# THEY DON'T USE THEIR BRAINS, WHAT A PITY: SCHOOL MATHEMATICS THROUGH THE EYES OF THE OLDER GENERATION

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*The paper considers issues in the teaching of mathematics from the viewpoint of a group of people aged 75 and over. Drawing on written accounts of their use of and attitude to mathematics, extracts are identified in which they reflect on their own experiences of learning mathematics at school or give their views on more recent mathematics education. Common themes are mental arithmetic and the use of calculators. Most respondents report positive assessments of their own mathematics education and reservations about more recent systems. Some accounts display inaccurate views of current practices in mathematics teaching and possible reasons for this are considered.*

## INTRODUCTION AND RATIONALE

This paper examines the views of a group of older adults on the teaching and learning of mathematics. It is based on extracts drawn from written accounts about their use of and attitudes to mathematics. These accounts, part of an archive collection, were originally examined with a general interest in what they might add to our understanding of adults' attitudes to and use of mathematics. Data was available for a large number of adults, but after initial exploration of the data, a decision was taken to focus on accounts written by people aged 75 and over. This group was selected partly because many of them raised issues about education but also because their age made it possible to make some statements about the education they received and hence findings can be considered in relation to the education system in operation at the time of their schooling.

Studies of adults and their reflections on learning mathematics often focus on students entering initial teacher education (eg Crook and Briggs, 1991) or on adults returning to learning mathematics (eg. Evans, 2000). There are also many studies of the mathematics encountered by adults as part of their work (eg Nunes, Schliemann and Carraher, 1993). Retired elderly people, on the other hand, are a relatively under-researched group as far as mathematics is concerned. Demographic studies indicate that this is a growing group, both in the UK and elsewhere (Schuller, 2005). Their social position is supported by a general attitudinal shift towards positive views on ageing and they exert increasing influence both politically as voters (Metz, 2002) and in civil society (Flynn and Croucher, 2006). They may thus be seen as an increasingly influential group in society, though few of them have direct contact with mathematics education. This lack of direct contact makes this group particularly interesting, as it raises questions about whether they have views about mathematics

teaching and learning and if so from where these views originate. It will be demonstrated that many have strong views that appear to be built partly on inaccurate perceptions, sometimes fuelled by the press and by misunderstandings about use of technology.

## BACKGROUND

The age of those in our sample allows statements about their school education, outlined briefly in the next section below. Because the accounts also talk about their own mathematical competence, we subsequently outline the state of knowledge on the older adults' mathematical performance. Finally, the nature of the data is discussed.

### Education in England in the early twentieth century

The people we are concerned with here were aged between 75 and 91 when writing these accounts in 2004. This means that the youngest in our sample had their education interrupted by the Second World War, though many of them had already left school by then. By the time the 1944 Education Act (known as the Butler Act) was introduced, the youngest in our sample were 15 and hence too old to benefit from the reforms it brought. The Butler Act is regarded as laying down the foundations for the modern education system (Mackinnon, Stratham and Hales, 1996). In particular it established a system of primary, secondary and further education with transfer between primary and secondary school at eleven plus. The Butler act is also credited with extending educational opportunity by securing a satisfactory secondary education for all children (Evans, 1985).

In the era preceding the Butler Act, most children in England began their education in elementary schools. Pupils were legally required to attend school from ages 5-14, but many schools admitted pupils at the age of three. This system is described by Smith (1949) who states that only a small minority of children went beyond elementary schools. The organisation of these schools varied with some having departments for infants, juniors and seniors.

The mathematics curriculum in elementary schools is discussed by Brown (2001) as part of a discussion of the developments of arithmetic teaching in England. She points out that arithmetic became part of the curriculum in all elementary schools as a result of the revised code of 1862. This mainly stated the types of calculation students should be required to carry out. These increased in complexity from oral addition to long division and calculations involving ratio and proportion. Pupils also needed to carry out calculations related to money and to the existing system of imperial measures. Teaching tended to emphasise drill, practice and repetition, with neat presentation also considered important. There was little fundamental change in the elementary school number curriculum for many years, and thus the adults in our sample are likely to have received an elementary education along these lines.

