poor numeracy limits learning opportunities and career choices, throwing up a significant, lifelong barrier to social mobility.

The UK's numeracy levels are significantly below the average for developed countries. 49% of the UK's working-age population have the expected numeracy levels of a primary school leaver. 30% of school-leavers (18–24s) feel anxious about using maths and numbers – meaning millions of children lack number confidence. Meanwhile, poor numeracy costs the UK economy up to £25 billion a year.

From our work over the past decade, we know improving numeracy can drive opportunities for everyone to progress, or be the best that they can be, without being hampered by socio-economic disadvantage.

To date, over 500,000 people have registered to use the National Numeracy Challenge – our free online numeracy improvement tool. It gives us the largest database of adult numeracy improvers held anywhere in the UK. And what our data shows, and our users tell us, is that improving numeracy makes people feel more able to get a qualification, find a job or get on at work.

So, what can be done to turn the tide on the UK's long-standing, pernicious numeracy problem and help unlock the number skills and confidence that will help drive social mobility?

We set out to explore how improving numeracy could play a central role in improving social mobility and to inform a set of recommendations for the nation.

We examined the connection between improving numeracy and opportunities in work; the role number confidence plays in supporting adults with low numeracy to get on a path to a Level 2 maths qualification (equivalent to GCSE maths grade C/4); and the efficacy of the National Numeracy Challenge in helping to improve outcomes towards qualifications and work.

This report presents the findings of research commissioned by National Numeracy and carried out by Research Partners between July and October 2022. Focussing on users of the National Numeracy Challenge, 1,025 users were surveyed and 24 in-depth interviews with users were conducted.

Key findings

The research ascertained that:

- Negative school maths experience is linked to lower number confidence and lower maths attainment.
- Lower attainment and number confidence are also linked to a greater negative career impact (earnings, career choices and progression).
- These issues disproportionately affect women, younger people and the unemployed.
- Having used the National Numeracy Challenge, 38% of people improved their number confidence and over 70% of respondents demonstrably improved their number skills.

1 The National Numeracy Challenge is a digital tool offered by NN to address poor numeracy. It helps individuals check and improve their numeracy, learn everyday maths, gain confidence and work towards the essentials of numeracy in an accessible way.

- The National Numeracy Challenge is effective in bringing about change and improving learning and work prospects.
- The National Numeracy Challenge is particularly useful in helping those without Level 2 qualifications (a GCSE grade C/4 or equivalent in maths).
- In addition, the National Numeracy Challenge has helped to boost individual self-confidence and self-esteem. For some, this also means that they have been able to take up other new learning opportunities.

Proposals

This research lays bare the huge negative impact low numeracy has on people's lives and livelihoods. To boost opportunities for individuals and productivity across society, we believe there are some fundamental areas that need to be addressed.

As a result of this research, National Numeracy has developed the following proposals. These focus on making a measurable difference to social mobility in the three key areas identified by the research: number confidence, work and gender.

1. Number confidence is an essential driver of social mobility. Widespread acknowledgement and improvement are required in the 'whole life' learning journey from the early years and primary education, right into adulthood. The confidence to understand and work with numbers, allied with the practical use of numbers in everyday day life, should form a central pillar of mathematical learning in the UK.
2. Women typically have lower levels of number confidence than men, which raises a high barrier to opportunities, career choices and earnings. Women and girls need to feel inspired and included in numeracy at every stage of the lifelong learning journey. Open acknowledgement and increased awareness of the gender barriers and culture around maths should be supported by an expanded evidence base of what would make maths work for women and girls. Government should ensure this evidence is taken into account in future education plans for both children and adults.
3. Lower maths attainment and number confidence is holding UK PLC back; it is linked to greater negative career impact across earnings, career choices and progression, and costs the economy up to £25 billion a year. To build the skills necessary for a resilient and adaptable workforce and to remain competitive within a changing economy, Government and business should embed the National Numeracy Challenge, and other engagement and confidence-building resources, into adult education, employment and skills-building programmes. This would help to reach hundreds of thousands more people with a proven, cost-effective method of improving numeracy.

It makes senses, both socially and economically, for Government and business to take action on what we know works when it comes to improving numeracy levels. The current approach of 'qualifications or bust' is not working. We know from this research and the hundreds of thousands of people we have supported over the past ten years, that low numeracy can be improved to great effect by meeting people where they are and taking attitudes, mindsets, and, crucially, number confidence into account. The evidence presented in this report shows that boosting number confidence can help drive social mobility. A concerted effort from across government, business, and civil society is required to drive this change and realise the wealth of benefits for both individuals and society.

1 Introduction

Key points

This research was commissioned by National Numeracy (NN) and took place between July and October 2022. It consisted of a survey of 1,025 National Numeracy Challenge users and in-depth interviews with 24 users. National Numeracy Challenge is an online tool which uses real-world maths in an accessible format to help individuals improve their maths confidence and skills.

The research aimed to explore the role of number confidence in social mobility. It examined the connection between improving numeracy and work/learning opportunities, including getting on a path to a level 2 maths qualification (equivalent to GCSE maths grade C/4). It also considered the efficacy of the National Numeracy Challenge in helping to improve work outcomes and qualification levels.

National Numeracy commissioned Research Partners to undertake a research project on its behalf to explore the links between number confidence and social mobility. This report is an overview of the results of that project.

1.1 Numeracy and social mobility

Levels of adult numeracy within the UK are low compared with other countries, with significant costs to the national economy. Low numeracy skills can have a major impact on an individual's working life and work opportunities. Multiple disadvantages result from low levels of education. One in four people has been put off from applying for a new job which listed 'using numbers and data' as a requirement.[2] Adults with poor reading and numberwork skills also have more difficulties than other adults in getting jobs and staying in them – their occupational careers are frequently marked by casual unskilled work and unemployment.[3]

Around half of UK adults wish numeracy, finances, and budgeting had been a bigger part of their life at home and school, with 40% saying they don't feel 'fully confident' with everyday budgeting and money management.[4] In recent research, nearly one in five people (18%) indicated that they avoid applying for a job or qualification because it, or the interview process, involves maths. Confidence with numbers is also the dominant factor linked to individual numeracy scores amongst National Numeracy Challenge users, whilst having a 'growth mindset' is the biggest predictor of improvements to these scores.[5]

Despite common perceptions to the contrary, there is at best a very small generic component to maths ability – whatever a person's starting point people can improve their numeracy.[6] However, many adults have such negative perceptions of themselves from mathematics as experienced at school, that what they can do, they see as 'common sense' or non-mathematics. Skills such as measurement or numerical calculations are taken for granted, because to recognise these as maths would contradict their self- image as unsuccessful maths learners.[7]

2 Poll of 2007 adults aged 16-75 by Ipsos Mori on behalf of National Numeracy. All interviews were conducted online between 5th and 9th April 2019. Data weighted to reflect the national population profile.

3 Bynner, J., McIntosh, S., Vignoles, A., Dearden, L., Reed, H. and Van Reenen, J., 2001. Improving adult basic skills: Benefits to the individual and to society. DfEE research brief, (251).

4 Survey of 2,000 adults undertaken between 22nd and 26th March 2019 by polling company OnePoll on behalf of Santander

5 https://www.nationalnumeracy.org.uk/research-and-resources/building-numerate-nation-confidence-belief-and-skills

6 https://www.nationalnumeracy.org.uk/research-and-resources/building-numerate-nation-confidence-belief-and-skills

7 Coben, B (2000) 'Mathematics or common sense? Researching invisible mathematics through adults' mathematical life histories', in Perspectives on adults learning mathematics: Research and practice, eds D Coben, J O'Donohue and GE FitzSimons, Kluwer Academic Publishers, Dordrecht, pp.53–66.

Unfortunately, weak literacy and numeracy skills are associated with stigma. A negative numeracy self-image works against the desire and capacity to engage with further numeracy-related learning.[8] Compared to more highly skilled people, low-skilled people with low confidence in their ability to learn are less likely to take up training offers, but if they do, they progress as fast as more self-confident learners[9]. Overcoming a lack of number confidence and understanding what contributes to low confidence levels is therefore important in raising numeracy standards across the UK.

1.2 National Numeracy Challenge

National Numeracy is an independent charity with a vision for everyone in the UK to get on with numbers so they can get on with life. It aims to improve how people understand and work with numbers in everyday life, sparking better opportunities and brighter futures. By empowering children and adults in the UK to feel confident with everyday maths, the charity aims to help individuals fulfil their potential at work, home, and school.

The National Numeracy Challenge is a digital tool offered by National Numeracy to address poor numeracy. The research evidence[10] shows that for programmes delivering basic skills to adults to be successful they need to motivate adults to take part, convey basic skills effectively and encourage adults to persist in the programme. The basic skills acquired also need to be sustained through use, and put to good use in good jobs. The National Numeracy Challenge takes the form of an online learning resource. It helps individuals check and improve their numeracy, learn everyday maths, gain confidence and work towards being secure with the Essentials of Numeracy – the basic skills needed in daily life and the workplace. It focusses on skills such as managing money, working out measurements, and understanding percentages rather than abstract mathematical concepts or technical applications of maths such as algebra or trigonometry.

By using real-world maths in an accessible format, the National Numeracy Challenge encourages individuals to explore and improve their maths confidence and skills. It also regularly reminds individuals to log back in to check their progress.

The National Numeracy Challenge allows everyone, regardless of how they feel about maths, or how well they feel they can use numbers, to:

- quickly and easily check their everyday maths skills
- increase their confidence with numbers
- learn online and improve their skills
- assess their existing strengths and weaknesses and current level of numeracy
- work towards being confident with the Essentials of Numeracy.

Individuals can work at their own pace and in their own space, including as preparation for a formal qualification such as Functional Skills. The Challenge also offers individualised feedback and additional resources to support people's journey towards enhanced number confidence and skills.

8 Marr, B, Helme, S & Tout, D 2003, Rethinking assessment: Strategies for holistic adult numeracy assessment—A resource book for practitioners, policymakers, researchers and assessors, Language Australia, Department of Education, Science and Training, Melbourne https://www.voced.edu.au/content/ngv:15901

9 Wolf, A., et al., (2008), "Adult learning in the workplace: creating formal provision with impact" Teaching and Learning Research Briefing, No. 59, London

10 Windisch, H. C. (2015), "Adults with low literacy and numeracy skills: A literature review on policy intervention", OECD Education Working Papers, No. 123, OECD Publishing, Paris

1.3 Research aims and objectives

National Numeracy's data shows that improving numeracy makes people feel more able to get a qualification, find a job or get on at work. Improving numeracy and number confidence could therefore play a central role in improving social mobility. This research project aimed to go beyond this broad headline to inform a set of recommendations for the nation.

The research objectives were to examine the experience of National Numeracy's user research panel to explore:

- the connection between improving numeracy and opportunities in work
- the role that number confidence plays in supporting adults with low numeracy to get on a path to a level 2 maths qualification (equivalent to GCSE maths grade C/4)
- the efficacy of the Challenge to help improve outcomes towards qualifications and work.

1.4 Research methods

The research was undertaken over three key stages. Firstly, a scoping phase explored the key research questions with National Numeracy (NN) stakeholders and beneficiaries informing the design of a survey instrument. Secondly, this survey was administered to National Numeracy Challenge users and thirdly the issues emerging from the survey were explored further with beneficiaries. In total 1,021 National Numeracy Challenge users took part in the survey and 24 were interviewed. Further details on the methods used and the characteristics of individuals taking part in the survey and interviews are provided in the Appendix.

2 The problem – maths experiences, career impacts and number confidence

Key points

Many adults develop negative perceptions of their numeric abilities at school which stay with them throughout life, limiting their maths confidence. This can in turn impact their attitude towards, and experience of, future work and learning opportunities.

Low number confidence is linked to less positive experiences of maths learning whilst at school and to more negative impacts on people's careers.

Women and individuals not currently working all rated their experiences of maths whilst at school less highly than other groups. These same groups are those least likely to possess a Level 2 maths qualification and are those with the lowest number confidence.

A large part of how individuals view their maths ability, and how confident they feel using numbers, comes from their prior experiences of maths learning. This chapter presents findings on how individual experiences of maths lessons and their level of math qualification relate to their number confidence.

2.1 Experiences of maths whilst at school

Survey respondents were asked to rate their experiences of maths lessons when they were at school out of a possible 5, with 5 being the most positive and 1 the least positive rating.

The mean score for the whole sample was 3.36, but there was a high degree of variation according to individual characteristics (Table 1). Compared to their counterparts, the following groups gave significantly lower mean ratings[11]:

- individuals without Level 2 maths (the lowest mean of any sub-group)
- women
- those aged between 35 and 64
- those not currently working or retired.

A comparison of the mean ratings given by people of different ages, genders, and qualification levels demonstrated that the group with the lowest mean rating for their school maths experiences was women without Level 2 maths aged 35 to 54 (their mean rating was 1.81 out of 5 – the only sub-group whose rating was below 2). The group with the highest mean rating was men with Level 2 maths aged over 65 (their mean rating was 4.02 out of 5).

11 These differences are statistically significant at <0.001, using Anova

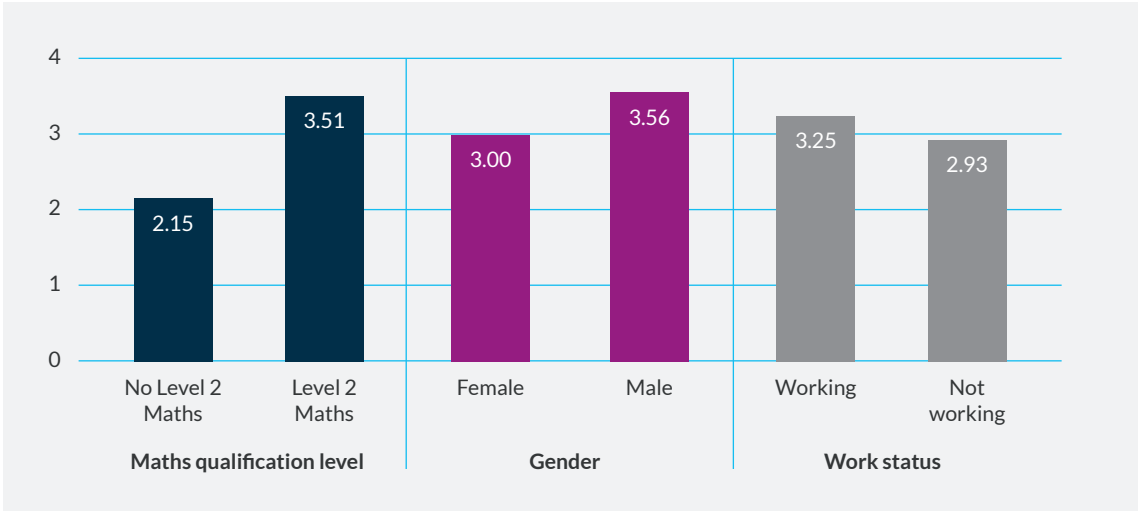
Table 1: Experiences of school maths lessons (mean ratings out of five) – all respondents

Characteristic	Categories	Mean rating (out of 5)	Base for the mean (N)
Whether have a Level 2 maths qualification	No	2.48	225
	Don't know	3.35	69
	Yes	3.64	727
Gender	Female	3.14	519
	Male	3.66	389
Age	34 or under	3.35	48
	35 to 54	3.15	181
	55 to 64	3.22	286
	65 or older	3.56	391
Employment status	Working	3.25	441
	Retired	3.55	481
	Not working or retired	2.93	92
	All respondents	3.36	1,021

Source: National Numeracy Challenge research panel survey September 2022 and National Numeracy Challenge held user data.

A further analysis was conducted including only those individuals who did not identify as being retired. The statistical differences for an individual's level of maths qualification, gender and work status all remained (Figure 1). The statistical difference by age was no longer present as this difference was between those above and below retirement age, rather than between individuals of working age.

Figure 1: Experience of school maths lessons (mean ratings out of five) – respondents who have not retired only



Source: National Numeracy Challenge research panel survey September 2022. Base: non-retired individuals (119 without and 385 with a maths qualification level 2; 288 females and 183 males; 441 working and 92 not working)

2.1.1 Insights from the National Numeracy Challenge user interviews

Echoing the survey findings, most of the 14 beneficiaries without Level 2 maths reported having bad experiences of maths learning when they were at school. This had left many feeling that they were simply 'no good' at maths and that this was something they could not change. Several said that they had always tried to hide their maths ability (or perceived lack of this) from others because they felt ashamed, or because they felt they "should" be better at maths by now.

> *"I left high school a number of years ago, and I didn't do very well at maths throughout ... It's always been a problem for me. And I've always kind of got by, keeping under the radar, people not noticing that I'm terrible at maths."*
> (Female, studying for a nursing degree)

> *"I struggled with it at my primary school, it was awful. I just have terrible memories of maths teaching. I am fearful if people ask me, and it goes back to childhood."*
> (Female, working part-time)

> *"At school I got an ungraded for my maths, I just knew I wasn't going to be able to do it. The teaching back then was really poor, they just didn't care, and they didn't have all the functional skills options for people who aren't academic like they do now."*
> (Female, working part-time).

Some of the 10 beneficiaries with Level 2 maths were maths teachers and tutors. Understandably, they had usually performed well in maths at school. However, some of the others who had passed their maths GCSE at school said that they did not have particularly good memories of studying maths at school and that their maths confidence had been low ever since. For example, one interviewee had been a primary school teacher, and despite having a maths GCSE, she did not feel at all confident when it came to maths. She said she would rather ask her husband to do any maths beyond working out a simple percentage.

> *"I feel like I kind of scraped through it to get my GCSE. But yeah, I do have one."*
> (Female, looks after family)

2.2 Level of maths qualification

Overall, 22% of respondents indicated that they did not possess Level 2 maths, 71% had such a qualification whilst 7% did not know if they had one or not. Analysis of the characteristics of individuals with and without Level 2 maths revealed different profiles according to gender and employment status (Table 2). Women are less likely than men to have Level 2 maths (25% of women compared to 19% of men don't have one) and the proportion of those without Level 2 maths increases with age (from 10% of those aged under 35 to 24% of those aged 65 or older). However, once retired individuals were excluded from this analysis there were no statistically significant differences regarding possession of a Level 2 in maths by age, gender, or work status.