Those receiving some secondary education are likely to have studied aspects of mathematics other than arithmetic. It is not possible to be precise about this, given the variation in ages of people in the sample and the different types of school they may have attended. Some possibilities are suggested by Howson (1982) who describes the curricula of central schools as having a commercial or industrial basis and hence including geometry, algebra, scale drawing and other aspects of mathematics alongside arithmetic. He also discusses possible content for grammar school curricula including geometry, algebra and trigonometry. It is therefore likely that some of the writers in our sample studied these aspects of mathematics at school.

**Older adults calculating**

Many of the adults in our sample compare their mathematical performance with that of younger adults, so research highlighting age differences in mathematical attainment of adults is relevant. The limited information available suggests that older adults are generally less successful at mathematics than younger people. In the 1980s, a large-scale survey of the number skills of UK adults was carried out as part of the preparation for the Cockcroft report (Cockcroft, 1982). This study, undertaken by Gallup, was conducted with a sample of 2890 adults drawn from across Britain. Findings are broken down using a range of criteria including age, with participants divided into five age brackets (ACACE, 1981, ACACE, 1982). The survey report indicates that respondents aged 65 and over scored consistently less well than any other age group. The study included some very straight-forward questions related to money. For example, one question asked for the total cost of a cup of coffee at 17p and a sandwich at 24p. The highest correct response rate (93%) was given by the lowest age group, those between 16 and 24 years old. The percentage of correct responses declined through the age ranges to 81% correct for those aged 65 and over. Whether we look at the over-65 group or at the group preceding it (45-65 years old), the age of many of our sample at the time of the study, they were still out-performed by the youngest adults.

A study carried out in 1984, with the aim of comparing the basic skills of different age groups, gives a similar if slightly more complex picture. This survey, conducted by Gallup for the Basic Skills Agency, was of 3001 people aged between 22 and 74 in 1994 (BSA, 1995). In this case, the 22-24 year olds were sometimes out-performed by those in their thirties and forties on higher level tasks. However, those in their thirties and forties still performed on average better than those in the fifties and sixties. The oldest group in the survey, the 72-74 year-olds, performed poorly compared to all other age groups. For example, in a question which involved calculating change from £20, 26% of 72-74 year-olds answered incorrectly, compared with 12% of 22-24 year olds. Despite this, the self-reporting strand of this survey found that the oldest adults reported less difficulties with number work than younger adults.

## The Mass-Observation Archive

The data used for this study come from the Mass-Observation archive at the University of Sussex. The archive specialises in gathering material about everyday life in Britain. The original Mass-Observation project started in 1937 and collected data in a range of ways, including diaries kept by volunteers about their everyday life. One such diarist, Nella Last, has recently become famous as the published version of her diaries has been adapted to form the basis of an award-winning television programme, *Housewife 49*. In the preface to Nella's diaries, the editors pay tribute to "…her diligence in recording her life, her feelings, her ideas and the texture of her times." (Broad and Fleming, 2006). The writers used for our current study record a similar combination of everyday events, thoughts and feelings and many also show an aptitude for writing, as Nella clearly does. The original mass-observation project resulted in many other publications, one of which was a scholarly work concerning life during the Blitz (Harrisson, 1976). Some of the issues arising from this work are relevant here. Harrisson's work was based on data about the Blitz collected by the archive at the time, but organised in a book published some thirty years later. For much of this time Harrisson was out of Britain, and he seized on this as significant because it meant that he was largely unaffected by changing views and accounts in Britain of what had 'really happened' in the War, recreated in the intervening years. This recreation of events by participants and observers is relevant to our study. Harrisson's study, unlike the current one, was able to call on additional data to corroborate written accounts. In doing this he demonstrated that, while some events believed by diarists to be occurring were indeed backed up by data, others were much more mythical and although said to be happening 'to other people' independent observers rarely recorded them. As a final part of Harrisson's work, war diarists were contacted and asked to rewrite their experiences from memory so these could be compared with original accounts. Although in some cases the accounts agreed, often the story retold around thirty years later was very different. There were also diarists who were very surprised when shown their original accounts, who could not remember writing them or sometimes even being on the scene. These limitations of memory clearly need to be borne in mind when reading some of the data in the current study, which refers to events often more than sixty years before the accounts were written.