Table 2: Possession of a Level 2 maths qualification (%) all respondents

Characteristic	Categories	Whether have a Level 2 maths qualification			Base (N)
		Yes	No	Don't know	
Gender*	Female %	67.6	24.9	7.5	519
	Male %	74.8	18.8	6.4	389
Age*	34 or under %	85.4	10.4	4.2	48
	35 to 54 %	75.1	21.0	3.9	181
	55 to 64 %	70.6	23.1	6.3	286
	65 or older %	66.8	23.8	9.5	391
	All respondents	**71.2**	**22.0**	**6.8**	**1,025**

** These are statistically significant differences at p<=0.05 using chi-square statistic*
Source: National Numeracy Challenge research panel survey September 2022 and National Numeracy Challenge held user data.

2.3 Career limitations caused by not having Level 2 maths

Poor basic skills are recognised as key to employability and adults with poor reading and numberwork skills have more difficulties than other adults in getting jobs and staying in them.[12] This section explores the specific career impacts on individuals from not having Level 2 maths.

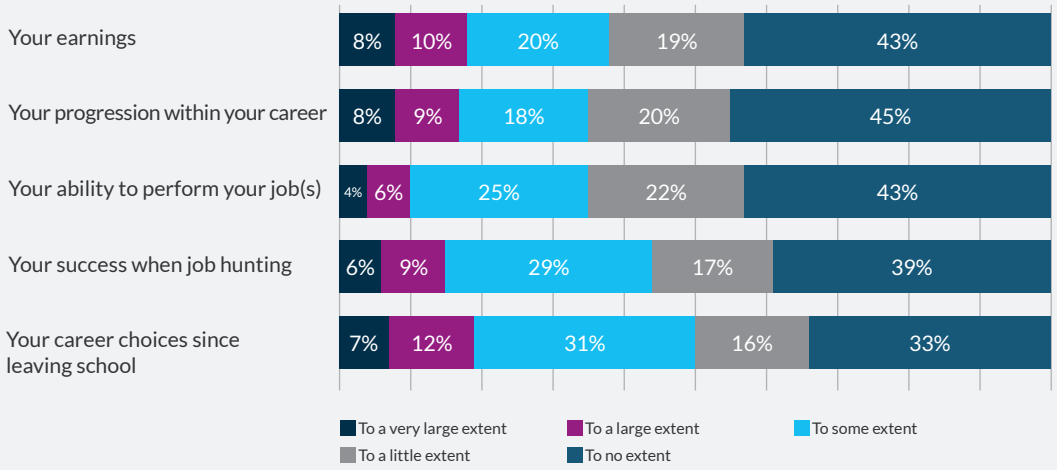
2.3.1 Overall effects

Respondents without Level 2 maths were asked to indicate the extent to which not having this qualification had affected various aspects of their working lives (Figure 2). Around 60% of individuals indicated that not having Level 2 maths had impacted their lives **at least a little** in every different aspect, with up to 50% indicating that there had been **at least some** impact and between 10% and 22% that there had been a **large or very large** impact.

Respondents indicating that they had been affected to at least **some extent** in each career area were then combined into one category (leaving out those who stated that they had been impacted to only a little or no extent). The number of different career areas that individuals felt had been affected, to at least some extent, by their lack of a Level 2 maths was then calculated. On average individuals indicated that there had been some impact on two areas of their working lives. However, this headline result masks a polarised distribution of responses – whilst 43% of people indicated there had been no substantial impact on any aspect of their careers, 29% of people had experienced at least some impact in all the five career areas they were asked about (Figure 3).

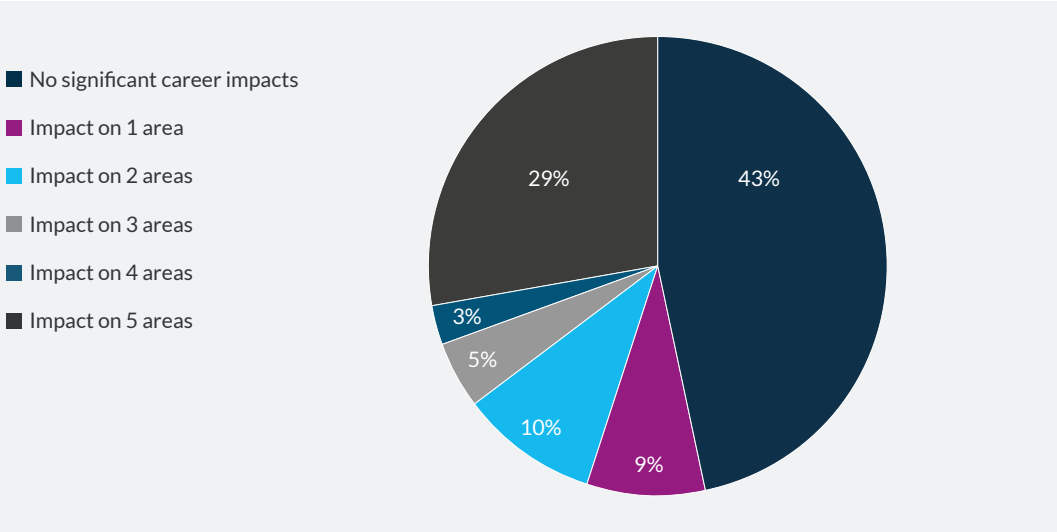
12 Bynner, J., McIntosh, S., Vignoles, A., Dearden, L., Reed, H. and Van Reenen, J., 2001. Improving adult basic skills: Benefits to the individual and to society. DfEE research brief, (251)

Figure 2: Extent to which not having a Level 2 has affected people's working lives



Source: National Numeracy Challenge research panel survey September 2022. Base: 225 individuals without Level 2 maths

Figure 3: No. of different areas of people's working lives that having a Level 2 has affected to at least some degree



Most of the National Numeracy Challenge users we interviewed had left school at a time when having a Level 2 maths was not an essential entry criterion to professions and higher qualifications in the way that it is today. Some individuals had not had their ambitions curtailed much, if at all, by their lack of a maths qualification. As time went on, their experience rather than their qualifications became more important in their career progression and employability. However, they felt it would be more difficult today to access the same careers without a Level 2 maths.

In contrast, other users had seen a negative impact on their career from not having a Level 2 maths. This had meant, for some, that they then lacked the confidence they needed to take on further learning to enhance their skills and career prospects, for example:

> *"My maths was absolutely rubbish. And I've always felt really conscious about it. When I did Level 2 for my adult health and social care, I struggled on the maths. And now I want to do Level 3, but I haven't approached anyone about it, because I want to improve my maths ... I think I've underachieved and I could have done a lot better. But I held back because I thought I wasn't good at maths for whatever reason. And that's just maths, it isn't everything."*
> (Female, working part-time)

Some National Numeracy Challenge users described how their school experiences of maths had curtailed them at work, leaving them feeling that they just had to 'get by' and do the best they could without being 'found out' or feeling 'too stupid' in front of others.

> *"I deal with massive figures on a daily basis. Sometimes I get them very wrong. Sometimes I get them right with the help of others. A lot of the time I fake it till I make it. And that's how I have to live my life… I'm a PA for the regional director, I deal with all the financing for the office. To be honest with you, even some basic arithmetic and working out I'm expected to be able to do - I can't do it."*
> (Female, working part-time)

One man who is now retired had done a variety of jobs, including graphic design and painting and decorating, but he had always preferred to be self-employed, in part so that people wouldn't find out about his lack of maths skills:

> *"I've mainly been self-employed. Probably, since I was about 16 or 17. And I think in a roundabout way, it's because I was so bad at numbers. I thought I'd never get a proper job, where you have to have an interview and everything. I can use a calculator, or some jobs I've had where you've not needed to use numbers, I suppose. So just basic jobs. Nothing professional or anything you need qualifications for."*
> (Male, retired)

Case study 1 provides an overview of one man's struggle with maths skills and confidence:

Case study 1: overcoming years of maths stigma is difficult

A man who had worked for more than 30 years as a social worker said that he had always been held back by his lack of maths skills and qualifications.

> *"I just had a bad time in maths at school. I got to a point when I was about eight and then I never really moved on from that… It's held me back in everything. I've got involved in relationships with the wrong people because I think my confidence is so low. Even though I've always been in a professional role."*

He had worked in a professional capacity for many years by gaining relevant experience and working his way up, but his maths ability had always been a worry for him. When he left school, he started work with his father who was a builder. After some voluntary work in the local youth club, and then getting a job in a children's home, he progressed to a career as a social worker. At one point he really wanted to be a primary school teacher, but a conversation with another teacher revealed that his lack of Level 2 maths meant he would not be eligible to do a PGCE, and so that was the end of that aspiration. Throughout his career, he always found using numbers at work difficult:

"I still struggled with the weekly timesheet… Adding, and also writing down numbers, or taking someone's telephone number down. I always give them my phone to put it in, because I don't get the number sequentially in the right order. I can write narratives, and my English is to a good level, I used to do court reports and lots of assessments, I didn't find that too difficult."

He said that he had never told his grown-up children about his difficulty with maths, and he had given up hobbies and interests if any involved using numbers because this then became too stressful for him.

"I think when you've got a very limited capacity numerically, you spend your life avoiding things. Even hobbies. I used to really like playing darts. But I couldn't add up. At that time you'd have to chalk it up and all that. I couldn't do that, so I stopped playing. And that affected my confidence … You blag all these things, and I just get impatient, and I get fed up, frustrated."

Because of his lifelong difficulty with numbers in general, he wondered if he had dyscalculia. He felt that for people with dyscalculia or other learning disabilities and difficulties regarding numeracy and maths, the National Numeracy Challenge as it stands currently may prove to be frustrating rather than helpful. This was, unfortunately, his experience.

(Male, semi-retired)

2.3.2 Effects on different groups

The impacts of not having Level 2 maths were perceived as greater, in all five career areas, by individuals who had not yet retired (Figure 4).[13] Those aged over 65 also felt fewer areas of their working lives had been affected (a mean of 1.6 areas compared to 2.4 areas amongst those aged under 35, 2.8 areas amongst individuals aged 35 to 54 and 2.2 areas amongst individuals aged 55 to 64).

Retired individuals were then removed from the analysis to focus on the career impacts on individuals with an active interest in their labour market outcomes. The results of this analysis of 'working age'[14] individuals found that the main differences were by gender. Working-aged women were significantly more likely[15] to feel that they had been impacted to some extent in all aspects of their working lives than men and to have observed an impact in all five career areas (Figure 5). A much higher proportion of these women believed, for example, that their earnings have been affected by not having Level 2 maths (59% compared to just 21% of men). There was also a statistically significant difference[16] in the number of aspects of their working lives that women felt had been affected (a mean of 2.9 versus 1.4 areas for men).

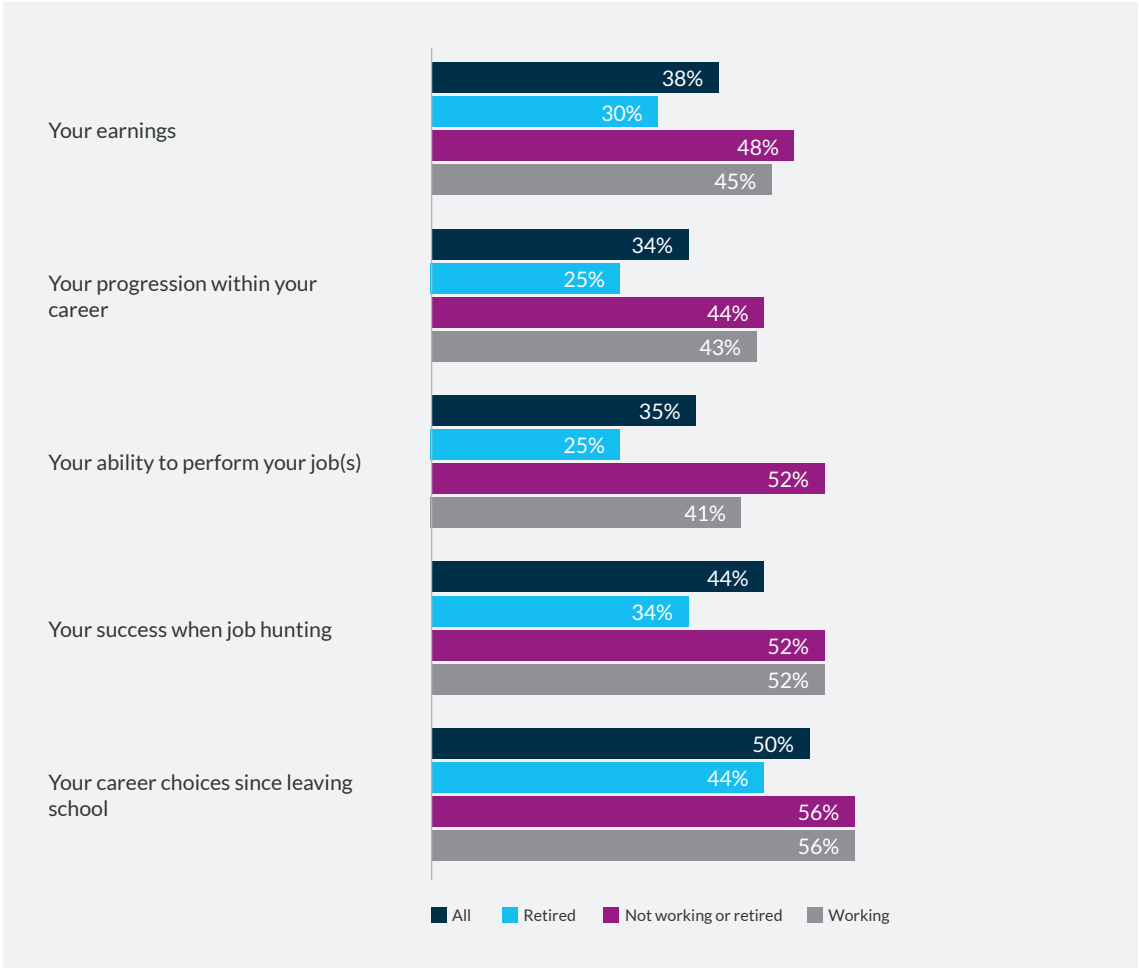
13 Differences between the retired group and other groups are statistically significant at $p<0.05$ using chi-square statistic for job hunting, ability to perform job(s), career progression and earnings

14 This term is used as short hand for individuals who have indicated that they have not yet retired, there is no upper age boundary set

15 Differences between the genders on all items is statistically significant at $p<0.01$ using chi square statistic

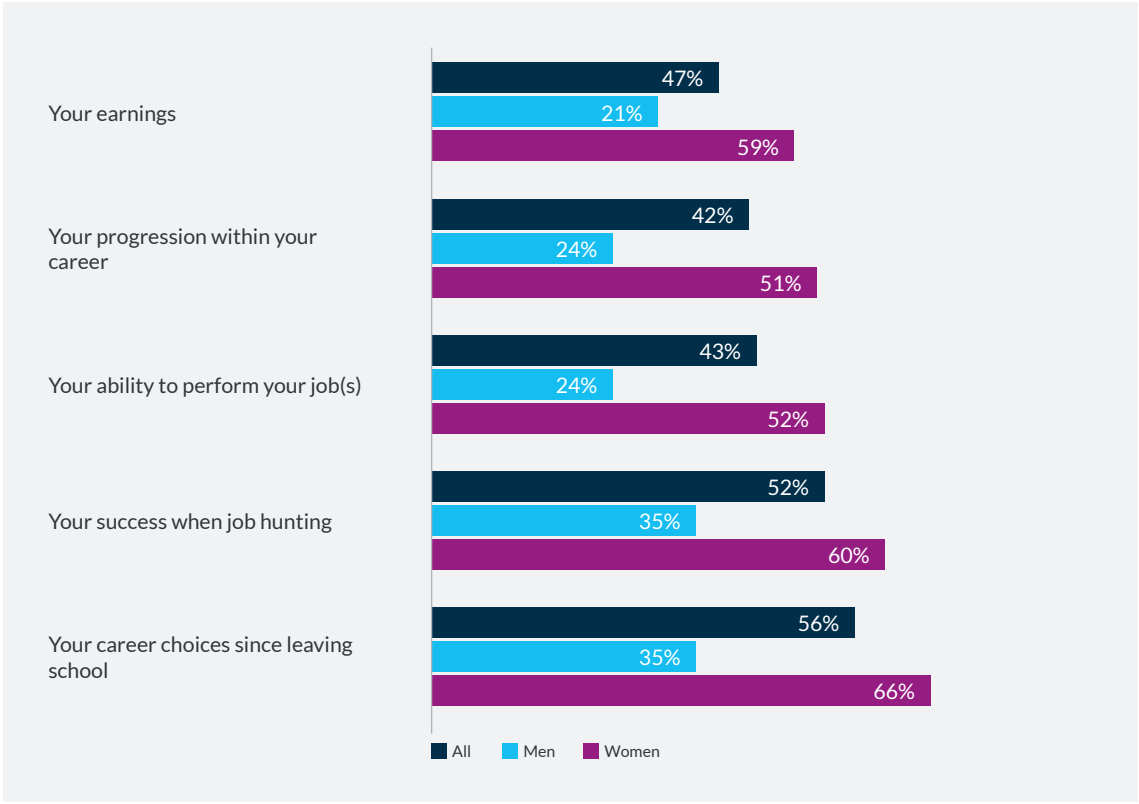
16 Significant at $p<0.001$ in Anova

Figure 4: No. of different areas of people's working lives that not having Level 2 maths has affected by employment status (% impacted to at least some degree)



Source: National Numeracy Challenge research panel survey September 2022. Base: individuals without Level 2 maths (94 working, 105 retired and 25 not working or retired)

Figure 5: The impact of not having Level 2 maths on the working lives of women and men (% impacted to at least some extent) – non-retired respondents only



Source: National Numeracy Challenge research panel survey September 2022 and National Numeracy Challenge held user data. Base: non-retired individuals without Level 2 maths (73 females and 34 males)

2.4 Baseline maths confidence

All National Numeracy Challenge users interviewed, aside from those who were maths teachers and tutors said that before starting National Numeracy Challenge their maths confidence was low. This was the case whether they had Level 2 maths or not.

> *"I don't have a lot of confidence particularly in my maths skills. I haven't had to think about doing math since I was 16. I'm 35… So [the Challenge] is really useful for my confidence more than anything else."*
> (Female, working full-time, has a Level 2 maths)

> *"Despite my background, I've always been maths-phobic. That might be strange for you to hear when I say that I'm a nurse and that I've given medications, but I never got my maths O level despite three attempts in college."*
> (Female, working part-time, no Level 2 maths)

When first signing up for the National Numeracy Challenge, people are asked to rate their confidence using numbers on a scale from 0 to 10. This acts as a baseline indicator of number confidence. Analysing this data for the survey sample showed that their overall mean initial number confidence score was 7.5.[17] This is higher than amongst all National Numeracy Challenge users whose mean initial confidence score is 6.5.[18]

17 This data was available for 978 respondents

18 Data from NN's own analysis

The following correlations were present in the data:

- a negative correlation between the number of areas of working lives that people feel have been affected and their initial confidence score[19]. People whose lack of a Level 2 in maths has affected more areas of their working lives tend to have lower number confidence.
- a positive correlation between ratings of maths lessons whilst at school and their initial confidence score[20]. People rating their school experiences more highly tend to have greater number confidence.

Further analysis examined how baseline number confidence varies by individual characteristics. Retired individuals were removed from the analysis, to focus on those with an active interest in their labour market outcomes. The overall mean for this group was slightly lower than for the whole sample at 7.1.

There were statistically significant differences[21] amongst 'working age' individuals based on:

- whether individuals possess Level 2 maths - individuals without a qualification had lower initial number confidence (a mean of 5.3 compared to a mean of 7.8 amongst those with a Level 2 in maths)
- gender – women had lower initial number confidence (a mean of 6.5 compared to 8.2 amongst men)
- work status – those not working had lower initial number confidence than those in work (a mean of 6.2 compared to 7.3)
- age – initial number confidence increases with age (those aged 34 or under had a mean of 6.57 compared to 7.02 amongst 35 to 54-year-olds, 7.09 amongst 55 to 64-year-olds and 8.28 amongst the 65 or older group).

These findings are in line with those of earlier research by National Numeracy which found that "confidence with numbers has a clear age and gender component; women consistently have lower confidence, and remarkably, the lowest confidence with numbers is among those who have just exited the education system".[22]

19 There is a moderate statistically significant linear relationship between number confidence and perceived impacts on working life ($r = -0.301$, $p<0.01$).

20 There is a large statistically significant linear relationship between number confidence and positive ratings of maths lessons whilst at school ($r = 0.544$, $p<0.01$).

21 All significant at $p<0.001$ in one-way Anovas

22 building_a_numerate_nation_report.pdf (nationalnumeracy.org.uk)

3 National Numeracy Challenge and number confidence/skills

Key points

Using the National Numeracy Challenge is linked to improved number skills and enhanced number confidence:

- 38% of National Numeracy Challenge users improved their number confidence having used the National Numeracy Challenge
- over 70% demonstrably improved their number skills.

The dominant predictor of whether someone had increased their number confidence having used the National Numeracy Challenge was them being motivated to improve their maths to support work and/or learning ambitions.

People of working age, females, and individuals without a Level 2 maths qualification are all particularly likely to gain number confidence through their use of the National Numeracy Challenge.

This chapter explores how individuals feel their number confidence and skills have changed since using the National Numeracy Challenge.

3.1 Changes to number confidence

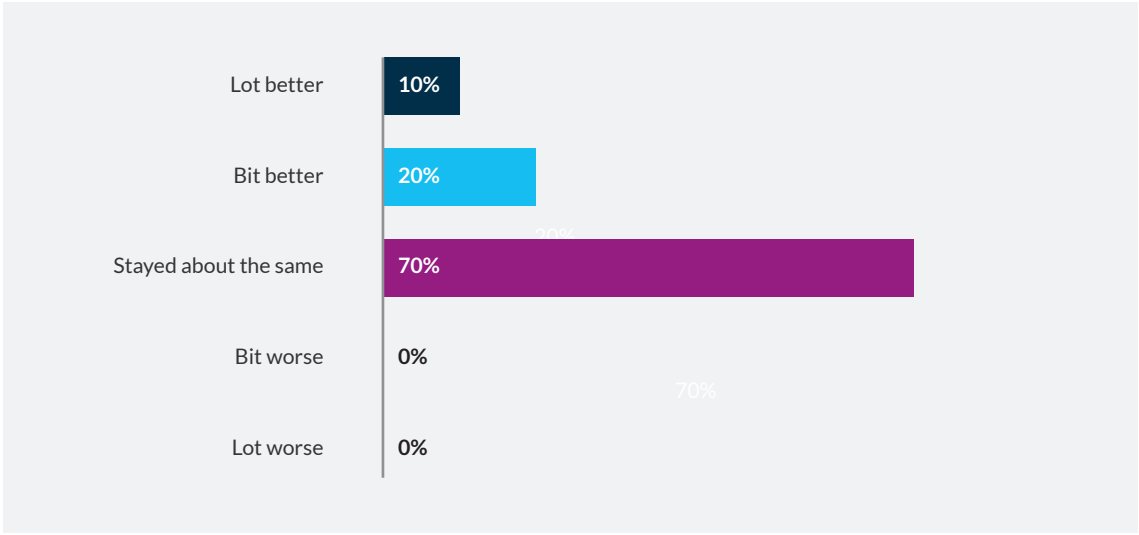
When they register for the National Numeracy Challenge individuals are asked to rate their number confidence on a scale from 1 to 10. Individuals may then repeat this assessment at a later point in their journey with the National Numeracy Challenge. The survey sample contains 504 individuals who had provided a confidence score on more than one occasion. Their ratings can therefore be compared to determine whether any change to their confidence occurred during their use of the National Numeracy Challenge. Overall, 38% of individuals improved their score with a mean change of +0.7 between the first and highest subsequent rating.

These groups had significantly greater positive change in their National Numeracy Challenge measured confidence score:

- individuals not in work (1.2 points change compared to 0.8 amongst working respondents and 0.6 amongst retired respondents)
- women (0.8 change compared to 0.6 change amongst men)
- individuals aged 55 to 64 years (0.9 change compared to 0.7 amongst the under 35s, 0.8 amongst 35 to 54-year-olds and 0.6 amongst those aged over 65)
- those motivated by learning and work factors when registering for the National Numeracy Challenge (0.98 compared to 0.7)
- those with more dashboard visits (1.0 amongst those visiting 15 times or more compared to 0.5 amongst those visiting less often).

The survey also asked respondents to reflect on the extent to which '*Since completing the National Numeracy Challenge, how do you feel about your confidence in using numbers in your daily life*'. This subjective assessment is available for all respondents, including those who did not complete a confidence assessment when using the National Numeracy Challenge. Just under a third of respondents (30%) believed that their confidence in using numbers had got better (Figure 6).

Figure 6: Extent to which individuals believe their confidence in using numbers in their daily life has changed having taken the National Numeracy Challenge



Source: National Numeracy Challenge research panel survey September 2022. Base: all respondents (1,021 individuals)

There were statistically significant differences in the proportions of National Numeracy Challenge users who felt that their confidence had improved by:

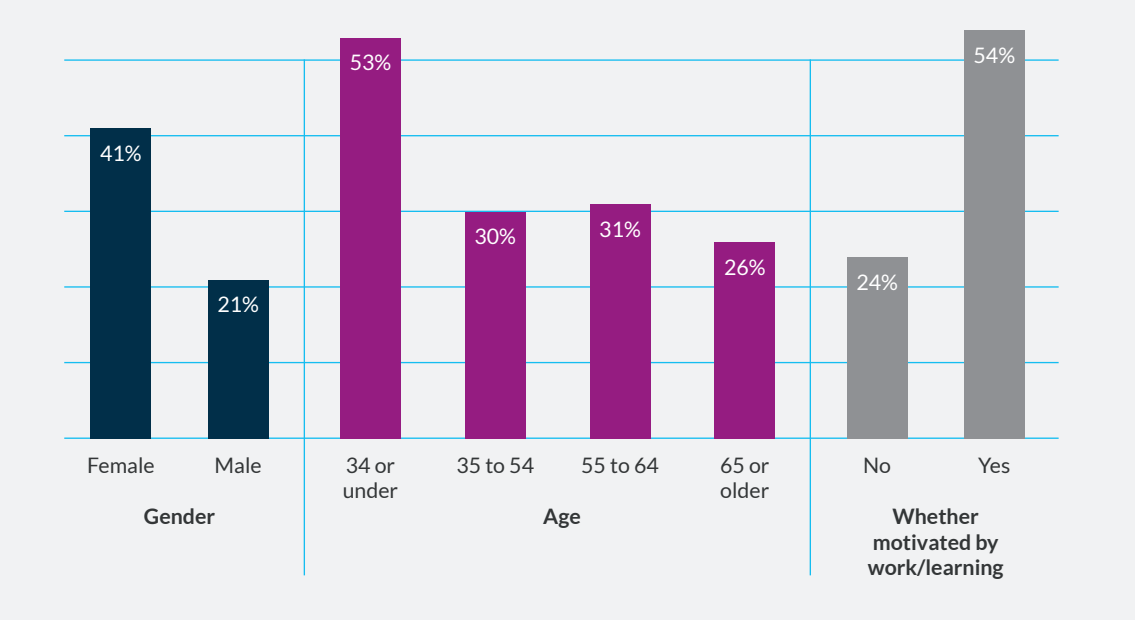
- whether an individual has a Level 2 maths qualification (37% of those without a Level 2 maths indicated their number confidence had improved compared to 27% of those with a maths Level 2)
- work status (retired respondents were less likely than other respondents to indicate improved confidence, 25% compared to 33% of those working and 39% of those not working or retired)
- gender (females were more likely to report improved confidence than men – 36% compared to 21%)
- age (younger respondents were more likely to report improved confidence than older ones, 52% of those aged under 35 compared to 26% of those aged 65 or older)
- whether the individual indicated that they were motivated by work and learning factors when taking the National Numeracy Challenge (52% of those who were motivated by work, compared to 25% of those who weren't)
- frequency of use of National Numeracy Challenge (the most frequent users of the National Numeracy Challenge were more likely to have improved their confidence, 47% of those using the National Numeracy Challenge 15 times or more, compared to 24% of those using it less often).

When retired individuals are removed from the analysis, statistically significant differences between the genders, between younger and older users and between those motivated and not motivated by work factors remain (Figure 7), but differences between those with and without Level 2 maths do not.

Regression analysis showed that the dominant factor linked to increased self-assessed number confidence is being motivated by work and/or learning when signing up to the National Numeracy Challenge. Other factors that are associated with increased confidence are being female, having a negative experience of maths whilst at school, and making more dashboard visits.[23]

23 See Analysis A in the Appendix

Figure 7: % indicating that their confidence had improved since using the National Numeracy Challenge (non-retired individuals only)



Source: National Numeracy Challenge research panel survey September 2022. Base: all non-retired respondents (288 female and 183 male; 47 under 35 yr olds, 174 35 to 54 yr olds, 197 55 to 64 yr olds and 54 over 64 yr olds; 155 motivated by work and learning factors to sign up to the Challenge and 354 not motivated by these factors)

There was some disconnect between perceived confidence change whilst using the National Numeracy Challenge and the survey results. Only half of those whose National Numeracy Challenge scores indicated their confidence had improved stated in the survey that they felt like their confidence had improved. In contrast, a quarter of those whose National Numeracy Challenge confidence ratings had not improved stated in the survey that they felt more confident. This is perhaps not surprising given that the two methods of measurement are so different. The National Numeracy Challenge questions are a stock take of how confident an individual feels on a given day, whilst the survey question directly asks about how much people feel they have changed.

Most of the users interviewed said that they felt more confident in their maths abilities having engaged with the National Numeracy Challenge. Some had gained a considerable amount of confidence, whilst others felt only a little more confident. In line with the survey results, improvements in confidence often related to an individual's starting point, particularly, whether they already had Level 2 maths – those with a qualification generally, but not always, starting the Challenge with more confidence.

> *"I absolutely do feel a lot more confident… I'm not going to go out and get a job as a maths teacher or an accountant ... But for myself, just for my own peace of mind, I enjoy using the Challenge to make things easier for me. I like to know that I don't have to use my fingers to add eight and five anymore. Because I always used to, if it came to more than 10, then I used to struggle. And I used to be quite embarrassed about that."*
> (Female, no Level 2 maths, currently not working due to ill-health)

> *"I think it confirmed what I already knew, the problem was not me. Yes, that's reassuring. It's not that I have a problem with maths. I'm actually quite good at it. From my own experience, I would say I'm probably quite a way better than the national average. So that's good. It's all about positive self-affirmation ... It was nice to have the proof of that. I'm actually doing maths quite happily. And I'm quite competent at it."*
> (Man, no Level 2 maths, working full-time)

One example is a woman in her 50s who said that taking the Challenge made her feel more confident about her maths abilities. This in turn motivated her to sign up for a Level 2 maths course, which she was in the process of organising. In the longer term she would like to secure a Level 3 in health and social care (as she obtained her Level 2 a few years ago) but knows that without Level 2 maths, she would struggle to complete the course.

> *"It [taking the Challenge] made me feel much better about myself, more confident, and that could be an achievement, even for me, in my life, to get a GCSE. It doesn't feel totally impossible now."*
> (Female, no Level 2 maths, working part-time)

Case study 2 describes how increasing her maths confidence helped one woman achieve a Level 2 maths qualification, and case study 3 describes how the National Numeracy Challenge helped another user develop an enthusiasm for other learning.

Case study 2: using National Numeracy Challenge to support Level 2 learning

A woman who did not do well in maths at school went on to get a degree in English and now teaches this for speakers of other languages. Having recently moved back to the UK from overseas, she found she needed to get a maths qualification to convert her teaching qualifications to those recognised in the UK. She found the National Numeracy Challenge when looking for maths support. It helped her to feel much more confident, as well as to improve her skills. She found the Challenge very helpful, using it has helped improve her maths confidence, and she recently enrolled onto an online Level 2 maths course.

> *"I don't hate maths anymore. It doesn't scare me anymore. And I think a lot of that was a hang up from being at primary school and it's just the way that I was taught ... I can go to my maths lessons online now, and it's okay. I can do this. And if can't, then, I'll go off I'll find some way that I can do it and understand it."*

She explained that feeling more confident with numbers was also helping her in her day to day activities, for example, making sure that the new fridge she was buying would fit in the available space.

> *"I'm a lot more confident with it … There was an example the other day at home, and we were trying to work out what was needed to buy a new fridge. And I was like, Okay, I need to measure this, I need to make sure it can fit in the space. Before, I would never ever have done that, I would have just gone, oh, well, it looks about right, and take a rough guess. And then I was like, no, actually, I can work this out. I can make sure I that I've got the right dimensions and the right area and the right fridge."*
> (Female, working full-time)

Case study 3: increased enthusiasm for learning

One National Numeracy Challenge user had increased her number confidence through taking the Challenge. This had then meant she felt more confident about wider learning. She had not engaged in any formal learning since leaving university almost 15 years ago and more recently had a negative experience when trying to learn French while living abroad. However, when an opportunity to sign up for a free personal development course came up recently, she decided to volunteer for it. She does not think she would have put herself forward for the course if she had not done the National Numeracy Challenge.

> *"The mental health first aid training, part of it was that you had to do maths test. I felt a lot more confident going into that, and I passed, because I brushed up on my skills … When the questions came up, I knew what they were asking for, and how to calculate the answers. Like, I know how to work this out."*

> *"I think the Challenge definitely helped, because it got me thinking, and it got me using my brain, it got me taking myself a little bit out of my comfort zone, rather than just thinking, I know what I do in my job, so I don't need to develop myself any more. It made me realise there's always room to learn, even if it's only a little bit of learning. I think I was put off by learning because I lived in Switzerland for a few years, and I really struggled to learn French. And I was just like, I'm too old. I don't want to learn. But coming back, and doing this, and doing the first aid course as well got me thinking, "Oh, I want to do another course now. I'm enjoying learning things.""*
> (Female, working full-time)

3.2 Changes to number skills

As with the confidence assessments, both National Numeracy Challenge recorded number skills assessments and self-assessed changes to skills are available.

3.2.1 National Numeracy Challenge recorded changes to maths skills

As part of the Challenge, individuals are asked to answer a series of questions which results in them achieving a score related to their maths skills as observed at that time. Two different tests are available as part of the National Numeracy Challenge – check-ups and quick checks. Comparing individuals' initial and their highest scoring subsequent scores on these tests provides an objective indicator of whether their maths skills improved over time.

1. Check-ups

This is the more extensive set of questions and results in users receiving a score of between 0 and 100.

Baseline check-up scores: 446 survey respondents had completed at least one of these check-ups. The minimum initial check-up score was 4.0 and the mean 84.8. Individuals without Level 2 maths had significantly lower initial check-up scores (73.1 compared to 88.3 amongst those with a Level 2 maths). Women had a significantly lower mean initial check-up score than men (80.1 compared to 90.5)[24], as did individuals not in work (74.7 compared to 86.7 amongst retired users and 86.5 amongst working users). National Numeracy Challenge also users motivated by work/learning factors when signing up to the Challenge had significantly lower initial check-up scores (75.6 compared to 87.1 amongst those motivated by other things).

Changes to check-up scores: 150 respondents had completed more than one check-up. Of these, 78% improved their score. The mean change in check-up scores was an increase of 7.8 points.

A regression analysis to predict whether individuals had improved their check-up score was attempted using a range of personal characteristics but was not significant.

Examining these characteristics individually showed that women gained significantly more points than men (8.9 on average compared to 5.4). Individuals indicating that work and learning factors motivated them to take up the Challenge also gained significantly more number skills points than those motivated only by other factors (12.2 compared to 6.6).[25]

24 Significant at $p<0.01$ using Anova

25 Gender and motivation differences significant at $p<0.01$ using Anova

2. Quick checks

Quick checks involve a shorter set of questions with a maximum score of 20.

Baseline quick check scores: 907 survey respondents completed at least one of quick check, with a range of scores achieved between 1 and 20. The overall mean for those taking an initial quick check was 13.6. Mean initial quick check score increased with age (from 12.6 amongst under 35 yr olds to 14.0 amongst those aged 65 or over), was higher amongst individuals with Level 2 maths (11.5 for those without a qualification and 14.5 for those with one), and lower amongst those motivated by learning and work factors to start the Challenge (11.8 compared to 14.0 amongst those motivated by other things).[26] There was no statistical difference between the initial quick check scores by gender or work status.

Changes to quick check scores: 432 respondents had at least one further quick check score and amongst these individuals 70% improved their score. The mean change in quick check scores was an increase of 1.4 points.