## DATA AND METHOD

The data used for this project comes from the Mass-Observation contemporary collection which contains data from 1981 to the present day. This data takes the form of responses to 'directives' which are sent out several times a year to those taking part in the project, who are described either as correspondents or writers. Most directives are composed of several questions or subjects which the writers are invited to respond to. This paper is based mainly on responses to a question about number asked as the first part of the Spring 2004 directive. The question was designed to explore people's use of and feelings about number. Respondents were asked to

record their use of number across a day and also to say something about how they feel about in numbers in particular contexts and about the use of numbers in everyday life and their awareness of their use of mathematics (Mass-Observation Archive, 2004). In the sections that follow, the discussion will be based on analysis of the responses given by writers who gave their age as 75 or over. There were 40 such writers, 18 men and 22 women. In addition, some data is drawn from responses by the same writers to a question asked in Spring 1991, which asked respondents to give details of their own education in the form of a list as well as to comment on their own education, their opinions on the value of education and their views of education in Britain at the time of writing (Mass-Observation Archive, 1991). Answers to this question have been described as a superb resource for studying educational life histories (Thomson, 1993). The use of responses to the 1991 question here is mainly to provide background about the educational experiences of those over 75 responding to the 2004 directive and, to a more limited extent, to try to shed light on some of the comments made in 2004. For this reason, the forty writers in the sample were traced back using the code numbers assigned to all respondents. Responses to the 1991 question were found from 34 of the 40 writers in our sample.

The use of Mass-Observation data raises theoretical and methodological issues which are discussed by Bloome, Sheridan and Street (1993) who suggest that the data can be interpreted in a range of ways. The approach taken in this paper is broadly in line with that categorised as 'Reading and Writing as Knowledge Construction' and described as follows:

> One important implication derived from viewing reading as knowledge construction is that the responses of the M-O correspondents might be considered reports of their perceptions, memories and interpretations of events rather than just unmediated descriptions of events.
>
> (Bloome, Sheridan and Street 1993, page 8)

In considering the data attention has also bee paid to guidance on the reading, analysis and interpretation of narrative research as outlined by Lieblich, Tuval-Mashiach and Zilber (1998). Talking particularly about self-narrative or life story, the authors say that stories provide coherence and continuity to one's experience, though they acknowledge that not all researchers are enthusiastic about the use of narrative accounts. They go on to outline different approaches to narrative accounts outlining their own position which is quoted below and which is the position being adopted here.

> We do not advocate total relativism that treats all narratives as texts of fiction. On the other hand, we do not take narratives at face value, as complete and accurate representations of reality. We believe that stories are usually constructed around a core of facts or life events, yet allow a wide periphery for the freedom of individuality and creativity in selection. Addition to, emphasis on, and interpretation of these "remembered facts."