Regression analysis showed that the dominant factor linked to individuals improving their quick check scores was work status – compared to individuals not in work or retired, both retired and working National Numeracy Challenge users improved more. Other factors associated with improved quick check scores are making more visits to the National Numeracy Challenge and age (with younger users more likely to improve).[27]

3. Use of the National Numeracy Challenge and improved number skills

There was a significant positive correlation between the number of dashboard visits an individual had made and changes to both their check-up and quick check scores.[28] This could be explained, at least in part, by the fact that those who visit the National Numeracy Challenge more are given more opportunities to take both full check-ups and quick checks, and there is a large correlation between the number of visits people make and the number of tests they take. People might therefore just be getting better at the tests simply by doing the tests more frequently, and there is a small positive correlation between the number of quick checks taken and the extent of skills gains observed[29]. However, the National Numeracy Challenge is designed to promote sustained and prolonged exposure to maths topics and tests as part of its design specifically to promote improved performance on those tests. The links between sustained use of National Numeracy Challenge and test attainment can still therefore (in these author's opinions) be justifiably claimed as a positive outcome for the Challenge.

3.2.2 Self-assessed skill change

The survey asked individuals 'Since completing the National Numeracy Challenge, how do you feel about your ability to use numbers in your daily life? This provides an additional, subjective, assessment of changes to maths skills for all respondents including those for whom no check-up score data is available. Just under a third of respondents (30%) believed that their ability to use numbers had got better (Figure 8).

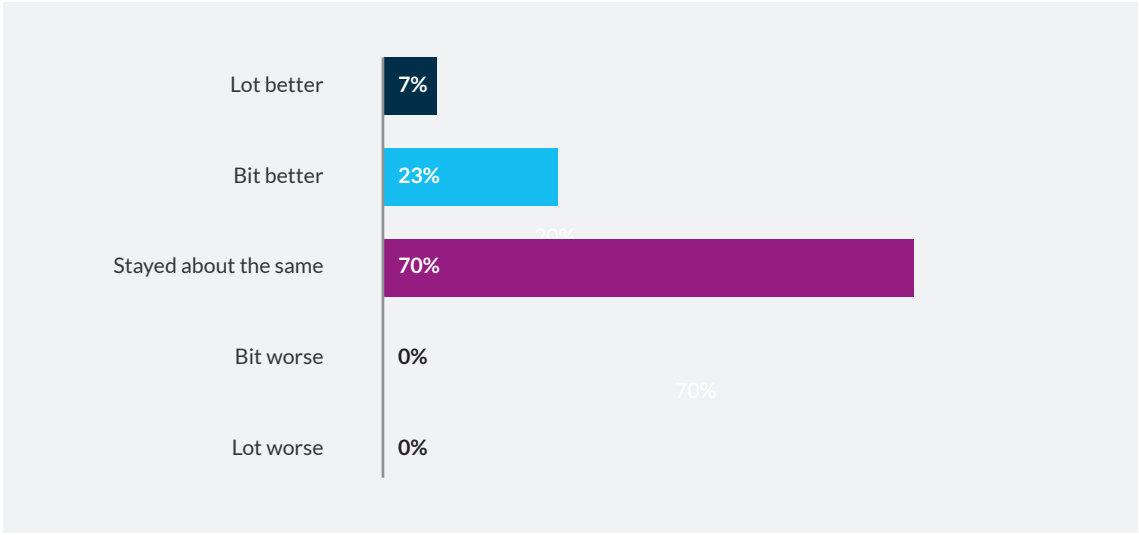
26 All differences significant at $p<0.01$ using Anova

27 See Analysis C in the Appendix

28 There is a small to moderate statistically significant linear relationship between number of dashboard visits to National Numeracy Challenge and the change in check-up scores ($r= -0.259$, $p<0.001$), and a small relationship between number of dashboard visits and change in quick check scores ($r = 0.199$, $p<0.001$)

29 There is a small statistically significant linear relationship between number of quick checks taken and the amount of change observed in quick check scores ($r= 0.185$, $p<0.001$)

Figure 8: Extent to which individuals believe their ability to use numbers in their daily life has changed having taken the National Numeracy Challenge



Source: National Numeracy Challenge research panel survey September 2022. Base: all respondents (1,021 individuals)#

There were statistically significant differences to the responses to this survey question between the following groups[30]:

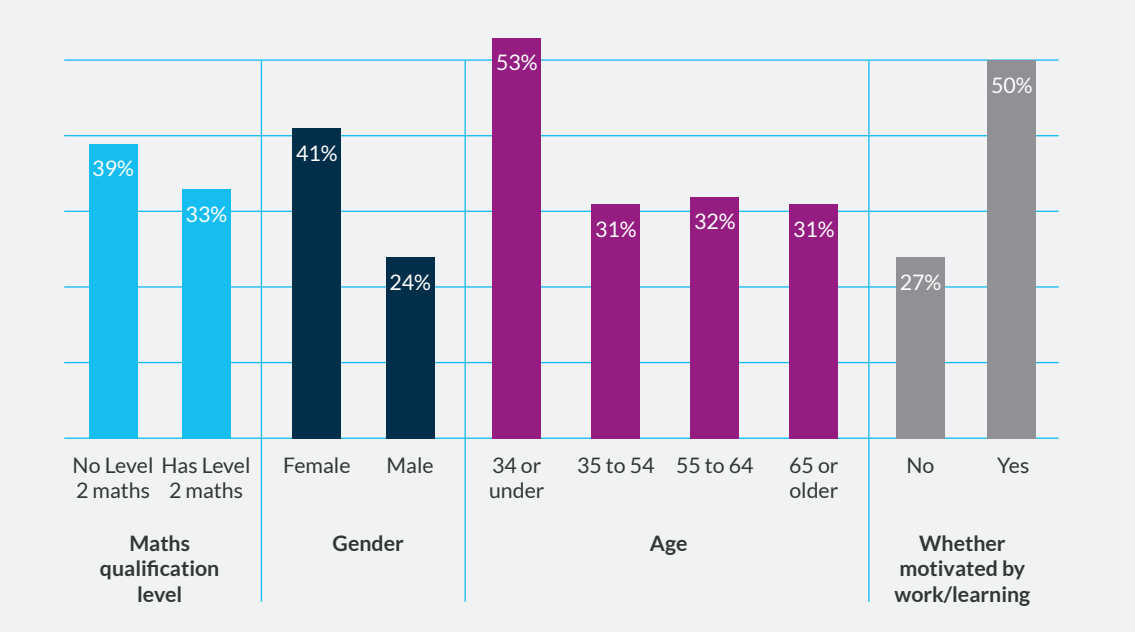
- those with and without Level 2 maths (37% of individuals without qualification indicated their number skills had improved compared to 27% of those with a qualification)
- individuals working and those not in work (35% of working, 23% of those not in work and 39% of retired people) respondents indicated that their number skills had improved)
- female and male respondents (35% of female and 22% of male respondents indicated that their number skills had improved)
- people of different ages (individuals aged under 35 were most likely to indicate that their number skills had improved – 52% compared to 25% of those aged 65 or older)
- more and less frequent users of the National Numeracy Challenge (49% of those making 15 or more visits felt their number skills had improved compared to 23% of respondents making fewer visits)
- individuals who indicated that work and learning factors motivated them to sign up for the National Numeracy Challenge compared to those motivated by other factors (49% of those indicating that work and learning factors motivated them to take the Challenge felt their number skills had improved compared to 25% of those for whom work and learning were not motivators).

Comparing perceived change in number skills with changes to quick check scores (for those with more than one quick check recorded) shows that those reporting that their number skills had improved tended to have achieved greater gains in terms of improving their quick check scores. However, it is not a precise fit, and some individuals whose quick check scores did not improve reported that they felt their skills had improved and vice versa. This may, to some extent, reflect the different time points at which the data was collected – users may have continued to improve their skills over time since their last quick check, although NN data suggests that some people tend to overestimate their number skills which may also explain some of the differences.

Removing retired respondents from the analysis, we can see that amongst 'working age' respondents that there are differences in the proportion of respondents who feel their number ability has improved by their maths qualification level, gender, age and whether work/learning motivated them on signing up to the National Numeracy Challenge (Figure 9).

30 All differences statistically significant at either p<0.01 or p<=0/05 using chi square statistic

Figure 9: % of individuals indicating that they believe their ability to use numbers in their daily life has improved since completing the National Numeracy Challenge (non-retired people only)



Source: National Numeracy Challenge research panel survey September 2022. Base: all non-retired respondents (288 female and 183 male; 47 under 35 yr olds, 174 35 to 54 yr olds, 197 55 to 64 yr olds and 54 over 64 yr olds; 155 motivated by work and learning factors and 354 not motivated by these factors)

4 National Numeracy Challenge and work/learning outcomes

Key points

As result of taking the National Numeracy Challenge, 28% of users without a Level 2 maths now feel more equipped to start a Level 2 maths course and 7% have already started one. These proportions are even higher for individuals who signed up to the National Numeracy Challenge to support their work or learning, 63% now feel more likely to start a Level 2 maths course and 22% have started one.

Amongst working National Numeracy Challenge users, a quarter now feel more equipped to get on at work having used the National Numeracy Challenge, whilst just over one in five (22%) feel more likely, or have taken steps, to get on in work.

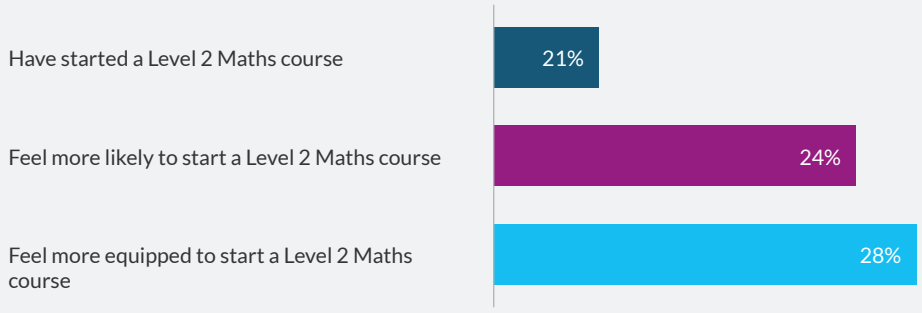
Individuals who believe that their number confidence and/or number skills have increased since using the National Numeracy Challenge are more likely to have taken steps to get on at work or have started a Level 2 maths course.

A recent survey shows that nearly two-thirds (63%) of people feel that their confidence in numbers had helped them progress at work or in their career.[31] This chapter examines whether, as a result of taking the National Numeracy Challenge, individuals feel there have been any effects on their work and learning outcomes.

4.1 Taking a Level 2 in maths

All survey respondents without Level 2 maths were asked whether, as a result of using the National Numeracy Challenge, how they felt about taking a Level 2 maths course (Figure 10). Around one in four felt that they either felt more equipped to start a Level 2 maths course (28%) or that they were more likely to start a Level 2 maths course (24%), whilst 7% indicated that they had already gone on to start a Level 2 maths course.

Figure 10: Whether individuals have changed their attitudes or behaviour regarding Level 2 maths courses as a result of using the National Numeracy Challenge (% agreeing or strongly agreeing that they…)



Source: National Numeracy Challenge research panel survey September 2022. Base: all respondents without Level 2 maths (225 individuals)

31 KPMG UK commissioned research by 72Point (OnePoll) - nationally representative survey of 2,000 adults (18+) May 2021

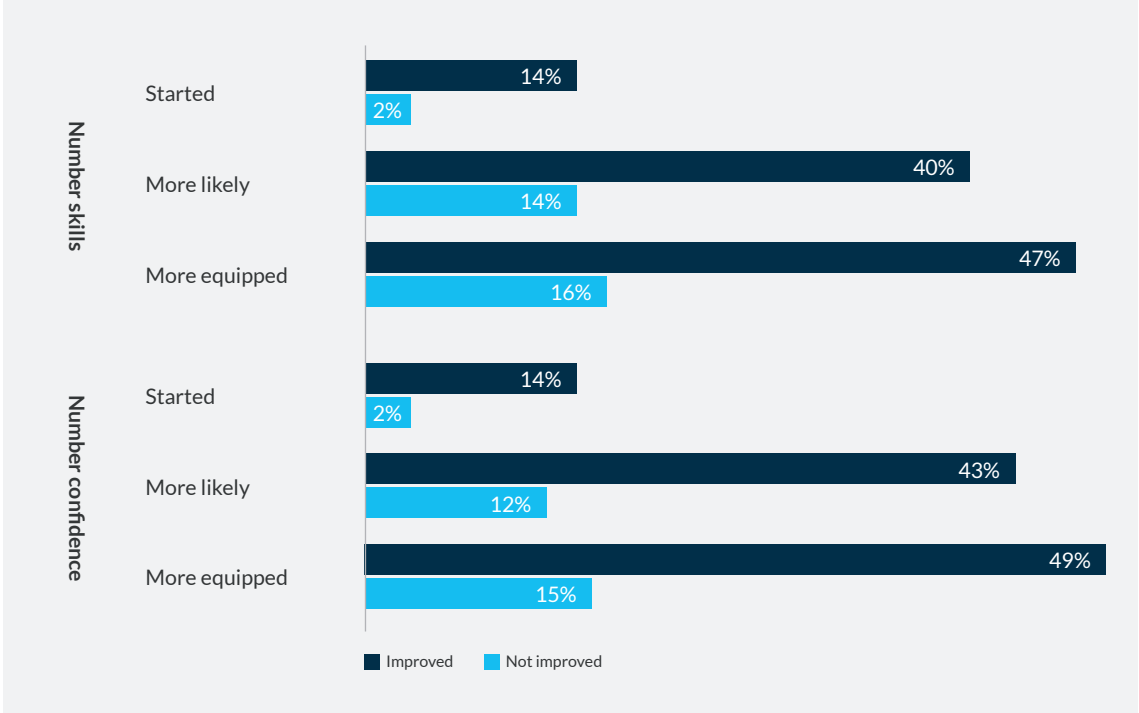
There were a range of statistically significant differences between the responses to these question in terms of individual characteristics:

- A higher proportion of working individuals felt they were now more likely to start a Level 2 course (42% compared to 14% of retired individuals and 32% of those not currently working), and more equipped to start a Level 2 course (37% compared to 11% of retired individuals and 28% of those not currently working). Individuals currently not working were most likely to have started a level 2 course (16% compared to 11% of those in work and 1% of retired individuals).
- Those motivated by work and learning factors to take up the National Numeracy Challenge were more likely than those who were not to feel more equipped to start a Level 2 maths course (53% compared to 20%), more likely to start a Level 2 maths course (63% compared to 11%) and to have started a Level 2 maths course (22% compared to 2%).
- Individuals visiting the National Numeracy Challenge most frequently (those visiting 15 times or more) were more likely to feel more equipped to start a Level 2 maths course (53% compared to 20%) and more likely to start a Level 2 maths course (31.5% compared to 19.3%).
- Those who felt that their career had been impacted in all five work areas were more likely to agree that they felt more likely to take a Level 2 maths qualification (35% compared to 22% of those with impacts in 1 to 4 areas and 16.5% who felt that there had been no career impacts).

There were also links between number confidence and the Level 2 maths survey indicators. Individuals who felt that their number confidence had improved were more likely to feel that they were better equipped (49% compared to 15% of those who felt their confidence had not improved) and more likely to start a Level 2 maths course (43% compared to 12%) and to have started a Level 2 maths course (14% compared to 2%). Similarly, those who felt that their number skills had improved were more likely to feel more equipped to start (47% compared to 16%), more likely to start (40% compared to 14%) and to have started a Level 2 maths course (15% compared to 2%).[32] Figure 11 provides an overview of these results.

32 Using chi-square statistic $p<0.001$ for all six tests

Figure 11: Whether respondents feel more equipped and more likely to start a Level 2 maths course, and whether they have already started one (respondents without Level 2 maths only) by whether they feel their number confidence and skills have improved



Source: National Numeracy Challenge research panel survey September 2022. Base: all respondents without Level 2 maths (225 individuals)

Fourteen of the National Numeracy Challenge users we interviewed did not have a Level 2 maths when they first engaged with the National Numeracy Challenge, but some had since gone on to enrol for a Level 2 course, and a few had achieved this by the time of the interview. Most said that they would not have had the confidence to take this action if they had not been on the Challenge first.

> *"The first time I used it, I was like, well, I'm rubbish. This isn't going to happen. I'm never going to get anywhere with this. But because it was something that I needed to have, I had to get over my fear and go well, maths is maths, it's not going to kill me, I'll get somewhere with it. So I stayed with the site for a while… and then kind of went, right now we're going for Level 2. So I started at Level 1, which I passed in July, which is good. Now I'm working on Level 2, but I still use the site every so often.*
> (Female, working full-time)

> *"I think it's played an important part in practising for my exam because it's not homework, it's something you can do in a very relaxed way. I don't think I'd be taking the exam in two weeks without it. I wouldn't feel as confident."*
> (Female, working part-time)

A few interviewees were told about the National Numeracy Challenge by their Level 2 maths teacher or tutor, and they had found it to be an invaluable resource which greatly supported their learning, confidence, and progress. For example, one National Numeracy Challenge user did not have Level 2 maths when she first found the Challenge, but a tutor on her Level 2 functional maths course told her about it. She found the Challenge very helpful because it gave her lots of practice for her Level 2 exam, which she passed:

> *"I gave up at maths at school. Only in later life, you realise you need your times tables, and that you use maths all the time, like with the vouchers I give out at my voluntary work."*
> (Female, does voluntary work)

Two interviewees said that they did not think they would have passed their Level 2 maths exam if it had not been for the Challenge, which helped them to practise and revise. One had already taken their Level 2 maths once and failed, but with the help of the Challenge, they passed on their second attempt.

> *"It helped me tremendously … It gave me practice and confidence … I went through it all, and then went back and it showed me what I got wrong … It made me pass my test, it helped me realise what I needed to do differently."*
> (Female, working full-time)

A few different reasons were given for why some people had not gone on to do a Level 2 maths after taking the Challenge, these included:

- taking the Challenge primarily to test themselves. It helped them to see they were better at maths than they thought they were, and because they had no strong career reason for obtaining a maths Level 2, they had decided not to pursue this.
- having yet to find a Level 2 course that fitted with their existing work and family commitments.
- being interested in taking a course in the future but not getting around to looking into it yet.
- not feeling sufficiently confident about their progress through the National Numeracy Challenge to take the next step.

4.2 National Numeracy Challenge as a learning tool for tutors

Some of the users interviewed were maths teachers and tutors and had found the National Numeracy Challenge useful with their teaching. One of the maths tutors has a maths A level. She said that regular use of the Challenge helps with her tutoring and gives her different ways to explain maths problems and concepts. It also helps to keep her skills honed, because she is stronger in some areas than others. She currently works for a tutor agency but is applying for more stable employment. Regular use of the Challenge helps her to feel confident in her applications, and to go for better jobs than she otherwise would.

> *"We have to do a skills check for work as well, just to see that we're currently at the level they want us to do for teaching. So, again, I've used the National Numeracy Challenge to help with that as well."*
> (Female, part-time teaching assistant and maths tutor)

An apprenticeships and functional maths tutor frequently referred her students to the Challenge to help them with revision for their Level 2 maths exam:

> *"I think it definitely has really resonated with the teaching, because I asked them to go away and do the questions and work through it. So it has impacted because you can give 16, 17-year-olds books to revise from but everything is there, interactive, and online is. So we like to push people to use it in their revision."*
> (Female, maths tutor)

Another teacher described how the National Numeracy Challenge reminded her of the maths that she did at school. Not only it has helped her in her teaching, but she also thinks it is well suited to its target audience (i.e. people without maths Level 2).

Case study 4 discusses how one tutor has used the National Numeracy Challenge to support his work with adult education students.

Case study 4: National Numeracy Challenge supports Level 2 maths learning

One of the interviewees manages a team of functional skills tutors for a Local Authority as part of the provision of Adult Education Budget-funded maths, English and ICT for adults aged 19 and above.

> *"We're always looking for ways of introducing people to math, that isn't scary ... on the internet, on the phone, at home, on a laptop, on your iPad, or wherever is zero pressure."*

He has been aware of the National Numeracy Challenge for several years but in the last two to three years he has reengaged with the newest version and has found it very helpful and well-aligned with adult learners' requirements. His team have used it a lot alongside their maths provision, which it complements very well.

> *"I say to my team, give this link to people, say go in and practice. You don't need past papers. There's loads of resources out there, but you need someone to help you, whereas the Numeracy Challenge is fine. It's self-run. That fits all the right bills. And I deal with people who've got no maths at all, no qualifications. They may be really good at maths, but they've never had a qualification."*

He thinks that the Challenge has good coverage and is not intimidating for people who have had bad experiences with maths in the past.

> *"They cover everything they did in the Level 2 functional skills curriculum. The questions are relevant, and they can get harder or easier, depending on your starting level. So again, appropriate, applicable. I've said before about encouraging people to explore more. And also, the flip side of that is not scary, it's not putting people off."*

The key aim of their provision is to help get people into work, and on occasion, to help them get on at work.

> *"We aim to get everybody we teach to a Level 2 and move them along, and that is primarily to get into work. The Numeracy Challenge is a part of that journey. They're not going to get a Level 2 by themselves. They're going to join a class or a group. So the Numeracy Challenge, I think is the gateway into Level 2, and it's a very, very useful gateway."*

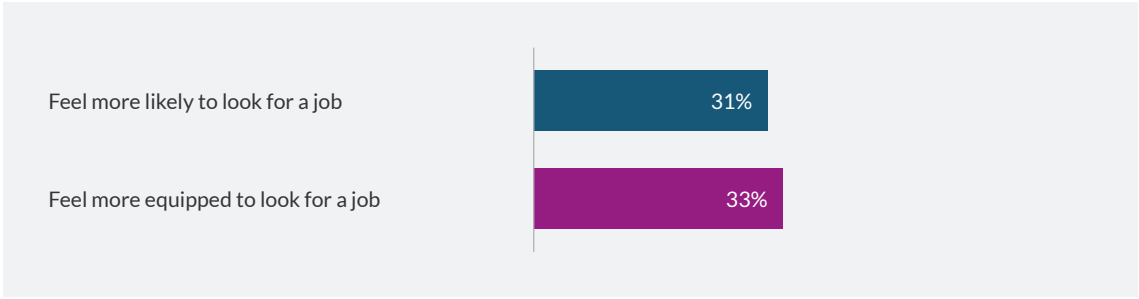
He was able to provide an example of getting a Level 2 maths to help people get back into work after having lost their jobs at Thomas Cook.

> *"The Thomas Cook example, the three ladies who came to us. They all got their maths qualifications, and they all went straight into jobs. And one in particular, I know got a job as a school secretary, because of her skills. But she couldn't have got in without her maths qualification."*
> (Male, adult education tutor manager)

4.3 National Numeracy Challenge and job search

Individuals available for work (i.e. those seeking work and students) were asked how they felt about job seeking after using the National Numeracy Challenge (Figure 12) and around a third indicated that they now felt more equipped and/or more likely to look for a job. It should be noted that some of these individuals will already have been seeking work when they first registered for the National Numeracy Challenge. The questions therefore focussed on job search intentions rather than actual job search behaviours.

Figure 12: Whether individuals have changed their attitudes or behaviour regarding job search as a result of using the National Numeracy Challenge (% agreeing or strongly agreeing that they…)



Source: National Numeracy Challenge research panel survey September 2022. Base: respondents available for work (not currently working) and students (45 individuals)

Amongst individuals who are seeking work 29% indicated that they felt more equipped to look for a job and 33% that they were more likely to look for a job as a result of using the National Numeracy Challenge. Compared to this, a slightly higher proportion of students (38%) felt more equipped to look for a job and a slightly lower proportion of students felt more likely to look for a job (29%) as a result of using the National Numeracy Challenge. A significantly greater proportion of those motivated by work and learning to take the Challenge state that they now feel more equipped to look for a job as a result (26% compared to 23%). Any further analysis is limited by the relatively small number of responses available.

Some of the National Numeracy Challenge users interviewed had taken the National Numeracy Challenge as they were hoping to improve their maths and/or get a qualification in order to improve their work prospects. Others said that while this had not been their primary motivation for engaging with the Challenge, they now felt better equipped to apply for future jobs.

> *"Knowing that the website is there, and those examples are there. If I came across a job that I thought I'm going to need maths skills, I'd be more confident applying for that job, knowing that I'd be able to tackle whatever it was. I wouldn't be going for any university maths lecturer jobs, but if it's a bit of adding up, I'll get quicker at doing it."*
> (Female, looks after family)

One National Numeracy Challenge user was doing a nursing degree, for which passing a maths exam was a requirement, and she had used the National Numeracy Challenge to support this. Another said that having done the Challenge had raised her career aspirations to a higher level than they had been previously (see the two case studies below).

Another National Numeracy Challenge user said that having done the Challenge, she was now keen to do Level 2 maths as this was the only thing standing between her and advancing her career and reaching her potential, by, for example, studying for a degree.

> *"That's the only thing holding me back. If I go and get that sorted, then there'll be so many more things that I could do. And even if I wanted to stay doing the type of work I'm doing now, I've been doing the job for 20 years, but there's nothing on paper to tell somebody who doesn't know me that I'm capable, confident and competent to do the job."*
> (Female, working full-time)

Case study 5 describes how National Numeracy Challenge supported one user to gain a nursing degree, whilst case study 6 shows how increasing number confidence can help raise career aspirations.

Case study 5: National Numeracy Challenge supporting study for a nursing degree

A woman in her 40s went onto the Numeracy Challenge website to help her gain access to a nursing degree for which she needed to get a maths qualification. After working in an office for many years while her children were younger, she was now in a position to work towards her longstanding ambition of being a mental health nurse.

> *"My conditional offer was that I passed the math test. And I did a science test as well. And both I found tricky, but the maths, as soon as I started, I thought, this is definitely something I'm going to have to [work on] because if I'm going on this course for three years and doing a degree, I'm going to make sure that I'm the best nurse I can be. So it was a huge thing."*

> *"As soon as I went on to [the Challenge] and started reading, there's a good bit of background and lots of videos as well about people talking about maths. And as soon as I saw the videos I was like, oh, my goodness, this is great. Because that is exactly how I feel. It was really, really important, just to know that you're not as rubbish at maths as you think you are. Maybe I'm not great at it. But there are lots of people who are not good at it as well. And I think that's what was really important … it's changed that, my whole mindset. Completely."*
> (Female, studying for a degree)

Case study 6: enhancing confidence and raising career aspirations

A woman in her 40s who does not have Level 2 maths is unable to work at present due to having long Covid. She has started to do the National Numeracy Challenge regularly and it is helping her skills and her confidence.

> *"I carry on doing it regularly to see if I can get better and understand things … I think if you do something over and over again, then you just get it. I learn by doing, I don't learn by reading. I've never been one of these people where you can give me a textbook and I can remember it all. But if I learn by doing it, I'll remember it forever ... It just goes to show how in the 80s, the system was lacking."*

> *"The way that the questions are worded, and if you get them wrong, it asks you to try it again. And then you go and look at the explanation of how they've got the answer. It's so much better than the way I learned it."*

She is much more confident to use numbers in her day-to-day life. For example, she sometimes buys and sells things on eBay and she is much more confident about the numbers side of this.

> *"I'm really proud of myself … And it has helped, because I'm selling stuff and buying stuff on eBay, and people offer me discounts, or if you want to give a discount to somebody, then it has come in handy. I've been able to just quickly look at things and work out that well, actually, that's not a 10 per cent discount at all. That's only like seven, stuff like that. And it's also been interesting when I talk to insurance companies when I renewed my car insurance. I can say, look, you have actually increased my premium by 80 per cent now, whereas I would have just gone on and said, right sort this out because you put it up a load; it comes across a lot better. So it's had its uses in my daily life as well."*

She would like to do Level 2 maths in the future as it will improve her job prospects when she is well enough to return to work. Being more confident with numbers has raised her career aspirations generally and has made her think that she can and will aim higher in the future.

> *"I had always planned to try and get back into a pharmacy setting. But I think because of the improvement that I've made, it's probably given me the confidence in myself to say, actually, I can go for something a bit higher than I was expecting. I was just going to go back as a dispenser. But I think that being better with numbers has given me the confidence to say, actually, no, you can train as a pharmacy technician. Now I would have the confidence probably to apply for trainee technician, rather than start and work my way up again. So it has changed my plans really, hasn't it? It has changed how I'm going to going to work. It hasn't changed what I want to do, but it's changed the level that I would be happy starting at."*
>
> *"I really love the way it works… You take the Challenge, and you take it again and you improve. So yeah, I think it's perfect. Well, it was for me anyway. I found it the most useful tool that I've had in the last 30 years."*
> (Female, not currently working due to ill health)

4.4 National Numeracy Challenge as a support to getting on at work

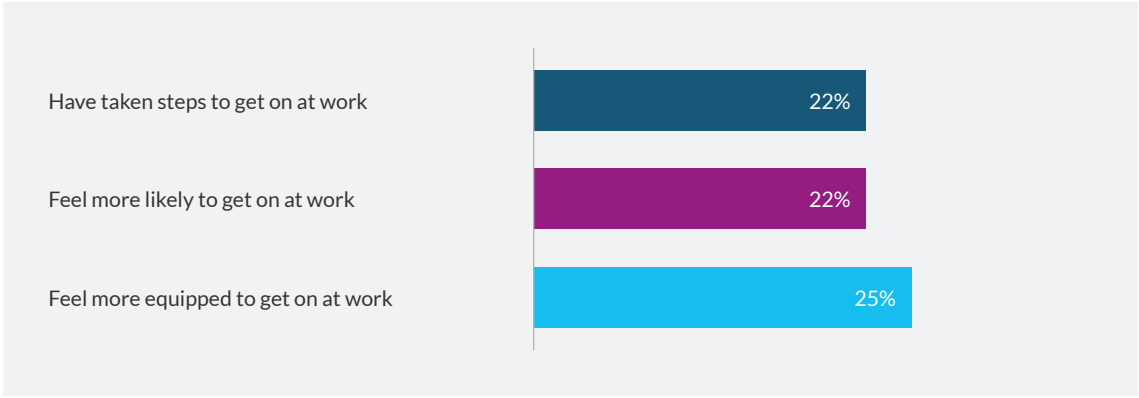
All survey respondents who were working at the time of the survey (full- and part-time workers and those self-employed) were asked how they felt about getting on at work as a result of taking the National Numeracy Challenge (Figure 13). Overall, one in four respondents (25%) now felt more equipped to get on at work, and one in five (22%) now felt more likely to get on at work and to have taken steps to get on at work.

Individuals motivated by work and learning were more likely than those for whom work was not a motivator to feel more equipped to get on at work (34% compared to 18%), more likely to get on at work (35% compared to 16%) and to have taken steps to get on at work (34% compared to 14%). Younger workers are more likely to feel it is more likely that they will get on at work (31% of those aged under 45 agreed this was the case compared to 19% of those aged 45 to 64) and to have taken steps to get on at work (33% of those aged under 45 compared to 16% of those aged 45 to 64).

There were also links between number confidence and the getting on at work survey indicators. Individuals who felt that their number confidence had improved were more likely to feel that they were better equipped (54% compared to 9% of those who felt their confidence had not improved) and more likely to get on at work (50% compared to 9%) and to have taken steps to get on at work (47% compared to 9%). Similarly, those who felt that their number skills had improved were more likely to feel more equipped to get on at work (54% compared to 9%), more likely to get on at work (51% compared to 8%) and to have taken steps to get on at work (46% compared to 9%).[33] Figure 14 provides an overview of these results.

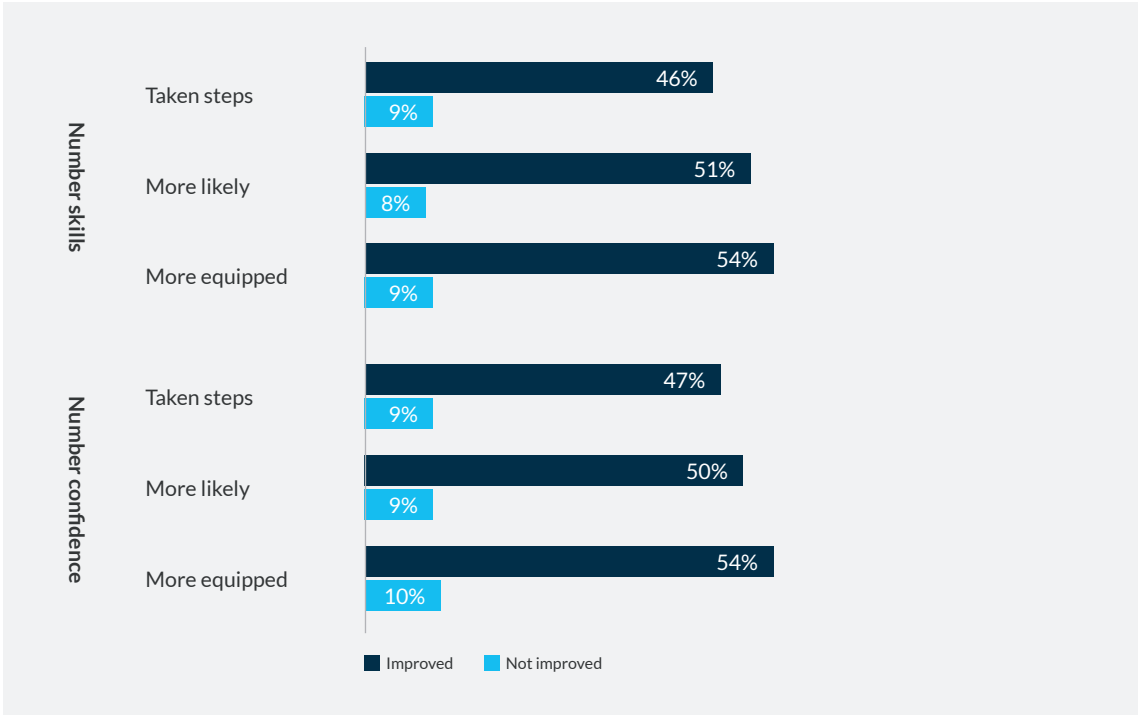
33 Using chi-square statistic $p<0.001$ for all six tests

Figure 13: Whether individuals have changed their attitudes or behaviour regarding getting on at work as a result of using the National Numeracy Challenge (% agreeing or strongly agreeing that they…)



Source: National Numeracy Challenge research panel survey September 2022. Base: all respondents working or self-employed (416 individuals)

Figure 14: Whether respondents feel more equipped and more likely to get on at work, and whether they have already taken steps to get on by whether they feel their number confidence and skills have improved



Source: National Numeracy Challenge research panel survey September 2022. Base: all respondents working or self-employed (416 individuals)

Some National Numeracy Challenge users stated during interviews that having improved their maths skills or having gained Level 2 maths with the help of the Challenge would help them get on at work in the future. For some, this meant advancement from their current role, with the same employer. For others, it opened possibilities for different careers in the future.

> *"Where I am in my career it's hard to go anywhere else. So I'd probably have to think about changing and doing something different with different skills. I talk about wanting to go into the police or something like that. And that's a huge amount of learning … So it's definitely given me more confidence to be like, I could study if I wanted to, or if I just wanted to go on a course or something while I'm still here. Yes, I could."*
> (Female, working full-time)

5 Wider impacts of the National Numeracy Challenge – the halo effect

Key points

For some National Numeracy Challenge users, there were additional knock-on effects from gaining number confidence. People described feeling more able and prepared to consider other learning, having raised their career aspirations. Some were also able to adopt a more positive approach to work and life in general having overcome the fears, and stigma, they associated with their lack of number skills.

The survey asked people, in their own words, to describe how using the National Numeracy Challenge had affected them beyond improving their number confidence and skills. Examples of responses are provided in Table 3.