(Lieblich, Tuval-Mashiach and Zilber 1998, page 8)

This paper is concerned mainly with extracts from the 2004 and 1991 responses which deal with education or related issues. This follows the categorical-content approach or 'content analysis' outlined by the above authors in which all extracts dealing with a certain subject are withdrawn from the text for analysis. The focus will be on the stories respondents tell about their own experiences of school mathematics and their perceptions of the mathematics education received by younger people. One aim of this paper will be to learn something about their views of, attitudes to and beliefs about mathematics and the learning and teaching of mathematics. This relates to work on affect in mathematics education which, as Hannula et al (2004) point out, has been studied in a variety of ways using differing theoretical frameworks. Consideration of affect by McLeod (1992) considered three aspects: beliefs, attitude and emotions. Later writers, e.g. DeBellis and Goldin (1997) have considered an additional element, values. As Hannula et al (2004) point out, although most research on affect has used one or more of these concepts, the theoretical foundation beneath them is not quite clear. McLeod (1992) saw beliefs as more stable and less intense than attitudes and emotions. The current data could be seen as containing elements of beliefs and attitudes. Relevant to the data is discussion of beliefs by Op 't Eynde, DeCorte and Verschaffel (2002), who put forward a framework of students mathematics-related beliefs. Part of the framework concerns beliefs about mathematics education and this is further broken down in to:

a) beliefs about mathematics as a subject

b) beliefs about mathematical learning and problem solving

c) beliefs about mathematics teaching in general

(Op 't Eynde, DeCorte and Verschaffel (2002, page 28)

This framework is relevant to the current work as our data suggests that in discussing beliefs about mathematics as a subject, many of those in our sample also considered the related aspects of mathematics teaching and learning as part of their coherent and continuous narrative describing and explaining their mathematical experiences. The links between these different aspects of belief will become evident as the data is explored.

## FINDINGS

### Overview of findings

Examination of the 2004 responses concerning mathematics revealed that issues related to education were raised by many of the writers in the sample. 25 of the 40 explicitly mentioned mathematics education, either in relation to their own learning of mathematics at school or in discussing the school education of younger people. Common themes were mental arithmetics and the use of calculators. A further 12 writers raised related issues such as the importance of mental arithmetic or their

attitudes to calculators but did not relate them explicitly to education. Extracts relating to these issues are considered in more detail in the following sections.

**Remembering school mathematics**

Many of the writers talked about learning mathematics when they were at school, often relating it to their own competence later in life. The first example below is chosen because it shows how some writers constructed a narrative discussing their own use of numbers, their school experience and the mathematical competence of younger people, with all these aspects related. The writer, Jack, described himself an 83 year-old retired engineer living in the West Midlands. Like all the extracts used in this article, the one below is reproduced with spelling, grammar and punctuation preserved from the original. The names used are pseudonyms.

> I have always been familiar with numbers and use them regularly. I am having problems with my eyesight now, so have to use mental arithmetic to determine what I want to know. This does not bother me. Sometimes- quite often in fact- I can add up quicker than the shop assistants can operate the till, and I always tot up what I am paying to make sure I am charged correctly. Often I have to ask the price, but it does not affect the way I go about shopping. It is just that I can no longer read, as my sight is blurred. When I was at school, the first lesson everyday was mental arithmetic and it has stood me in good stead.
>
> (Jack, age 83)

Many other writers, like Jack, mentioned mental arithmetic and the learning of multiplication tables was also a common theme.

> To those of us taught mental arithmetic in our earlier years, the use of everyday numbers is natural as to go almost unnoticed… going back to the days when mechanical calculators were little more advanced than rows of coloured beads- and that's about the same time as the start of my elementary education- we had to have a good memory for numbers and the learning of the twelve-times table as a sound way of achieving this. The basic principles of such knowledge continue to serve me well, and while trying not to be too much of a bore about this, the use of a pocket calculator is not one of the necessities of me…
>
> (Ralph, age 82)
>
> When I moved from infant school to Junior school, the school day lasted a half hour longer. In that half term the extra time was spent practising our tables. Teacher drew a large clock face on the blackboard and wrote a number from 1 to 12 in the centre. She would then point to a time on the clock and we would call out the answer.
>
> (Wendy, age 80)