Table 3: Effects of the National Numeracy Challenge – quotes from survey respondents

Quote	Respondent characteristics
Because number work has been a huge barrier all my adult life, now that I've undertaken learning math as an adult with a positive outcome, I now feel I can apply this learning and new mindset to learning other subjects – I'm training to be a Nurse now!	Female, student
Before I took the National Numeracy Challenge, I had always felt that I was bad at maths, because that was what I had been told all throughout my schooling career. However, after taking the National Numeracy Challenge, I realised that I actually wasn't that bad at maths and that I had been massively underestimating my ability.	Female, student
Before, I didn't bother trying, but now that I'm more confident, I think about it more in my daily life, without fear.	Gender unknown, working part-time
Contributed towards reversing my negative association with maths.	Female, working full-time
Has proved to me that I can follow instructions successfully and that I have an aptitude for learning. Has made me hungry to do more courses and to successfully complete and gain a Level 2 in Functional Skills for maths.	Female, full-time carer
It motivated me to do math and in turn I could motivate my kids. I am in the process of making math visible to them in their daily life experiences.	Female, currently seeking work
It's made me take more of an interest in working things out e.g. the supermarket shop - I take the time to work out the price per litre/kilo for goods in my head or I will get my phone out and use the calculator function if necessary to enable me to make smarter choices with regards to finding the best prices.	Female, working part-time
More confident in tackling problems or reading statistics etc even if I don't understand I know where to look for help. I feel my husband is more patient and understanding about my issue with numbers – we can talk about it openly and I don't feel stupid.	Female, retired
My confidence is at an all-time low when I started doing the Challenge I felt a sense of achievement as I was diagnosed with dyscalculia but being unemployed with no feedback has knocked me back.	Female, currently seeking work
Recognising and having my confidence in my own ability at maths without having any formal qualifications.	Male, working full-time
It gave me more confidence. I always thought I was just dumb at math. It turns out school was trying to teach parts of math I won't really need, and that's why I felt awkward with math, until I realised I could actually be a lot better at the important parts of it, thanks to this website.	Male, currently seeking work

Source: National Numeracy Challenge research panel survey September 2022. Examples of responses to an open question asking about the impact of the National Numeracy Challenge on people's lives

There were also examples amongst those interviewed which demonstrate how taking the National Numeracy Challenge had helped people to feel more confident in other areas of their lives, i.e. it had prompted a "halo effect", where a positive experience or outcome in one area leads to a more positive outlook in other areas.

Having engaged with the Challenge and improved their maths skills and confidence, several National Numeracy Challenge users said that they were now keen to keep on learning. One example is that of a woman who was due to sit her Level 2 maths exam soon. She had found the confidence to do this because of doing the Challenge. The maths course was the first learning she had done in many years, but she was already thinking about doing another course afterwards.

> *"If I crack this exam, I want to do another online course to keep the brain moving."*
> (Female, working part-time)

Another National Numeracy Challenge user had similarly been inspired to continue learning after recently passing Level 2 maths.

> *"I want to get established in my new job and get my English next."*
> (Female, working full-time)

One of the beneficiaries was currently studying for Level 2 maths and thought that gaining this qualification will mean that she is not limited to the kinds of work that she can take on in future. This in turn gives her more flexibility and higher earning potential.

> *"I think because they've asked me to take on some tutoring responsibility, I will need to have [Level 2 maths] as one of the key conditions of doing that sort of work. So if I hadn't wanted to advance that area, I probably would have just stayed where I am doing what I'm doing."*
> (Female, working full-time)

Another, who had Level 2 maths already, still said that having done the Challenge had made her feel more confident about applying for higher-level jobs in the future.

> *"I'm looking at laboratory jobs, or working in the finance sector, something like that… I'd say that the Numeracy Challenge had a little bit of impact because it's helped me apply for better-paid jobs than what I would do originally, it helps build confidence."*
> (Female, part-time work)

Further examples are provided as case studies 12 and 13.

Case study 7: National Numeracy Challenge as a stepping stone to other learning

A man in his 30s works as a precision engineer, having worked his way up since leaving school at age 16, but he would like to do a degree in the future. He did not have a bad experience of maths at school but said that he did not pay much attention in class, and hence left without a maths GCSE.

> *"I was probably an average kind of student. I think there was potential there, but I never tried. I'm not so much regretting it now because I've got myself a good job. But I do wish that I'd tried a lot harder in school."*

He came across the Challenge and enjoyed doing it. He goes on the National Numeracy Challenge website and practices almost every day. His confidence with numbers has increased dramatically, to the extent that he has started a Level 2 maths course, intending to take a degree in the future.

"I really want to do Open University, I really want to do a STEM degree. That's a lot more work… so I thought I'd start with this college one, because it's a lot less work involved, just to see how I get on with that. And then in the future, maybe look into the university one."
(Male, working full-time)

Case study 8: National Numeracy Challenge supporting Level 2 maths study

A woman who works as a Healthcare Assistant in the NHS did not feel that a lack of Level 2 maths had prevented her from doing what she wanted to do so far, but that it probably would in the future. Things had changed since she was at school, and Level 2 maths was now a general requirement for many more things. This meant that her younger colleagues were more qualified than her and she was worried that she would be overlooked for a promotion.

"To progress at work, I need to do my maths so that I can go up a band ... They want us all to be Band 3s because we do such a specialised job. So I need it or I'll be the YTS girl and I'm one of the longest-serving members of staff, but I'll be left behind."

A conversation with her line manager about the possibility of studying for Level 2 maths led her to the National Numeracy Challenge. She has found it helpful for improving her skills and confidence while she prepares for her Level 2 maths exam.

"It's all functional skills, and the questions are a bit like past papers where they try and trip you up in the same way, so it helps me practice because I can see that I'm not quite getting what they're asking for."

The Challenge, and studying for her Level 2 maths have increased her enthusiasm for learning more generally too, and she intends to keep on doing this in future.
(Female, working part-time)

6 Using the National Numeracy Challenge and its role in supporting other learning

Key points

Almost a third (31%) of non-retired National Numeracy Challenge users sign up for the Challenge hoping to improve their numeracy to get a qualification, find a job or get on at work. Women, younger users, and those without an existing Level 2 maths qualification are most likely to be motivated to use the Challenge by aspirations related to work. Users find that the National Numeracy Challenge supports their work on other courses and gives them the confidence to try new learning with a maths component.

Most people tend to use the National Numeracy Challenge in short sessions and eight out of ten users access areas of the site designed to support further learning – they don't just complete the Challenge questions; they also explore the available resources more widely. Less confident users tend to visit the site more often as do those without an existing maths qualification and younger people.

Just over one in ten users are engaged in other learning alongside the National Numeracy Challenge. The groups more likely to be engaged in additional learning are women, those aged under 35, and those who signed up for the Challenge hoping it would help them gain a qualification or job, or to get on at work.

This chapter examines how individuals use the National Numeracy Challenge, including whether and how it supports and complements other types of learning.

6.1 Finding out about the Challenge

Survey respondents had come to the National Numeracy Challenge website through a wide variety of routes, such as through Experian, Facebook, National Numeracy Challenge campaigns and partner websites.

Some of the beneficiaries interviewed had found the National Numeracy Challenge after searching on the internet for maths resources, while a few others had been told about it by a tutor or an employer. Many of those interviewed could not remember exactly how they had found out about the National Numeracy Challenge but thought it was probably through an advert on Facebook or other social media. Several said that reading about other people who were apprehensive about maths in the advert gave them the hope and reassurance they needed to go on and look at the National Numeracy Challenge.

> *"In the advertisement, I think it talked about how people feel about mathematics, and that some people are worried about maths. I thought the same, so I just clicked on it."*
> (Female, working full-time)

> *"It just gave me a bit of background into the normal views that people have about maths. And this just made me feel like, Okay, so I'm not as bad as I thought. So that's how it all started."*
> (Female, full-time student)

Case study 9 provides an example of how one user responded to National Numeracy Challenge marketing.

Case study 9: National Numeracy Challenge is an attractive offer

A man aged 60 said that the advert he saw which led him to the National Numeracy Challenge was designed in such a way that even though he usually panicked when he saw numbers, it made him want to find out more:

> *"I think it must have been either an advert on Facebook or one of the social media platforms. Now, normally I'd avoid things like that, I think maths; I can't do that. But whatever the advert said it must have been something that inspired me to click on it ... I used to work in advertising, doing logos, and promotions. So whenever I see an image with words, that inspires me. I think, oh, that's really clever. I want to see something that means something to me. It drew me in, whereas [usually] if I see numbers, I panic."*

He had always feared maths after a very bad school experience, but he found the Challenge friendly and supportive.

> *"From what I remember, it seemed very friendly, and not intimidating. I remember it being very supportive and encouraging. And you did so many tasks or numbers and things. And it showed you how to do them. It seemed accessible and fun. And as you were doing it, you would think oh my god, I did that. That was really, really good."*
> (Male, retired)

6.2 Motivations for using National Numeracy Challenge

When first signing up for the National Numeracy Challenge, users are asked what their priorities are for taking the Challenge in terms of whether they were looking to enhance their money management, the support they could offer other family members' maths ability or in terms of improving their numeracy to get a qualification, find a job or get on at work. A similar proportion of users indicated each of these three areas motivates them (22% indicated money, 17% indicated family and 17% indicated work/learning, the remainder were motivated by other factors).

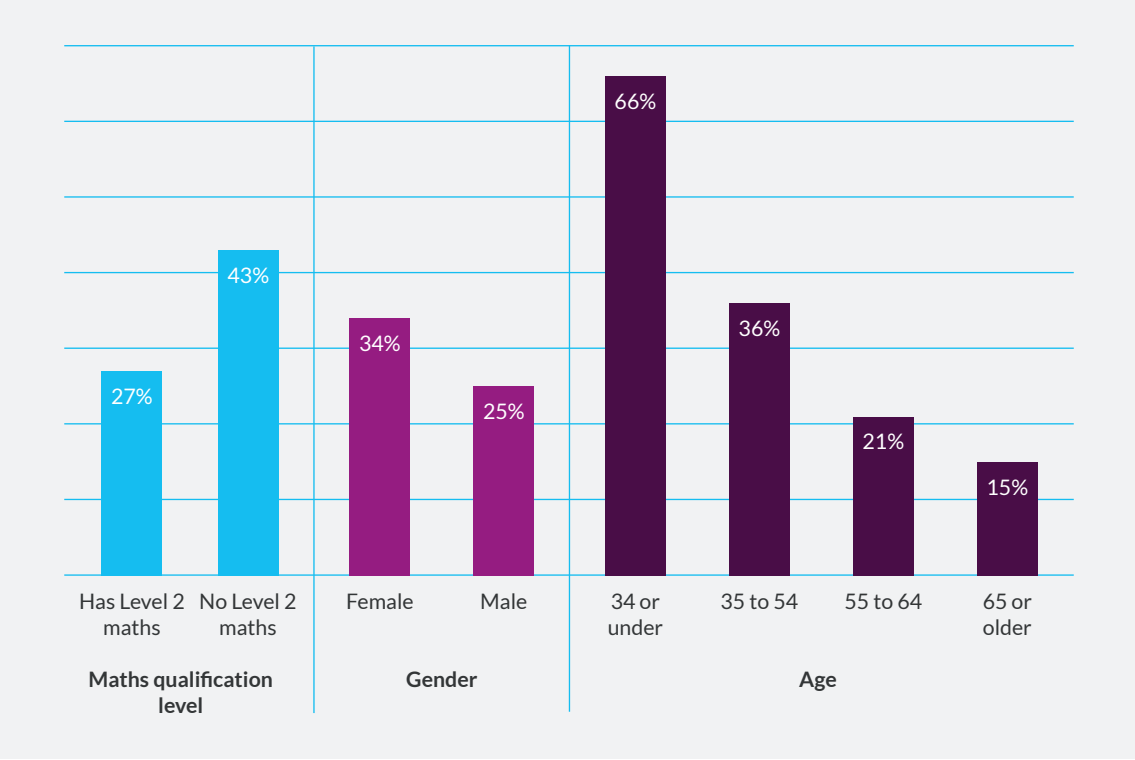
The proportion of users motivated by all these factors is higher amongst non-retired respondents (26% indicated money, 22% indicated family and 31% indicated work/learning had motivated them to access the National Numeracy Challenge). Figure 15 provides more details.

Amongst this working age group, those most likely to be motivated by learning and work factors when starting the National Numeracy Challenge are those aged 35 or under, women, and those without Level 2 maths[34]. Those citing work and learning as motivators had significantly lower initial number confidence scores (a mean of 6.3 out of 10 compared to 7.5 amongst those not citing work as a motivator for using National Numeracy Challenge).[35]

34 All differences statistically significant at either $p<0.01$ or $p<=0/05$ using chi square statistic

35 Significant at $p<0.001$ in Anova

Figure 15: % of respondents motivated by work factors when signing up to the National Numeracy Challenge (non-retired respondents only)



Source: National Numeracy Challenge research panel survey September 2022 and National Numeracy Challenge held user data. Base: non-retired individuals (114 individuals without and 366 with Level 2 maths; 288 females and 183 males; 47 aged 35 or under, 174 aged 35 to 54, 197 aged 55 to 64 and 54 aged 65 or older).

During interviews, beneficiaries described their motivations for taking the National Numeracy Challenge. Some of them had been looking for a way to improve their maths, some wanted to check to see what level they were at, whilst others started the National Numeracy Challenge as part of their aim to seek out a Level 2 qualification in the future.

> *"I think to test myself a bit. I have considered resitting the GCSE."*
> (Female, working full-time)

One man in his late 50s who had not obtained a maths qualification at school described how he took the National Numeracy Challenge because he wondered whether it was a direct route to getting a maths qualification. He had worked as a building surveyor for 30 years; a job which involves a considerable amount of maths. He felt that the teaching he received whilst at school, rather than his inherent maths abilities, was at the root of his lack of maths skills.

> *"I never did particularly well at maths, I left secondary school without much in the way of a maths qualification. Subsequently, I use maths quite a lot ... I went from thinking, well, I'm just no good at maths, to realising that, no, actually, the problem wasn't that I was no good at maths. It was the people who tried to teach it. Frankly, they've been useless. I had some notion of seeing if I could actually get a proper maths qualification. I think that's what I was looking for when I came across the National Numeracy Challenge. Was there a route to a qualification in maths?"*
> (Male, working full-time)

Having established, through completing he National Numeracy Challenge, that his maths skills were relatively strong, he decided that at this stage in his career, he probably didn't need Level 2 maths after all. However, there were examples of younger people who were keen to use the Challenge as a steppingstone to a Level 2 qualification, as in the case of the National Numeracy Challenge user below who later enrolled on a Level 2 maths course:

> *"I've always enjoyed numbers, and I have always had the thought of eventually going for hopefully, a degree. So when I saw it, I thought, oh, I'll just see how well I'm faring. Because I do maths in my job, but I'll be rusty on some of the topics. I just thought I'd give it a go."*
> (Male, working full-time)

A few of those with Level 2 maths were maths teachers or tutors. They had found the National Numeracy Challenge as part of their search for maths resources to support their teaching and now referred their pupils/ students to the resource.

> *"I use it quite regularly. ... It's interesting because it is the types of questions that we get on the functional skills exam. So it does give [the students] a really good example of what to expect from the beginning to what they need to be learning… I send the link out to all my students when we start off. I tell them to use it like weekly."*
> (Female, working part-time, maths tutor)

Case study 10 provides an example of the National Numeracy Challenge helping a user to achieve one of her life aims.

Case study 10: ticking off an item from their bucket list

One National Numeracy Challenge user's father has passed away a few months ago. This combined with the fact that she will be 50 next year, made her take stock of her life and consider the future. She made a list of things that she would like to do in her fiftieth year, and one of these was to pass her Level 2 maths.

She found the Challenge motivating and said that it had brought out her competitive streak. She likes re-doing it to see if she can improve her score.

> *"I'm definitely more confident. It's great to be able to use the tools and redo the tools. It's not a person, so there's no pressure and you get a sense of achievement."*

> *"I'm better with numbers than I think I am…. It's made me more aware that I'm not as thick as I thought I was. I'm more aware of numbers, and I also know I could be better."*

She is more likely now to check her wage slips from work to make sure she's being paid what she is owed. She was interviewed in the summer and hoped to get a place on a Level 2 maths course in the autumn. The National Numeracy Challenge helped her to feel confident enough to enrol in a course. (Female, working full-time)

6.3 How the National Numeracy Challenge is used

Several indicators of 'National Numeracy Challenge usage' are available - the number of dashboard visits logged by the National Numeracy Challenge system,[36] and respondent recall of the number of times and how they used the Challenge.

6.3.1 Level of use

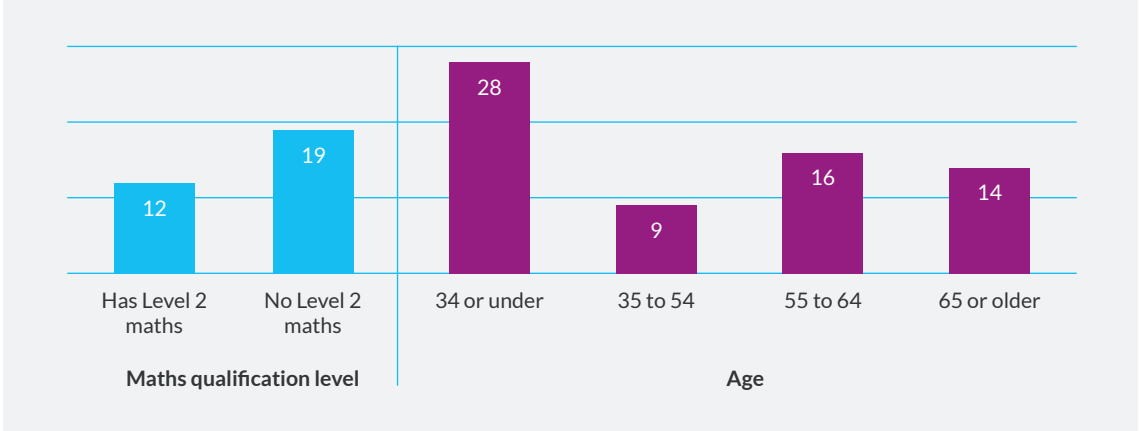
The average number of online visits to the National Numeracy Challenge recorded by the system was 8 per user[37]. People generally had good recall of their visits as those reporting using the Challenge the most tended to be those with the highest number of dashboard visits.

36 A dashboard visit is logged when an individual lands on the home screen in the National Numeracy Challenge. This happens after an individual registers, logs in, completes a check, or interacts with the site in some other way. The number of dashboard visits is therefore a useful measure of overall National Numeracy Challenge usage levels.

37 This is the median value as the mean was affected by a small number of very high values.

There is a significant negative correlation between the number of dashboard visits and initial confidence scores.[38] Those visiting most often had lower initial mean number confidence. For example, individuals making 15 or more visits[39] had a mean baseline confidence score of 6.9 out of 10 compared to 7.7 amongst those visiting less often.

Additional statistically significant differences are that those without Level 2 maths visited the National Numeracy Challenge more often (19 visits on average compared to 12 by those with Level 2 maths) as did younger users (under 35-year-olds visited an average of 28 times, those aged 35 to 54 visited on average 9 times, those aged 55 or over visited 15 times). Removing retired individuals from this analysis, these differences remain as presented in Figure 16.