Similar comments occurred in other accounts and some, like Ralph, imply that the ability to calculate mentally is common to most of their generation and is linked to the schooling they received. Although many of the writers were positive about their ability to calculate mentally, not all were as relaxed as Ralph about use of mathematics. However, even those with negative views about mathematics appeared

to be able to make reasonably accurate use of basic arithmetic. For example, Gloria started her writing under the heading 'Using Numbers' by saying 'I don't. I loathe & avoid them.' Later, she talked about a job she once had in a bookshop:

> I was put onto extending complicated invoices, with 12½% and 17½% discounts. I quite enjoyed these & refused to use a calculator. A hawk eye in the office would find 2 or 3 mistakes in 100 of my invoices. This I thought good. I'd never achieved 97% in an arithmetic exam.
>
> (Gloria, age 78)

Another person claiming to be relatively poor at mathematics was Ken. However, he also claimed to have been helped by learning mental arithmetic at school and, like many others, linked this to being in the pre-calculator generation, a theme that will be picked up later.

> I have to say at the outset that using numbers is quite alien to my nature. Mathematics was my worst subject at school; but at least I was educated in the days before electronic calculators were invented and was schooled by a daily test of mental arithmetic…
>
> (Ken, age 81)

The majority of the quotes about school mathematics referred to arithmetic, perhaps reflecting the curriculum experienced by many of our writers. A related theme was calculation related to measurement, including the need to work with imperial measures. There were differing views on this with some expressing nostalgia for the old system and others regarding it as a waste of their time.

> I am astounded that the UK kept the imperial measurements for so long and often wondered why it was ever invented. The waste of time I spent as a child calculating tons, 20cwts, 4 qtrs, 2 stones, 14 lbs, 16 ozs, etc. It was not until we were decimalised that I wondered if industry did what we had to do at school. We were given several weights in all these units and had to total them up by entering each item under its respective column and dividing the base unit (ie. 16oz) and carrying the lbs over to the lb column. It took ages to do. Linear was the same, with their inches, feet, yards, rods, chains, furlongs and miles.
>
> (Henry, age 78)

Some did mention other aspects of mathematics, sometimes to record what they had studied but sometimes to indicate that they knew there were aspects of mathematics they had not been taught at school. Opinions varied about whether they had 'missed out' by being offered a narrow mathematics curriculum.

> I had a good grounding in mental arithmetic as a child- learning multiplication tables by rote… My great regret is that I never learned about mathematics. I enjoyed geometry but found algebra more difficult. I learnt to use logarithms, but we never tackled trigonometry properly at school as it was not on the syllabus for matriculation.
>
> (Brian, age 82)

> I know nothing about higher mathematics and I don't have any sense of inferiority over this. Along with most other people, the use of numbers in everyday life is as natural as language and I daresay we know enough to see us through.
>
> (Ralph, age 82)

Examination of the 1991 data concerning education confirmed that around half of the sample had left school at fourteen, though missing entries for some make this picture incomplete. Ralph, whose quote above suggests he was not unhappy with the curriculum focussing on number, says in the 1991 responses that he left school at fourteen after an elementary education. Ralph's working life included some time running a hardware shop as well as work as a decorator. Brian, quoted above as regretting that he didn't study mathematics more widely, tells us in the 1991 data that he went to grammar school and then left school at fifteen to work as a junior clerk in a borough treasurer's office. Other respondents had similar experiences to these two, with higher education being rare in their youth, though some returned to study later.

When discussing their own schooling in answer to the 1991 directive, respondents made little mention of mathematics and when it was mentioned it was often alongside English in a discussion of what was considered to be a good basic education. Some examples follow.