Source: National Numeracy Challenge research panel survey September 2022 and National Numeracy Challenge held user data. Base: non retired individuals (47 under 35 yr olds, 174 35 to 54 yr olds, 197 55 to 64 yr olds and 54 over 64 yr olds; 366 with and 114 without a Level 2 qualification)

6.3.2 Type of use

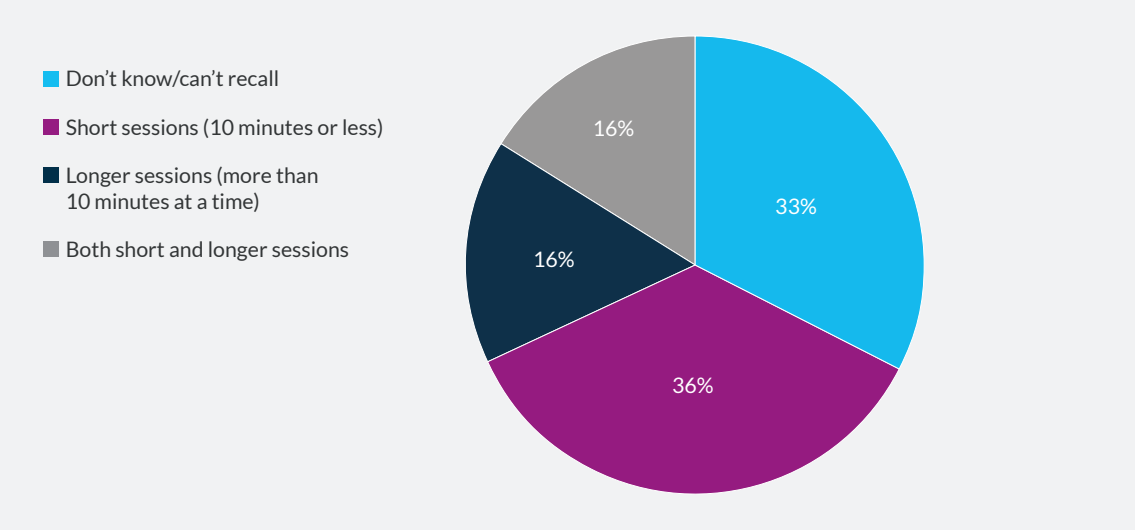
The survey also asked individuals for how long they tended to use the National Numeracy Challenge (Figure 17). As this shows, those who could recall how they used the Challenge most commonly did so in short sessions, with the remainder equally likely to use it for longer sessions or in a combination of long and short sessions.

Additional information was available from NN records regarding whether individuals used any of the accompanying learning resources that sit alongside and support users taking the Challenge itself. These resources can be explanations of answers to questions that users got wrong in the Challenge to additional information about topics their scores suggest they are finding more difficult. Over eight out of ten National Numeracy Challenge users (83%) had accessed some form of additional NN resource alongside taking the Challenge.

38 There is a small statistically significant linear relationship between number confidence and perceived impacts on working life ($r = -0.134$, $p<0.01$).

39 This is the highest quartile of respondents (i.e. 25% of the sample used the National Numeracy Challenge 15 times or more).

Figure 17: Ways in which the Challenge was used



Source: National Numeracy Challenge research panel survey September 2022. Base: all respondents (1,021 individuals)

In their survey feedback, National Numeracy Challenge users also highlighted how the National Numeracy Challenge worked for them in short bursts, allowing them to work at their own pace and to their own schedule.

> *"I used the National Numeracy Challenge to test my current knowledge and hopefully challenge and improve my methods of various types of numeracy daily challenges at home and work."*
> (Male, working)

> *"Short, focused work suited me best, putting complicated ideas simply."*
> (Male, working)

> *"I really like the fact you can see where you go wrong."*
> (Female, working)

> *"It was a good exercise to see where my weaknesses and strengths were at."*
> (Female, working)

> *"A useful refresher of useful maths rather than the irrelevant maths I was taught at school."*
> (Male, retired)

Interviewees had used the National Numeracy Challenge in a variety of ways. Some had taken the National Numeracy Challenge once or twice, stopping when it had given them the reassurance they needed. Most usually found that they were better at maths than they had thought. However, most users had been through the National Numeracy Challenge several times, and were pleased to see their scores improving. They continued to visit the National Numeracy Challenge regularly to keep their maths skills and confidence up.

> *"I enjoyed it. I mean, I've been on it literally every day since I found it ... I'll spend most of the time doing the practice questions. And then after a bit, I'll have a go at the actual test. I got full marks on it for the first time today. Which I was happy about."*
> (Male, working full-time)

> *"I used it loads of times. I've tried to do it at least twice a week. And I'll tell myself, I've got to do my maths, got to keep that routine going. Because I know if I have a long break from it, then I'll be starting from scratch again, because I don't remember. I think it's a lot of practice, isn't it with maths?"*
> (Female, working part-time)

Several National Numeracy Challenge users commented that the Challenge felt non-threatening, was fun rather than pressured, and was easy to dip in and out of. They liked receiving emails from National Numeracy to remind them to visit the Challenge again.

> *"I was impressed, it was a nice gentle start. I've re-taken the test a couple of times, I often go on when I have a spare 10 minutes, or when I get an email about it."*
> (Female, working full-time)

One user said that a key strength of the National Numeracy Challenge is that it feels like a friend rather than an enemy, and that doing the Challenge had made her feel better about maths in general:

> *"You could click on adjectives of how maths made you feel; overwhelmed, scared, or whatever. And it made me feel like, oh, this is a friend in the pocket … I think what it shifted a little bit was getting rid of the demons from the past. They'll always be there in some shape or form, but you can use your everyday maths and get better at it."*
> (Female, working part-time)

Case study 11 describes how one user accessed the National Numeracy Challenge.

Case study 11: using the National Numeracy Challenge "little and often"

A woman who had been a primary school teacher before taking a break from work to look after her young son had seen an advert for the National Numeracy Challenge and had clicked on the link to visit the site. She wanted to improve her maths confidence, particularly with a view to helping her son in the future.

> *"I suppose it was curiosity, just looking at what was available. Also, I've never been that confident with maths. Obviously, with teaching, I've had to teach maths, but especially working special needs, it was always quite a low level… I was interested in being able to help my son and increase my own confidence with it, and not panic so much about numbers or avoid doing things that involve them."*

The first time she visited the National Numeracy Challenge, she worked all the way through it. She found the problem-solving questions interesting, and the feedback on how well she done was useful. She took the opportunity to look again at the questions she had not got right and worked through those. Then, every few days, she got an email inviting her to visit the Challenge again.

> *"And depending on whether I had time or not, I'd have a look at the examples that they gave… Just on my laptop, I quite often check my emails first thing in the morning before we were doing the school run. My little boy used to watch television for a while before he'd have his breakfast. So I checked my emails then, and if one came up, I might look at one of the actions if I had spare five minutes."*

She found the National Numeracy Challenge to be an easy way to engage "little and often" to keep her maths skills up to scratch. She feels more confident with maths now, having engaged with the National Numeracy Challenge regularly over time. To keep her skills up, she would like to be sent or directed to a weekly maths problem that she could work through.
(Female, currently caring for her family)

6.4 National Numeracy Challenge alongside other learning

The National Numeracy Challenge is designed to support and complement other learning as appropriate. The survey asked respondents whether, while using the National Numeracy Challenge or since then, they had done anything else (e.g. other courses or classes) that had helped them get into or on at work. Just over one in ten respondents (12%) had.

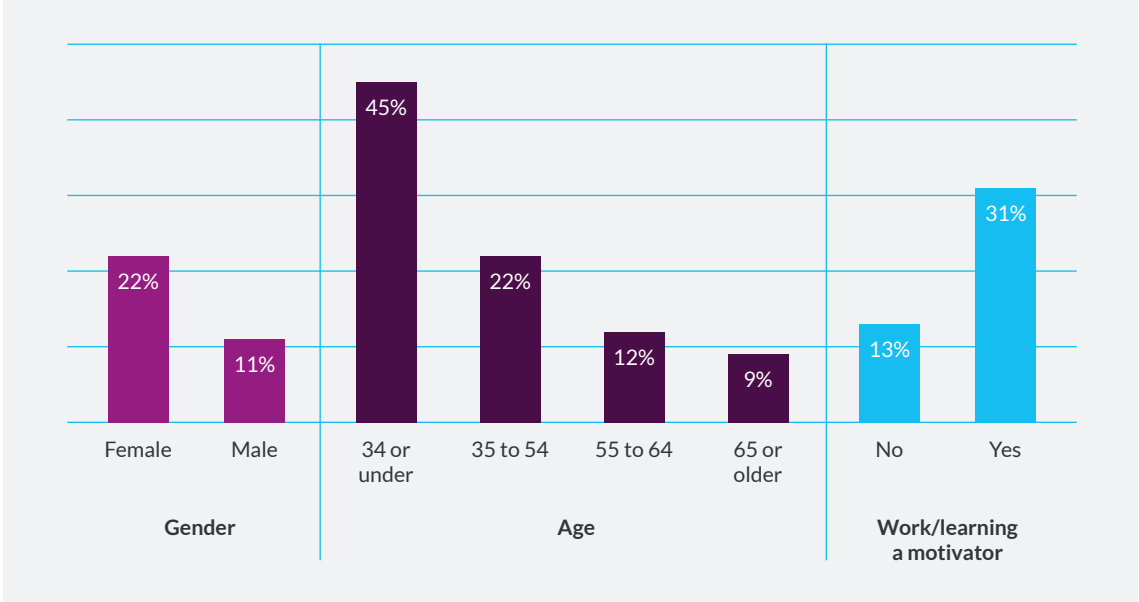
A statistically higher proportion of individuals had engaged in other learning amongst those who:

- have made the most dashboard visits (16% of those making 15 or more visits compared to 10% of those making fewer visits)
- were not retired (17% compared to 4% of retired)
- had experienced the most negative career impacts from their lack of Level 2 maths (22% of those with impacts on all five areas compared to just 6% of those with no career impacts)
- women (14% compared to 8% of men)
- younger individuals (46% of under 35s compared to 22% of those aged 35 to 54, 10% of those aged 55 to 64 and 4% of 65 or older).

When retired individuals were removed from the analysis, there were significant differences related to several individual characteristics. Amongst working age respondents, younger people, women, those not in work, and those who indicated work and learning factors motivated them to sign up to the National Numeracy Challenge were all more likely to have undertaken other learning alongside the Challenge. Figure 18 presents the key results.

Even when students are removed from the analysis, younger respondents are still more likely to be undertaking learning, although the difference between those in and out of work disappears.

Figure 18: % undertaking other learning alongside the National Numeracy Challenge (non-retired individuals only)



Source: National Numeracy Challenge research panel survey September 2022. Base: non-retired individuals (288 female and 183 male; 47 under 35 yr olds, 174 35 to 54 yr olds, 197 55 to 64 yr olds and 54 over 64 yr olds; 155 motivated by work and learning on sign-up and 354 motivated by non-work factors)

National Numeracy Challenge users who had undertaken other learning were asked, in an open question, to specify what learning they had done and whether the National Numeracy Challenge was helpful for the other learning. Individuals described a range of different types of learning that they had undertaken alongside their use of the National Numeracy Challenge. These included:

- access to HE or HE courses (e.g. teacher training, Open university)
- formal learning at a variety of levels from functional skills to Level 5
- work related courses to which the National Numeracy Challenge was complimentary (e.g. accountancy, teaching, CPD courses including in Excel and IT, and online webinars)
- an apprenticeship
- informal learning some with a maths focus (e.g. self-study, brain training, games, and quizzes).

Amongst the 110 respondents providing a description of additional learning, 20 referred to the usefulness of the National Numeracy Challenge in their answers and 18 of these felt that the National Numeracy Challenge had made a positive difference to them.

The National Numeracy Challenge was discussed in terms of supporting work that individuals were doing on other courses. For example:

> *"I'm taking an Access to HE course as I'm looking to go to university. The Challenge helped in brushing up my maths skills."*
> (Female, retired)

> *"I did a PGCE in ESOL and Literacy. The Numeracy was helpful in determining my maths level."*
> (Female, working)

> *"I enrolled on a degree course with the Open University. The course has helped me to refresh my knowledge."*
> (Female, seeking work)

> *"I have undertaken some IT courses and found the Numeracy Challenge helpful when dealing with spreadsheets especially working with formulae."*
> (Female, working)

> *"I took a Level 1 maths class and passed. Yes, using challenge alongside was very useful as I enjoyed the extra practise, and it helped me to focus."*
> (Female, retired)

> *"I'm currently doing a level 2 maths college course which is going really well. The National Numeracy Challenge helped me a lot when I was using it more often because I realised, I'm better with numbers than I thought, and the National Numeracy Challenge helped me in the areas where I was rusty."*
> (Male, working)

> *"The Challenge really helps with my classes."*
> (Female, working)

Individuals also described how using the National Numeracy Challenge had enhanced their confidence. For some this meant that they now felt ready to move into more formal learning. For example:

> *"It gave me some more confidence with maths."*
> (Female, working)

> *"It helped me a lot as it even boosted my self-esteem and the love for mathematics."*
> (Gender unknown, student)

"The Challenge improved my confidence to join courses I perhaps wouldn't have attended in the past."
(Female, working)

"It made me consider taking a qualification in maths."
(Female, working)

"Helped me to feel like I'm not thick and encouraged me to look into some maths courses."
(Female, working)

"It definitely improved my confidence calculating different questions that I might not have tried before."
(Female, working)

"People definitely have a blocker when it comes to math, they get scared and think they can't do it even though they use it a lot in everyday use. I think this is an excellent way to boost confidence and I like that the examples are based on real things."
(Female, working)

"Since using the national numeracy challenge it has helped me a little bit better as I lost my confidence at school when I didn't understand a question my teacher threw a board rubber at me and it put me off learning."
(Female, working)

"Using National Numeracy has helped me to not question myself to much when doing maths."
(Female, working)

"I think because National Numeracy Challenge actually exists tells me I'm not the only person who struggles, I'm not 'stupid' I just missed out on maths as a child, and I can get support as an adult to overcome this missing learning. The resources are excellent and adult focused helps as other resources can be very childlike, which feels odd as an adult, that's really important."
(Female, not working or retired)

"Using the National Challenge has helped me to get a position volunteering for a local children's charity."
(Female, not working or retired)

The National Numeracy Challenge also helped individuals more generally with their day-to-day use of numbers. For example:

"It's useful to keep up the level of maths as for most of the times we don't do these types of calculations."
(Male, seeking work)

"Scan my Bank and Investment accounts and make judgements."
(Male, retired)

"Helped to boost day to day tasks adding productivity."
(Gender unknown, student)

"The Challenge is really good for assessing a task and mentally working out the answer."
(Male, retired)

"Help to keep my mind active."
(Male, retired)

Several users we interviewed had used the National Numeracy Challenge alongside a maths course that they were taking. The National Numeracy Challenge provided an invaluable chance to practice maths skills in a general sense as well as helping them to focus on any areas of maths

in which they less confident. Several National Numeracy Challenge users stated that it had been a key part of their preparation for either enrolling on or starting a course, and/or for taking a Level 2 maths exam. National Numeracy Challenge users teaching or tutoring people about maths had used the Challenge alongside dedicated teaching resources such as White Rose or Twinkle. One secondary school teacher has a maths degree but was required to complete the National Numeracy Challenge with a score of 100% to secure a place on her teacher training course. She continues to use the Challenge to support her work.

Case study 12 highlights how the National Numeracy Challenge can support other forms of learning.

Case study 12: using the Challenge to support studying for Level 2 maths

A woman who needed a maths qualification to access a nursing degree said that she first took the National Numeracy Challenge to see which areas and topics she needed to work on. She was going to her adult maths class at this time, and her tutor highly recommended the National Numeracy Challenge website. The tutor had told her that the Challenge resources were "excellent", particularly because quite a lot of alternative maths support materials available are designed for those of school age. The National Numeracy Challenge is more appropriate for adult learners.

She found that going onto the Challenge website little and often, kept her skills and confidence up, and it worked well in conjunction with her adult maths class, because it highlighted the areas that she most needed to practice on.

> *"If you did the test, and you had feedback on the answers that you maybe didn't get, right. I thought that was great. Because it told you exactly, like things you were not really 100% sure about. And I just use that for my adult class. So then I would go and tell my tutor, I didn't do well on, say, fractions on my recent test, can we go over that again. And then that would get us a good gauge as to what I need to work on."*

She has also really enjoyed reading the case studies of how other people have progressed through doing the Challenge.
(Female, full-time student)

6.5 Feedback on the Challenge

This section outlines some of the overall feedback on the National Numeracy Challenge from the beneficiaries who were interviewed.

Many of the those interviewed said how much they liked the functional, applied nature of the Challenge questions. The fact that people could see how these topics were relevant to their day to day lives also made the questions feel less intimidating, as it was different to the kind of maths they remembered from school.

> *"I love the way they do it. I love the examples that they use ... There's one question that I can never get right. And I'm going to keep going until I get it right. And it's about there's a school trip; you have to have one adult to every four children. The bus takes 56 people, how many children can go? ... They're very real world, you can relate to a lot of the stuff that you read in on there, which I think makes it a bit less scary."*
> (Female, not currently working due to ill health)

One National Numeracy Challenge user, who is also a maths tutor, commented that there is nothing else available that is so appropriate or such a good resource for the adult learners who need to get Level 2 maths. He thought the design and the layout of the National Numeracy Challenge website is very conducive and well thought out, but he particularly liked the applied nature of the questions. Several beneficiaries said that they appreciated the variety of topics and the fact that they had different questions each time they visited the site.

> *"It's practical solutions to practical problems…. This is for people who've got real-life experience ... There's practical applications of maths which need a little more thinking in real-life terms. And that's what the Numeracy Challenge has got, questions that apply to adults."*
> (Male, maths tutor)

Another benefit of using the National Numeracy Challenge was the opportunity to work back through questions they had answered incorrectly. This was felt to be very helpful and most users found the numerical explanations useful in highlighting where they had gone wrong, and how they could tackle a similar problem in the future.

> *"The way that the questions are worded, and if you get them wrong, it asks you to try it again. And then you go and look at the explanation of how they've got the answer. It's so much better than the way I learned it…. If you don't get it right, you can look at how they did it. But even if you do get it right, you can still go on and have a look at how you were supposed to come to the answer, because I might have done it a different way. And they come up with an easier option."*
> (Female, not currently working due to ill health)

Others liked receiving reminder emails that directed them to topics where their skills were less strong so that they could easily go back in to practise and improve.

> *"Picking up on the areas that I wasn't so confident with, and I can go back and look at those. So each time when I've gone back to it, it's always directed me to the bits I wasn't so confident with."*
> (Female, looks after family)

Users also provided some suggestions for ways to enhance the Challenge, these included:

More opportunities for bite-sized learning such as a short problem-solving exercise which users could be directed to on a regular basis (e.g. daily or weekly) with the same time commitment as might be the case for a Wordle or Sudoku puzzle.

> *"I was thinking about how people might do a Sudoku, or something like that. Well, if there's like a daily math problem, then I could do that kind of thing instead."*
> (Female, looks after family)

> *"I'm starting, for my own cognitive side of things, to do a Wordle daily. If there was something like that, in the Numeracy Challenge that was quick, easy, two minutes. From a time perspective, like a short, sharp, sharp bite-size, even if it's once a week … That feels far more doable than 20 minutes."*
> (Female, working part-time)

More publicity, including in schools, colleges, and other education providers for the National Numeracy Challenge. The Challenge was seen as a valuable resource with the potential to support a wider range of people, including those working towards GCSEs in schools and colleges.

> *"I think it's a really easy platform to use. And I think it's really accessible. But I wouldn't have known about it if it wasn't through work. So I don't know how well they are promoting it elsewhere."*
> (Female, working full-time)

> *"It needs to be promoted, it has to get out more…. I'm quite happy to tell people that I'm not really great at math, and I've been telling everybody about the website, and I'm like, why's nobody heard of this? So I think adverts on TV, or something, just so everybody knows. Because I think it's such a big thing for people, or what if people maybe don't even want to admit it [that they have trouble with maths]?"*
> (Female, full-time student)

Providing different levels of support and relating the Challenge more directly to qualifications. A few beneficiaries had hoped that the National Numeracy Challenge might provide a more direct routeway to doing Level 2 maths and were a little disappointed when it did not. It was also suggested that the Challenge could provide a way for beneficiaries to benchmark their current maths skill level. One National Numeracy Challenge user said that he would like to see National Numeracy provide several different Challenges which were related to qualification levels, so that people had an idea of the level they were at.

> *"Maybe related to qualifications? I don't think anybody's going to be asking, oh, I want a certificate. But I think we would like to say be able to say, Okay, I've passed got through this challenge at this level. What would the equivalent be? Would this be O level, A level, degree level? I think I think people would genuinely just like to see that."*
> (Man, working full-time)

> *"I think they could put some questions for entry level, pre-entry level, just in the background, to say, would you like an assessment? You could build people up and just have a series of questions … And gateways to encourage you to go and find a provider. But really, that's nit-picking, compared to what it does ... I don't think there's much more needs to be done."*
> (Male, working full-time)

Comments were also made in several interviews about how **some people may need additional support** to make progress with their maths skills. Three of the beneficiaries interviewed said that they had struggled to progress. They highlighted that people with dyscalculia or other learning disabilities could be frustrated by the National Numeracy Challenge. One National Numeracy Challenge user interviewed had been diagnosed with dyscalculia (see the case study below) whilst another suspected he might have dyscalculia. Both had struggled to progress with the Challenge. As the questions started to become harder, one user found he was unable to understand the question solutions and explanations. He therefore became frustrated and gave up.

Another user described her learning style as 'learning through doing'. She did not fully connect with the Challenge as she felt that the way information was set out was too much like learning from a book. She felt she needed something livelier and more interactive to keep her attention.

> *"I'm a hands-on learner, I get distracted, I'm easily bored. If I've got a video, I'll sit and watch it and I'll get engrossed in it. So don't give me a bit of paper. Everybody's different ... I think it was it was the layout as well. I found it very bland. I'm quite a fun, jovial person, I like I like fun things. Especially with maths, you've got to keep me entertained ... It reminded me of school, and I thought you know what, I've had enough now."*
> (Female, working full-time)

One user had made some progress with the Challenge and was in the process of signing up to do a Level 2 maths course, but still thought that there could have been access to more intensive support via the National Numeracy Challenge. This would have helped her when she struggled with her course. She found all the Challenge topics helpful, but when she reached a certain point, she became frustrated because she couldn't understand the answers to questions she got wrong. She felt she needed explanations from a real person.

> *"I just get really frustrated because I can't work it out. And I've got no one to ask .... It would be lovely if you could ring someone up and say, look, I've got this far, but I'm stuck. Or even send an email, or how you have those little chat windows, like when you're shopping online."*
> (Female, working part-time)

Case study 13 outlines the difficulties that some people face with maths learning, even when using the National Numeracy Challenge.

Case study 13: can National Numeracy Challenge do more to support those with dyscalculia?

A man who has been diagnosed with dyscalculia saw an advert for the National Numeracy Challenge. Now that he is retired and the pressure to achieve is no longer there, found that he was curious to check whether he was still as bad at maths as he thought he was.

> *"Curiosity and sort of checking off later in life thinking, right, am I as bad as I once was? Is it not as scary anymore? Could it be enjoyable?"*

He went on the Challenge about three times, made some good progress, but then got to a point where he got stuck, and couldn't understand it anymore. This reminded him of his maths experiences at school, and so he stopped.

> *"On the first session, I was really pleased with the progress. And I thought, oh, right, I can do this… Everything I did in the first session was really good. I think it might have said something like, that's enough for today, come back for another session ... So then I went on it again, perhaps once or twice. And then as I got a bit further on, it did get more complicated. And even though things were being explained, I didn't understand it."*

> *"I reckon I did three sessions, and then probably on the third one, it became too frustrating, and it took me back to that place like at school, where it was fear based. Usually, when that happens, when I get frustrated with numbers, I'll change the subject. I won't get annoyed with myself like I did years ago. I'll just I'll just think, you can't be good at everything. I'm really good at painting, decorating, words, but I'm crap with numbers. So I think that's how I left it."*

He continued to get some emails from National Numeracy, and they were friendly in tone. He always meant to go back onto the National Numeracy Challenge website but he lost his confidence and never did. Nonetheless, his overall impression of the Challenge was positive, and rather than having made him feel worse about his difficulties with maths, it made him feel more at peace with it.

> *"I think that everything they've done is absolutely brilliant. The main thing is it takes the fear away. And it reinforced I knew more than I thought it did. It's gentle, and it's like a nurturing experience."*

However, he thought it would be helpful if dyscalculia was mentioned somewhere on the website, because this might be helpful for some people.

> *"It would have been nice if they'd have mentioned dyscalculia. Perhaps said something like, if you are getting stuck, have you considered that you might have dyscalculia, and then explained it."*

(Man, retired)

7 Conclusions

The National Numeracy Challenge is a useful tool which supports individuals to enhance their number confidence and improve their number skills. Using the National Numeracy Challenge more frequently is also associated with greater confidence and number skill gains.

The National Numeracy Challenge is particularly useful for those seeking better work and learning outcomes through improving their number confidence and skills. Being motivated by work and learning is a key predictor of whether someone feels more confident and more skilled in using numbers in their day to day lives after having used the Challenge. Working respondents also see their number skills improve more over time than those not working. This may be because those motivated by work are more likely to stick with the National Numeracy Challenge, even when they find it difficult. These individuals can likely see a worthy end goal because of their efforts to improve their use of numbers.

The National Numeracy Challenge also works well in supporting women to overcome some of the difficulties they have experienced from a lack of number confidence. Women are more likely to have had negative school experiences of maths and feel more career affects from lacking Level 2 maths. They are also more likely to feel their number confidence and skills have improved since taking the Challenge. Women described the 'non-threatening' nature of the National Numeracy Challenge, and how their increased confidence with numbers had impacted other areas of their lives.

There are links between individuals feeling more confident and more skilled with numbers having used the National Numeracy Challenge and feeling more equipped and likely to start a Level 2 maths course, seek a job and get on at work. Individuals with improved confidence and skills are also more likely to have taken steps towards a Level 2 maths course and enhancing their work situation.

This research therefore indicates both that using the National Numeracy Challenge has a positive impact on number skills and confidence and that this, in turn, has positive impacts for people's work and learning.

Appendix

Research methods

Initial scoping interviews

Following the project inception meeting, the research team completed four stakeholder interviews with key staff at NN to ensure that they understood the drivers of the research and its aims and that the project was undertaken with a mutual understanding of the required research outputs and audiences. Following these interviews a discussion guide was developed to allow researchers to explore the key research questions with a range of beneficiaries.

A sample of 50 individuals from the National Numeracy Challenge research panel were contacted by email and asked if they would be prepared to participate in an initial research interview to discuss their number confidence.[40] Beneficiaries were targeted if they had used the National Numeracy Challenge either as a first step to a qualification, or to help them get on at work, and if they reported feeling more confident after taking the Challenge. Eight volunteers were interviewed in August 2022. A semi-structured discussion guide was used to ensure all pertinent topics were covered. With beneficiaries' permission, the interviews were audio recorded, recordings were auto transcribed and analysed. The experiences of this group provided useful insights into people's reasons for taking the National Numeracy Challenge and some of the resulting outcomes from doing so.

Survey

Following the initial scoping interviews, the research team, in conjunction with NN staff, designed an online survey which NN then administered by emailing a link to all members of the NN user panel[41].

Survey response

23,966 people were sent an email, resulting in 23,578 successful deliveries, a total of 1,021 responses were received resulting in a response rate of just over 4%.

Sample profile

The sample contains more women than men, is skewed towards older respondents (aged 65 or older), contains a mix of working people, those not currently working and retired individuals, and has respondents from across the UK. Details of the characteristics of participants are provided in Table A1: Sample characteristics.

Compared to the profile of all National Numeracy Challenge users, the survey sample has a higher proportion of men (43% of those for whom gender is known in the survey sample are male compared to 31% of all National Numeracy Challenge users) and a higher mean age (61 years compared to 39 years amongst all National Numeracy Challenge users).

40 Participating beneficiaries each received a £20 shopping voucher.

41 These were individuals who used the National Numeracy Challenge and agreed to be re-contacted for research purposes at some point since 2020.

Table A1: Sample characteristics

Characteristic	Categories	%
Gender	Male	38.1
	Female	50.8
	Unspecified/prefer not to say	11.1
Age	16-24	1.4
	25-34	3.3
	35-44	6.1
	45-54	11.7
	55-64	28.0
	65+	38.3
	Unknown	11.3
Whether have any Level 2 qualifications	Yes	86.8
	No or don't know	13.2
Employment status	Employed full time (30 hours a week or more)	23.5
	Employed part-time (less than 30 hours a week)	12.7
	Not employed – retired	47.1
	Not employed – unable to work/caring responsibilities	4.2
	Not employed – seeking work	2.3
	Self-employed	7.0
	Student	2.5
	Prefer not to say	0.7
Region	East of England	9.7
	East Midlands	6.9
	Greater London	8.1
	North East	4.5
	Northern Ireland	0.9
	North West	8.3
	Scotland	8.2
	South East	13.6
	South West	9.7
	Wales	3.7
	West Midlands	6.5
	Yorkshire and Humber	6.6
	Unknown	13.3
	Base: all respondents (N)	**1,021.0**

Source: National Numeracy Challenge research panel survey September 2022 and National Numeracy Challenge held user data.

Interviews with National Numeracy Challenge users

Altogether, 24 interviews with National Numeracy Challenge users were carried out by telephone: eight before the survey and sixteen afterwards.

Each interview lasted between 25 and 45 minutes and was guided by a semi structured discussion guide. The guide was amended slightly after the first eight interviews which were carried out before the survey, and which informed its design. The remaining 16 interviews were carried out with survey respondents who volunteered to speak to a researcher and explored survey topics in more detail. However, the themes covered in all the interviews were similar. Each National Numeracy Challenge user interviewed was sent a £20 gift voucher as a token of appreciation for their time.

With permission from the beneficiaries, all interviews were audio-recorded, and these recordings were used to write up the interviews into a thematic analysis grid in Excel. The findings from this were used in this report.

Regression analysis

Analysis A: self-assessed changes to number confidence

A binary logistic regression was used to examine whether gender, age, work status, motivations for using National Numeracy Challenge, experiences of maths whilst at school, and number of dashboard visits to the National Numeracy Challenge were associated with the likelihood of someone indicating that their confidence using numbers had improved.

A preliminary analysis suggested that the assumption of multicollinearity was met (tolerance >= 0.75). An inspection revealed 15 outliers (Std. residual >=-2.4), these were kept in the dataset. The model was statistically significant, $\chi^2(8, N = 895) = 146.56$, p=<0.001 suggesting it could distinguish between those who did and who did not improve feel more number confident.

The model explained between 15.1% (Cox & Snell R square) and 21.4% (Nagelkerke R square) of the variance in the dependent variable and correctly classified 74.7% of cases. As shown in Table A3, number of dashboard visits, ratings of school maths experience, whether work and learning motivated National Numeracy Challenge sign-up, and gender all significantly contributed to the model.

The odds ratios were as follows:

- compared to those for whom work/learning factors did not motivate National Numeracy Challenge sign-up, those motivated by work/learning were 2.75 times more likely to feel more number confident
- compared to males, female National Numeracy Challenge users were 1.73 times more likely to feel more number confident
- for every point decrease in the rating of school maths experience National Numeracy Challenge users were 1.4 times more likely to feel more maths confident
- for every additional dashboard visit National Numeracy Challenge users were 1.04 times more likely to feel more maths confident.

Table A2: Logistic Regression predicting the likelihood of National Numeracy Challenge users indicating they felt more number confident

	B	*SE*	Wald	*Df*	*p*	*Exp(B)*	95% CI *OR*	
							Lower limit	Upper limit
Age (years)	-0.007	0.009	0.697	1	0.404	0.993	0.976	1.010
No. of dashboard visits	***0.037***	***0.006***	***37.299***	***1***	***0.000***	***1.038***	***1.026***	***1.050***
Work status: not working or retired			1.346	2	0.510			
Work status: working	-0.098	0.294	0.111	1	0.739	0.906	0.509	1.614
Work status: retired	0.153	0.341	0.203	1	0.652	1.166	0.598	2.273
Does not have a Level 2 maths	-0.108	0.191	0.320	1	0.572	0.897	0.617	1.306
Rating of school maths experiences (reverse scale)	***-0.291***	***0.067***	***18.595***	***1***	***0.000***	***1.338***	***1.172***	***1.527***
Work/learning factors motivated National Numeracy Challenge sign up	***-1.012***	***0.223***	***20.561***	***1***	***0.000***	***2.752***	***1.777***	***4.264***
Gender (female compared to male)	***0.551***	***0.169***	***10.634***	***1***	***0.001***	***1.734***	***1.246***	***2.415***
Constant	0.642	0.630	1.039	1	0.308	1.900		

Analysis B: Changes to check-up scores

A binary logistic regression was used to examine whether gender, age, work status, motivations for using National Numeracy Challenge, self-assessed change to number confidence, experiences of maths whilst at school, and number of dashboard visits to the National Numeracy Challenge were associated with the likelihood of someone improving their National Numeracy Challenge check-up score. This analysis was limited to individuals who had completed more than one check-up. The model failed to achieve statistical significance.

Analysis C: Changes to quick check scores

A binary logistic regression was used to examine whether gender, age, work status, motivations for using National Numeracy Challenge, self-assessed change to number confidence, experiences of maths whilst at school, and number of dashboard visits to the National Numeracy Challenge were associated with the likelihood of someone improving their National Numeracy Challenge quick check score. This analysis was limited to individuals who had completed more than one quick check.

A preliminary analysis suggested that the assumption of multicollinearity was met (tolerance >= 0.75). An inspection revealed 8 outliers (Std. residual >=-2.65), these were kept in the dataset. The model was statistically significant, 2(9, N = 420) = 48.78, p=<0.001 suggesting it could distinguish between those who did and who did not improve their quick check score.

The model explained between 11.0% (Cox & Snell R square) and 15.5% (Nagelkerke R square) of the variance in the dependent variable and correctly classified 71.2% of cases. As shown in Table A2, age, number of dashboard visits and work status significantly contributed to the model.

The odds ratios were as follows:

- National Numeracy Challenge users who were working were 3.25 times more likely, and retired National Numeracy Challenge users 3.22 times more likely than those who not working or retired to have improved their quick check score
- for every additional dashboard visit National Numeracy Challenge users were 1.04 times more likely to have improved their quick check score
- for every year increase in age National Numeracy Challenge users were 0.96 times less likely to have improved their quick check score.

Table A3: Logistic Regression predicting the likelihood of National Numeracy Challenge users improving their quick check scores

	B	*SE*	Wald	*Df*	*p*	*Exp(B)*	95% CI *OR*	
							Lower limit	Upper limit
Age (years)	***-0.036***	***0.015***	***6.119***	***1***	***0.013***	***0.964***	***0.937***	***0.992***
No. of dashboard visits	***0.043***	***0.011***	***16.950***	***1***	***0.000***	***1.044***	***1.023***	***1.066***
Work status: not working or retired			7.821	2	0.020			
Work status: working	***1.180***	***0.429***	***7.567***	***1***	***0.006***	***3.254***	***1.404***	***7.543***
Work status: retired	***1.168***	***0.477***	***5.994***	***1***	***0.140***	***3.216***	***1.562***	***8.192***
Does not have a Level 2 maths	-0.477	0.255	3.482	1	0.062	0.621	0.376	1.024
Rating of school maths experiences	0.291	0.098	0.295	1	0.587	0.948	0.782	1.150
Work a priority on National Numeracy Challenge sign up	0.026	0.355	0.005	1	0.943	1.026	0.512	2.056
Gender (female compared to male)	0.005	0.233	0.000	1	0.983	1.005	0.637	1.587
Change in confidence using numbers (self-assessed)	0.044	0.181	0.058	1	0.810	1.045	0.732	1.490
Constant	2.612	1.139	5.254	1	0.022	13.620		

National Numeracy is a charity dedicated to helping people feel confident with numbers and using everyday maths. Our mission is to empower children and adults in the UK to get on with numbers so they can fulfil their potential at work, home and school. Our work improves how people understand and work with numbers in everyday life, sparking better opportunities and brighter futures.

National Numeracy is a registered company (company no: 7886294) and charity (charity no: 1145669).

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National Numeracy
Getting on with numbers