> At council school, I learned to be literate and numerate and certainly learned that life wasn't always fair, although I don't think that came in to the curriculum.
>
> (Graham, writing in 1991)
>
> By the time I left that school, I do not think there was a child in the class who could not read, write and do basic arithmetic.
>
> (Ken, writing in 1991 about the school he left around age 11)
>
> Educational standards have fallen alarmingly over the last 25 years. Perhaps the teacher quality hasn't been so good, or perhaps the new systems are to blame. When I was at school, EVERY child had to learn from the start, READING, WRITING and SUMS as we used to call them.
>
> (Rosie, writing in 1991, her block capitals)

Although the three quotes above have a similar theme, they differ in that Graham was writing about his own level of numeracy whereas Ken extended this to all his class and Rosie appeared to suggest that it could be extended to the whole generation. Many of the writers seem to be hinting at a golden age when everyone was successful in learning arithmetic at school. This issue will be picked up again in the discussion.

### Current and Recent Mathematics Education

Many of the writers talked about the mathematics education which they felt had been received by those younger than them. This frequently arose in the context of stories about younger people unable to do what our writers perceived as simple calculations,

usually in the context of shopping or other transactions involving money. It is not possible to tell from the accounts of these incidents when they occurred, though there are indications that many happened some years before the time of writing in 2004 and some writers were referring to a general pattern rather than specific incidents. We also cannot say what was meant by 'younger people' except that presumably those concerned received their primary education in the second half of the twentieth century.

> There is some satisfaction in being able to mentally check the change when you purchase anything and even confess to a good feeling when the shop gives you more than they should and you can take it back and look at the surprise of their faces.
>
> (Wilf, age 79)
>
> Some years ago a family party wanted to go to a church in Oxford which charged for going up the tower. The cash machine had broken down, so the chap in charge apologised but we couldn't go. It was inconceivable to him that I could multiply something like 5 adults @ £2.50 plus three children @ £1 and two pensioners @ £2 in my head. We had to wait until someone came and put the machine right!
>
> (Brian, age 82)

The reliance of younger people on machines was a common theme amongst many of the writers. Stories like those above were common and the assumption seemed to be that the younger people could not calculate without the machines provided in shops. It did not seem to be acknowledged that often the machines had to be used as a record keeping measure. The over-reliance on calculators was also frowned upon, and although some writers were restrained about this, as in the quote from Ralph earlier, others were more fiercely critical.

> I am appalled at the inability of younger people to use figures. Without a calculator they are lost. I used calculators once when I was at work for long calculations, but it takes away your natural ability so I stopped using one and carried on. I firmly believe that some children … would believe a calculator if it said that 2+2=5.
>
> (Jack, age 83)
>
> …you see boys & girls on the Cash Desk in these small SUP markets & they are <u>informed</u> by the "machine" How! Much! Change! To! Give! The! Customer! No wonder they can't calculate! They <u>don't</u> use their BRAINS, what a pity- as they will not work if not used- maybe! <u>Today</u>! That is the cause of all !Youth" and bad things that happen all the time- They are either stuck in front of TVs or Computers where everything is dished up to them or they don't have TO THINK! "Pitifull," I'd say…
>
> (Winnie, age 86, her punctuation and emphasis)

Although many of the comments made were about younger adults, some of the writers did talk explicitly about school education at the time of writing in 2004. One writer in a strong position to discuss this was Henry, who in his introduction noted

that he had fourteen grandchildren. Henry's account of his day includes two incidents related to his grandchildren doing mathematics.

> As it was a school day, I popped round to see my grand children off to school. Although I did not have anything to do with numbers then, I checked that one of them had the maths I was helping him with the day before. All long division, ten problems…
>
> When I pick the three boys up from school, the five year old comes out early and I do his 'homework' for 45 minutes and his book was about a farmer who kept losing and finding sheep in different places and we needed to know how many sheep he had at one time. Although the total was never more than one digit, it was still difficult for him as he had to remember each time how many sheep were in each place.
>
> (Henry, age 78)

Henry was unusual in having close contact with school mathematics. In contrast, there were several examples which suggested that the writers did not have an accurate picture of current practices.

> To exploit numbers when shopping requires resource to mental arithmetic at speed, which is no problem. It seems to me that schools set little store by mental arithmetic. One needs to be able to do all the calculations on the spot to ensure economical household expenditure.
>
> (Warren, age 79)
>
> What used to be called 'simple' arithmetic; addition, subtraction, multiplication and division were not beyond the abilities of the average elementary school child of my time. I've no idea if pupils at today's enormous comprehensives are even taught such skills. Seeing the universal use of calculators makes me rather doubt it.
>
> (Ralph, age 82)
>
> I don't think many young people know how to add or subtract, never mind divide or multiply. We were brought up to divide pounds, shillings and pence but I wouldn't recommend it even for a bit of fun.
>
> (Graham, age 85)

As with both the quotes above, writers often discussed schooling today in comparison to their own experiences. Although some seemed critical of schools or of younger people, others were more sympathetic or saw changes as reasonable, as in Henry's comment about imperial measurements. A slightly different point of view was expressed by Gladys, who felt that children at school today were missing out.

> …I can't be doing without numbers in my life- the simple arithmetic type. I only went to school until 14 so didn't go on to logarithms, geometry and the more sophisticated maths. And I feel I missed out. But I think today's children miss out in the mechanical age of being able to use their brains in the way we did by learning tables and working out sums in our head.

(Gladys, age 78)

The quotes above show a wide variation in knowing how mathematics is currently taught. In most cases, it was not possible to tell from the responses to the 2004 directives which of the writers still had contact with schools. However, the 1991 data sheds some light on this. Perhaps not surprisingly, some of those who did not appear to have an accurate picture of current practice admitted to having little or no contact with education. Some admitted to getting their information from the newspapers.

> I feel relieved that I have no vested interest in education nowadays, as the picture seems so confused. I have almost deliberately avoided informing myself about it as there are so many other things to be concerned about.
>
> (Brian, writing in 1991)
>
> I do not know very much about what goes on in school nowadays, though I read all that the newspapers have to say on the subject… there is, I believe, still too much of an element of 'play' in primary school.
>
> (Warren, writing in 1991)
>
> (Education today) Well I don't really know – only from what I read- & it's not good is it?
>
> (Winnie, writing in 1991)

It is interesting to note that Winnie, who admits to only knowing about education from what she reads, is the writer giving one of the strongest views of the drawbacks of machines, as quoted earlier and used in the title. Care must be taken because it is possible that Winnie had increased contact with schools between the times her two accounts were written. Our information about the contact our writers have with the education system is limited. Nevertheless, from the data we have, it appears broadly true that those expressing the strongest and least accurate views about school mathematics today seem to rely mainly on the press for information.

## DISCUSSION

In considering the comments made by these respondents, the self-reported nature of the data must be recalled. We cannot claim that it provides factual information, but it tells us about the views, beliefs and attitudes of the writers. Although they exhibit a range of views and experiences, there is some commonality. The majority report an education which emphasised mental arithmetic, and believe that this has helped them in their lives. There is also a quite widespread belief that those educated more recently are less able to calculate mentally. Many of the writers felt calculators were to blame and were surprised at the apparent reliance of the younger generation on machines. Although is not possible to check this information's factual basis, the comments about the mathematics curriculum experienced by the writers are consistent with the type of education available at the time. The majority appear to subscribe to the philosophy behind the system in which they were educated.

These findings contrast with other studies which suggest that many adults have a negative view of mathematics, with memories of mathematics lessons, particularly those involving multiplication tables, contributing to this. Thus, Buxton (1981) in a study of adults who panic about mathematics, suggests, 'Tests of mental recall of facts (often wrongly referred to as mental arithmetic) have much to answer for (page 7).' It is impossible to say definitively why the sample considered in this paper had a more positive view of mental arithmetic. It could be related, as they suggest, to their age and experience, or it could be that our respondents form a particular subgroup consisting of those more inclined to have positive memories of mathematics. Another possibility is that these memories have become more positive over the years. Positive findings are not unique in studies regarding attitudes to mathematics, as pointed out by Dowker (2005, Chapter 11). In reviewing work related to the role of attitudes and emotions in mathematics she concedes that such studies tend to emphasise the negative, but she also points out that enthusiasm for mathematics has been identified in studies of both adults and children.

Our writers imply that, when they were at school, success in learning arithmetic was common or even universal. This contrasts with the work of McIntosh (1981 from an original written in 1977) who reviews literature on the teaching and learning of mathematics at primary level over a period of 150 years. He found that there have been concerns about children's performance in arithmetic throughout that period and failed to identify a period in which the situation was markedly better.

The respondents' views on more recent education can be compared with what is known about developments in the mathematics curriculum in England. It is clear from looking back at curriculum advice (e.g. Nuffield Mathematics Project, 1967) that the second half of the twentieth century saw a broadening of the primary mathematics curriculum with less emphasis on number. Until the introduction of the National Curriculum in 1989, there was no centralised curriculum for primary mathematics, meaning that wide variations between schools were possible. However, in practice the curriculum was partly determined by the need to prepare for secondary education. Another factor leading to commonality was the use of commercial mathematics schemes by the vast majority of primary schools. The reality, therefore, was that the emphasis on basic arithmetics and learning number facts probably was reduced compared to the period between the wars, but these things still had a key place in the primary mathematics curriculum. This situation is summed up by Brown (1999) who says that most schools continued throughout to teach and test number bonds and multiplication tables and that calculators were used sparingly if at all.

It is easier to check the information given about the perceived mathematics curriculum when the writers gave these accounts in 2004. At this point the National Numeracy Strategy (DfEE, 1999) had been running for five years and primary schools were offering a curriculum in which mental calculation had a central place. It is interesting to note that the multiplication exercise involving the clock face

described by Wendy is now in use in schools in an electronic format. Henry appeared to have a more accurate view of current practice than our other writers and this is not surprising given the time he spent helping his grandchildren with their maths. Other writers clearly have inaccurate views of current practice.

Our writers also estimate that they are better at calculation now than many of the younger people they come into contact with. Although this information cannot be verified, it clearly could be true for the individuals giving the information. What is more doubtful is whether it can be generalised (as many of them do) to their entire generation, as this contradicts research comparing the mathematical performance of adults of different ages.

Given that the data is self-reported and that many of the incidents described happened over sixty years beforehand, it appears possible that some of the factors identified by Harrisson (1976) are relevant to our writers. Some events may be misremembered or it may be that the implication that such events are commonplace is an over-generalisation. It is also possible that in the sixty years or more between these people leaving school and their accounts being written, there was a recreation of their education in the common collective memory similar to the recreation of the Blitz described by Harrisson. This might be explained partly by a tendency to remember things in a positive light and to defend one's own generation. Another factor appears to be the role of the press in misleading the public about educational practices in the intervening years. A final factor may be a misunderstanding of technology which shop workers and others are often obliged to use for recording purposes, perceived by the older generation as being reliant on them.

## FURTHER QUESTIONS AND CONCLUDING REMARKS

Given the small size of this sample, further similar work would assist in establishing whether others in this age-range exhibit similar attitudes. A further interesting line of enquiry would be to investigate factors contributing to the semi-mythological view of recent mathematics education held by some respondents. One possible avenue would be to investigate newspaper reporting of mathematics education in the second half of the Twentieth Century. A further question is whether the views of our writers were shared more widely in the general public at this time and, if so, whether some of the calls for curriculum changes were based upon such views.

Whatever the reason for the views held by these respondents, some of their descriptions of current practice are clearly inaccurate. In other cases the information given may be correct but few appear to see any compelling rationale for changes in the curriculum or for use of calculating devices, either in school or elsewhere. This is cause for concern and presents a challenge to the mathematics education community in terms of better publicising current practices and the rationale behind them.

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